The Chemical Age

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Notes and Comments

Science in the King's Reign

SOME significant technological achievements of the King's reign were reviewed by Sir Frank Smith, secretary of the Department of Scientific and Industrial Research, at a special Jubilee luncheon of the Society of Engineers in London on Monday. There were, he said, four great achievements to be proud of: The advances in medicine, which had prolonged our lives; the more complete harnessing of the electron, which had given birth to industries unknown in 1910; the fixation of nitrogen, which had overthrown the menace to our food supplies, and the production of new steel-cutting tools, which had revolutionised the machine, reduced the price of manufactured good and increased leisure. Speaking of food supplies, Sir Frank Smith pointed out that in 1910 over 1,250,000 tons of nitrates from Chile were used each year as agricutural fertilisers. The world demand was then increasing to such an extent that it had been calculated that the Chile nitrates would be exhausted by 1923. There was also the prospect of a shortage of sulphate of ammonia. To-day more nitrates for fertilisers can be produced from the air above us than we can at present use. The process in brief consists in causing nitrogen and hydrogen to combine together at a temperature of about 400° C., at pressures varying from 200 to 1,000 atmospheres. To cause the nitrogen and hydrogen to combine rapidly a comparatively small quantity of another substance, called a catalyst, has to be present What the catalysts really do and how they do it, even at this time has yet to be discovered, and is one of the unsolved problems of chemistry. Failing definite knowledge the right substance had to be sought by trial and error, and to bring about the fixation of nitrogen on a satisfactory commercial scale 20,000 different substances were tried out as catalysts.

When the King came to the throne there was not one listener-in in the world. To-day, in this country alone, there are over 7,000,000 people with licensed receivers, and on his Jubilee day the King spoke, via millions of thermionic valves, to hundreds of millions of his subjects. Of equal importance industrially is the discovery which led to the photo-electric cell, the development of the talkie film, and television. In 1933 the production of one motor-car per week occupied only eight persons, compared with 55 persons 14 years ago. New tools have also so cheapened the car that many more are needed, and five times as many people are now employed in its production as in 1921. It is the same in nearly all industries. The new tools have enabled better and cheaper machines to be produced and these, in turn, have cheapened the production of numerous products, from a pin to the machinery of the "Queen Mary." "The progress we have made," Sir Frank concluded, "has produced growing pains, but with sense and goodwill we shall conquer the pains and not allow them to conquer us."

The New Premier

WHILE the technical and trade Press has no concern with politics as such, our readers would not wish us to pass over in silence such an outstanding event as a change in the office of Prime Minister. Mr. Ramsay MacDonald filled the highest office under the Crown during a period which will be seen in the perspective to have been of enormous significance to British trade and industry. His lasting claim to fame was his act of rare courage in breaking the party ties of a lifetime four years ago and forming a National Government to deal with an unexampled crisis.

The statesmanship he showed on that occasion is attested by the continuance in office of that Government to-day with little diminished authority and by the smoothness with which the succession of Mr. Baldwin to the Premiership has been accomplished. Mr. Baldwin, on his part, has begun his third term as Prime Minister on a note of national concentration which has been widely acclaimed. He has made a large number of changes in the personnel of the Administration, but the business world is especially grateful to him for leaving Mr. Neville Chamberlain and Mr. Runciman undisturbed at the Treasury and the Board of Trade.

Higher Staff Appointments

SIR HAROLD HARTLEY has an impressive record as teacher and industrialist, and his views are always stimulating. In his address to the Association of Technical Institutions, among many challenging statements a few may be selected for special mention. We have referred earlier to the construction of the Iraq pipeline. When Sir John Cadman described this undertaking he laid particular stress upon the team-work of those who carried that great venture to so triumphant a conclusion that 1,200 miles of welded pipeline were laid across the virgin desert in 13 months, buried five feet deep, and yet only leaked in three places. Sir John was only persuaded with diffidence to mention any names in connection with that work, so intense was the team spirit among all. Sir Harold Hartley, recognising that the day of the individual craftsman has largely disappeared, says that "the modern method of production creates a new series of problems requiring expert solution . . . . involving the co-operation of teams of specialists. This team work is the characteristic feature of large-scale management which is dependent on specialised personnel dealing with each of its various aspects." The successful managing director of the future will not be the rugged individualist of the Victorians, self-sufficient and unwilling to take others into his confidence—whose method and spirit still live amongst us in that veil of secrecy with which some still seek to envelop their operations—but in a captain in the true sense of the word—the captain of a team. The captain is also one of the team, and must pull his weight as well as guide, encourage and assist the other members.

Under this new system and in these large organisations there arises the difficult problem of replacing those whom anno domini causes to drop out of the ranks. It is necessary, as Sir Harold Hartley points out, for each individual to know his function in relation to the others, and this in turn involves a staff that has, individually, a bird's eye view of the various phases of the undertaking. There are few things more difficult than for those engaged on a works in the daily task of " making the wheels go round " to get a bird's eye view of anything. Their horizon is so obviously limited by that pump that pumpeth not, that leaking condenser, or that tank of xyz that has been promised for delivery but is not yet ready, that they have little time or energy left to consider the interrelationship of their work to that of others. However necessary it may be to have this community of effort to make the affairs of the concern prosperous, it becomes still more necessary for promotion to the higher ranks. It seems that only by conscious educational effort of the concerns themselves can men be obtained who are fitted for the higher staff and directorate. We should deprecate any suggestion that men should be chosen for this training during the early years of their service with the firm. Experience shows that it is frequently not until a man is nearing the wrong side of 30 that his true worth can be assessed. If the years from 30 to 40 were spent in training, by which is meant moving from department to department at intervals of two years or thereabouts, within 10 years the clever and adaptable should be ready to occupy what is intended to be his specific place in the organisation. Training for the higher staff appointments in the present large organisations is no matter of book learning—the only teacher is experience, though, as in other forms of teaching, the personal effort of the pupil counts for very much.

Exposition of Chemical Industries

IN addition to its display of raw materials and finished products, the 15th Exposition of Chemical Industries, to be held in New York from December 2 to 7, of which some advance details were published in THE CHEMICAL AGE of April 27, promises to be a great exhibition of equipment in terms of heavy plant, machinery and the innumerable accessory machine units which serve the great industrial plants and represent the handling of mass-production operations after they have been worked out in the laboratory and on semi-works production scale. Quite naturally this trend will be responsive to the fact that the American market, after years of depression, has a stored up demand for capital goods and for plant equipment generally, to replace units which the mere factor of obsolescence should have replaced sooner. Statisticians point out that there is more than $100,000,000 set aside for new plant projects in the chemical industries. As a background for building and machine maintenance the chemical processes to be handled must certainly be advanced by the unprecedented accumulation of research facts which are available. The factors of accumulating reserves, improved business confidence, obsolescence, and the trend toward new product development, must inevitably combine to make the exposition a natural market place.

The exposition will carry on from the high point which the 14th exposition established in 1933. Dominant again will be the new school of thought with respect to the technique of exhibiting at expositions. While the exposition of 1933 was outstanding in its recognition of the value of well-planned exhibits, this trend will be greatly augmented in 1935 because not only is the improvement well recognised, but there is now more confidence in terms of the means available for carrying it forward. Exhibitors and their craftsmen are working in advance to arrange their exhibits, not merely to represent their firm, not merely to be instructive, but through attractive and intelligent display to bring to a quick thought climax the captured and stimulated interest of the observers. All this is in response to the present American spirit.

New Psychology of Presentation

WE are told that the American industrial spirit has been refined by the depression. It is open minded, but highly analytical of what is claimed and how it is presented. At Grand Central Palace in December visitors to the exposition will notice that some exhibitors call attention particularly to key items of equipment or material products. From these the eye of the observer will pass to the background of the exhibit, seeing clearly the relationship of other products of the exhibitor, perhaps earlier inventions or products auxiliary in function. Some things are emphasised; others provide the background. Assisting in this method of selective emphasis will be the use of animation, colour and light. It is all part of the new psychology of exhibit presentation which seeks to clarify. The tendency to show not only the material or the machine, but to make the visitors understand just how it is used, is part of the exhilarating trend from static to dynamic exhibit style.

An additional factor of appropriate timing is seen in the fact that the 15th Exposition of Chemical Industries, by virtue of the week during which it is presented, will be available to the great influx of members of the mechanical engineering fields who will be in New York attending the national mid-winter meeting of the American Society of Mechanical Engineers. The matter of design, purchase and operation of industrial plant equipment—the functions of chemical engineering and mechanical engineering—are increasingly related. The recent tercentenary of the American chemical industries brought the subject of their work and realisation of their importance to national attention. The 15th Exposition of Chemical Industries will tell a story in terms of actual materials and machines which make up this great group of industries. Here will be the pageant in terms of the tangible, the proving ground, and the market place.

Civil Defence Against Gas Attack

Mr. J. Davidson Pratt Criticises Highly Placed Alarmists

MR. J. DAVIDSON PRATT, general manager and secretary of the Association of British Chemical Manufacturers, in a lecture given before the British Science Guild on Wednesday, stressed the importance of educating the civil population in methods of defence against gas attacks in war, more especially from the air. Much unnecessary anxiety, he said, had been created by the publication of highly alarmist articles on the subject of gas attack from the air, by individuals—some, unfortunately, highly placed—who had no real knowledge of the subject and who, by pseudo-scientific methods, made calculations which were not justified by the basic data. The individual who described luridly how a bomb dropped at Oxford Circus would annihilate the whole of the area from Baker Street to Charing Cross deserved to undergo all the most refined tortures of the Spanish Inquisition, because of the untold harm he did in thus misleading the general public. He hoped such alarmists would soon find their scope of action seriously curtailed by the issue of an official pamphlet setting forth the real nature and extent of the menace of gas from the air.

How Chemicals Kill and Injure

Defence against chemical war is particularly urgent and important in spite of the prohibition contained in the Geneva Protocol, because in the first place a country with a well-developed air service and a strong chemical industry has the means ready to hand for a rapidly improvised gas attack on the nerve centres of its enemy. A second reason arises from the fact that gas has a devastating effect on the morale of people ignorant of its properties and uninstructed in methods of defence, and a country's lack of preparation to defend itself against gas might well induce an enemy who had the means to attack ready to hand to use gas in order to secure a speedy victory.

Mr. Davidson Pratt pointed out that while in the case of sea-coast towns there is a danger of gas bombardment by naval guns, the real menace is from the aeroplane which can drop bombs of any size. The bombs may liberate a variety of toxic agents which may act on the human body in various ways; gases like phosgene and chloropicrin attack the lungs; tear gases like ethyliodoacetate and chloroacetophenone affect the eyes; organic arsenic compounds such as diphenylchloroarsine, diphenylcyanoarsine, and diphenylamine arsenious chloride exert their irritant action on the breathing passages, while others of the vesicant or blistering type, such as mustard gas and Lewisite, will burn the skin and any other part of the human body with which they come in contact, whether as liquid or vapour. Thus, protection for the whole body is a desideratum for poison gases of the mustard gas and Lewisite type, whereas for the other types a gas mask protecting the lungs and eyes is adequate.

The Pleasant Task of Protecting Your Home

The main defence against gas for the fighting services in the field is the gas mask or respirator. Collective protection, by which is meant gas-protected shelters or dug-outs, has only a limited application, as troops cannot fight in dug-outs. With the civil population the reverse is the case. The civil population as a whole can keep indoors and that is the safest thing for them to do as soon as an air-raid warning is given. Prompt action in getting under cover is essential as an aeroplane spray gives no warning. The aeroplane, if high up, may be miles away, and a man, if he were in the open, would be contaminated before he realised his danger. As it will never be possible to say before hand whether gas will be used or not, the necessary precaution of taking cover in gas-protected rooms or shelters must be adopted immediately by the general public in every air-raid warning.

To make indoor protection as safe as possible, there should be in every house, office, or building a gas-protected room or rooms in which the occupants can remain until the all-clear signal is given. The question at once arises as to where the selected room should be—in the basement, on the ground floor or in the higher storeys. The danger from high-explosive bombs as well as from gas must be considered. The natural instinct is to go down into the deepest basement and to have as many floors above one's head as possible. With only the gas menace to consider, the top of the house would be safest, as the occupants would be above the level of any gas clouds produced by bombs in the streets. A compromise is necessary when dealing with both risks, and the expert view appears to suggest the basement, if there is no danger of flooding and, failing that, the first floor.

Having selected the suitable room, it should be made as gas-proof as possible by closing up all likely means of ventilation with materials ready to hand. Cracks can be filled up with putty, or even mud, while wet newspaper is quite a useful material to be found in most households. The windows require protection, as the glass may be broken by concussion, so they should, if possible, be boarded up outside and covered inside by stout materials, such as blankets—wetted for preference—linoleum, etc. Fires should, of course, be extinguished in the gas-protected rooms. Provision should be made for food, water and other conveniences in case the occupants should have to remain in them several hours. The general public will have to be instructed as to the maximum number of people who can safely occupy a room 10 ft. by 10 ft. *e.g.*, five people can safely occupy a room 10 ft. by 10 ft. The necessary data are available and will no doubt be contained in any instructions issued by the Government.

There will naturally have to be some provision in the way of public gas-proof shelters for people caught in the streets. The idea sometimes put forward of extensive underground shelters, proof against high-explosive bombs and gas, is not likely to be feasible except to a very limited extent for certain vital services, because of the enormous expense involved. There are, however, considerable possibilities in London, and probably in other cities, of providing a limited number of such shelters without undue cost, by the peace-time construction of underground garages, for which there is a crying need. If these were constructed with the question of defence in mind, they would make good shelters from air raids in war time.

Gas Masks for the Favoured Few

Everybody in a city cannot stay indoors until the raid is over. Essential services must go on, and gas masks will therefore be necessary for people such as the police and fire brigades, for whom a high standard of protection will be wanted, because they may have to operate in highly-contaminated areas. Such people would also require some measure of protective clothing in the nature of oilskins, in order to protect against aeroplane spraying and contamination by liquid splashes. Other services will have to continue to function, and they also will need gas masks, perhaps of a simpler type. Whether the rest of the civil population will need gas masks is a difficult question. There is the psychological argument that the civil population will demand gas masks, and since it will not be possible to supply the millions which will be wanted if such a demand arises in an emergency, it will probably be desirable to provide some simple type which could be on sale in peace and which could be readily made by the million in the event of war.

It is necessary to assess carefully the circumstances in which such a mask will be used. They will probably be two-fold: firstly, in case of leakage of gas into a gas-protected room, for one reason or another; and, secondly, when it is necessary to go into the street before the area is cleared of gas, as, for example, when evacuating a heavily bombarded area. For these circumstances, an adequate minimum standard of protection has to be laid down. It is then necessary to design a gas mask which will give this protection, be simple and foolproof in use, have a long life, be cheap to make and be capable of mass production, literally in millions, from material available in the country in times of emergency. This problem is no doubt receiving the urgent attention of the experts, but suggestions towards its solution will certainly be welcomed, and in particular in regard to the still more difficult question as to the best method of protection for very young children. All these types of gas masks are likely to rely to a large extent on active carbon or charcoal. The use of this for industrial purposes, such as solvent recovery and the debenzolisation of coal gas, is making steady progress, but new sources of supply and methods of production would give an added assurance in time of war.

The provision of protective clothing also involves a large number of technical problems, even if the problem be limited to the two well-known vesicants, mustard gas and Lewisite. There is scope for an investigator to produce a garment which, by chemical or physical means, will permit the wearer to work, and protect him for several hours, not only against the vapour of these liquids, but also against drops such as could be liberated by an aeroplane spray or a bomb burst.

Detecting the Nature of the Gas

Dealing with the steps to be taken when the bombs begin to drop, Mr. Davidson Pratt said the task of identifying the type of gas is one which only a person with a training in chemistry can do. Such a person he called a "gas detector," as a matter of convenience. By a system of area organisation the "gas detector" will immediately proceed to every place where a bomb has fallen in his area and diagnose its nature. This will not be an easy problem. The fumes of high explosives may smell like gas and he will have to be guided by other considerations, such as destructive effect. On the other hand, a bomb may contain both high explosive and gas, so that the decision may present considerable difficulty. The "gas detector" will have rapidly to say in each case whether or not gas has been used, and, if it has, whether the area will require decontamination. That will be about the most he will be able to say on the spot. He will, however, take samples of material contaminated by gas and have them quickly examined to see if the particular gas can be identified. That may be fairly easy with known gases, but even these present difficulties; with new gases it may take days to get the final answer even with all the resources of the scientific and analytical laboratories in the neighbourhood, just as it took sometimes weeks in the last war before we were quite sure as to the nature of a new gas used by the Germans. Nevertheless, skilful and rapid diagnosis by the "gas detector" will greatly facilitate the work of the decontamination squads and the doctors, but an error of judgment may be fraught with serious consequences. He will thus be the key man in the scheme of defence, and arrangements will be necessary in peace so that he may be trained to undertake this work in an emergency.

This question of "gas detectors" presents a series of problems both of technique and organisation. Rapid methods of "spotting" the known types of war gases will be wanted, and their limitations will have to be clearly defined and made known to those using them. The supply of suitable personnel also needs careful consideration. Trained chemists will be wanted in large numbers for work on munitions and research problems, and will therefore not be available in sufficient numbers to provide for the rapid survey of a bombed area. Here the services of the pharmacist (the trained man in the chemist's shop) may be most useful, as his pharmacological training should provide a good basis for the work, and as chemists' shops are generally well distributed throughout every city and town.

Difficulties of Decontaminating an Area

The next step in the scheme of defence will be the work of the decontamination squads which will have at once to deal with those areas, buildings, vehicles, etc., which must be quickly freed from gas to enable the essential activities of the community to proceed. They will have to be organised on an area basis, probably with the municipal sanitary and street-cleaning staff as a nucleus, but they will need to be mobile in case their services are wanted in a neighbouring area.

Decontamination presents a series of problems which will necessitate the attendance and advice of the trained chemist, who will have to say what methods to use in any particular case, to supervise the work and to give a final pronouncement as to when the work of decontamination has been satisfactorily completed. He will have to be enterprising and resourceful, because neutralising chemicals, such as bleaching powder for mustard gas, will be scarce and he will have to depend on the materials most readily to hand, which will in most cases be water and earth. Decontamination problems will also arise in connection with the work of making good the damage. Water mains and gas pipes will be burst and electric cables will be cut. All of them may be contaminated and may require special treatment before repair gangs can safely get to work. Here the chemist's special knowledge and experience will be invaluable in deciding the best means to adopt. Similar problems will arise in the demolition or repair of buildings and of structures which have been bombed.

The first aid and decontamination centres will have to be organised so as to deal as rapidly as possible with a large number of people who are either contaminated or suspect they are contaminated. Speed is the prime essential and the quicker a contaminated person can remove his clothing and scrub or wash the affected parts, the less likely he is to suffer any injury. As every minute matters, it will often be better for people to wash or bathe in their own homes rather than waste valuable time by going to the decontamination centre where there may be further delay because of the number of people waiting.

Gas defence, reduced to its simplest elements, requires that the general public should keep out of contact with gas, whether as liquid or vapour, by staying in gas-protected rooms till the raid is over and the area cleared up, and that there should be an organisation for the decontamination of the areas affected and the first-aid treatment of those who have been exposed to gas. The success of the scheme will depend entirely on the behaviour of the population, as was clearly demonstrated in connection with the anti-gas training of troops during the great war. If people panic and lose their morale, the results may well be disastrous. This they are very likely to do, if they have not been properly instructed in the scheme of defence and the nature of the menace. The education of the civil population, in order that they may be imbued with the proper psychological reaction in the unfortunate event of a gas attack, is therefore essential, and it is comforting to know that the Government has a full realisation of the problem and is taking steps which in its opinion will best achieve the desired end.

Exports to the United States

Marks of Origin

EXPORTERS of chemical products to the United States are aware that, with certain exceptions, all articles, together with their immediate container and the package in which they are imported into the United States, must bear an indication, in a conspicuous place, and in legible English words, of the country of origin, but in view of recent experiences the Department of Overseas Trade calls their attention to the following points. In the first place, nothing short of the name of the country of origin is accepted as a proper indication of origin. Thus, "made in England" is acceptable, but not "English origin."

The law further prescribed that the indication of origin, *i.e.*, marking, stamping, branding or labelling, shall be as nearly indelible and permanent as the nature of the article will permit, and decisions rendered regarding the application of this provision make it clear that labelling is not an acceptable alternative to other means of indicating the origin, if the nature of the article, its container or the package in which it is imported, permits of a more permanent method of marking, such as stencilling. Again, if labelling is the only practicable means of indicating origin and it is possible to sew on the label, attachment of the label by means of tags is not acceptable. Briefly, the means employed to indicate origin must be as nearly indelible and permanent as the nature of the article will permit. The penalty for failure to mark imported articles strictly in accordance with the requirements is a fine of 10 per cent. *ad valorem* and, in addition, release from Customs is delayed until marking has been effectively carried out.

THE extraction of nicotine from powdery tobacco waste is reported by the firm Ruesch, Kunz and Company, in Burg and Liestsal, Switzerland. Their product is consumed entirely by the domestic market. The plant is reported to be handling slightly less than its capacity of one ton of tobacco dust per hour. Ruesch, Kunz and Company claim to be the only Swiss firm extracting nicotine from tobacco waste under the German process invented and patented by the firm Bigot, Scharfe and Company, Hamburg, in 1926 or 1927.

Heat Transfer in the Food Industry—II*

Further Papers from the Symposium held by the Institution of Chemical Engineers and the Food Group

THE use of a fluid as a medium for the transmission of heat to the various types of plant used in modern industrial and chemical processes has so many advantages that it has become very widely adopted in recent years and its applications are constantly increasing, said Mr. J. Arthur Reavell, M.I.Mech.E., in his paper on "Fluid Heat Transmission in the Food Industry," read at a joint meeting of the Institution of Chemical Engineers and the Food Group of the Society of Chemical Industry on April 17.

Steam heating is an advance on direct firing in respect of temperature distribution and control, safety and efficiency, and is, of course, widely used for low-temperature work. With direct firing the efficiency may be from 10 to 40 per cent., whereas with a good boiler used for process heating the efficiency from fuel to steam should be at least 70 to 75 per cent. On the other hand, there are usually a number of incidental losses, the importance of which is frequently underestimated. For example, in the use of saturated steam at 100 lb. per sq. in., the steam temperature will be 338° F. and its latent heat 876 B.Th.U., giving a total heat of 1,185 B.Th.U. from 32° F. The condensing temperature is 338° F., but when the condensate leaves the steam trap a "flash-off" occurs and the temperature immediately drops to 212° F. By the time the water gets back to the boiler it will have lost further heat, probably at least 50° F., and will actually enter the boiler at, say, 160° F. The loss of heat is thus 338 − 160 = 178° F., which is equivalent to 15 per cent. of the heat supplied in the steam. For higher pressures and temperatures the percentage loss increases.

Some Disadvantages of Steam

A further disadvantage of steam is its very close limitations in regard to temperature. It has just been mentioned that a pressure of 100 lb. per sq. in. corresponds to 338° F., giving temperatures in the product heated of up to 320° F. as a maximum. Very much higher temperatures than this are required in a wide range of industrial processes, and with steam a higher temperature can only be obtained by a very considerable increase in pressure. For example, a steam pressure of 250 lb. per sq. in. corresponds to a temperature of only 406° F. For a temperature of 600° F. a pressure of 1,500 lb. per sq. in. is required. It is true that in modern power generation plant a steam pressure of 500 lb. per sq. in., or over, is often used, giving 470° F., but to apply such pressures to heating plant and process work generally is quite out of the question. Attempts have been made to overcome this inherent difficulty with saturated steam by the apparently simple expedient of superheating, but the results have invariably been disappointing for reasons which are best illustrated by an example.

In hot water heating the hot water is circulated under a sufficiently high pressure to prevent the formation of steam. This avoids the loss of heat from the condensate that occurs with steam heating, but the limitations in regard to working temperature still apply, and at least to the same extent. A further difficulty is that, if natural thermal circulation is relied on, the boiler or heater must be arranged beneath the vessel or plant to be heated. In any event, natural circulation is sluggish, and it is difficult both to get good distribution and to arrange that a number of vessels can be heated from one heating unit. Alternatively, if a circulating pump is used, difficulties immediately arise in keeping the gland tight at the high working pressures involved.

Circulating Hot Oil

Of the available liquids for fluid heat transmission, the most usually applicable and certainly the most widely known is oil, and if properly applied it overcomes practically all the difficulties that have just been referred to. There are, however, certain principles of design and operation that must be closely followed, and a number of practical points which must receive attention if the installation is to be a success. The apparently simple idea of circulating hot oil is not in actual fact quite so simple as it seems at first sight.

Nearly 400 Kestner "Merilene" heating installations are in operation in various parts of the world, having a heat output totalling approximately 400 million B.Th.U. per hour. A positive rotary pump forces the oil at a high velocity through a specially-designed oil heater or absorber, and thence through the supply main to the apparatus to be heated. The latter may consist of jacketed kettles, tanks, pipe coils, or any form of vessel through which a continuous flow may be maintained. From this apparatus the oil is circulated back through the return mains to the pump, which keeps it in continuous circulation. An expansion tank, provided in order to take care of the increased volume of the oil as its temperature rises, is connected to the return main at a point close to the pump suction. The only pressure on the system, except the static head, is that necessary to overcome friction; consequently, it is a maximum at the pump discharge, becoming progressively less throughout the circuit to the point where the expansion tank connects.

When the system is in operation it will be noted that the circulating oil is going through a continuous cycle of cooling and reheating. At the point where the heat is utilised the temperature of the circulating oil drops as it passes through the jacketed vessel, pipe coil, or whatever the apparatus may be. In the absorber the circulating oil is reheated to the same temperature as before, and is, therefore, ready to repeat the cycle. There is no loss due to condensation, and nearly all the heat given up by the oil from the time it leaves the absorber until its return is available for useful work. The only possible loss, which is relatively slight, is that due to radiation from the pipes and apparatus, which may be reduced to a minimum by using proper insulation.

All classes of fuel are used for firing these plants. A great many have been installed using fuel oil, which is a very convenient fuel from the point of view of quick starting and easy control. Gas is also used, either coal gas or producer gas, and this also is very clean and convenient. The tendency now is to use solid fuel, especially since the tax on oil was introduced. Sometimes a natural draught is used with coal or coke, but, generally speaking, it is better to adopt a forced-draught grate.

Convenience of Electricity

There is no question that electricity is extremely convenient as a means of heating; it is very clean in use, and very accurate thermostatic control can be obtained. When properly applied, its only real disadvantage is the power cost, and this is very often outweighed by the other considerations and the cost of current is yearly decreasing. Incidentally, it is usually possible to obtain current at night time at a low figure, and time switches can be fitted to cut in only during periods when current cost is low.

The Kestner patent "Isolectric" plant is built to take advantage of these features, and there are in general two types: the first uses oil as a heat transmission medium in the same way as the "Merilene" plant, the only difference being that the furnace is replaced by an electric oil heater of special design. In the second type, electricity is used directly for the heating of vegetable oils and other non-conducting liquids. With electric heating there is practically no loss, since the whole plant can be very effectively lagged. There are no losses up a flue pipe and no furnace to be built. The plant occupies a very small floor space, and is fitted with thermostats and automatic safety control to give foolproof working.

There are now available certain chemical compounds which have the advantage of giving very much higher temperatures in heating systems than are possible with water or steam for the same pressure. For example, there are diphenyl, diphenyl oxide and various mixtures of the two together with sometimes the addition of other materials. The Kestner Co. have developed various types of plant, using combinations of these materials which are most suited to the particular

* The first instalment of this article was published in THE CHEMICAL AGE, May 18, 1935, page 437.

conditions to be met, and plants using these materials are referred to as their " Perolene " systems. The heat transmission medium can be used either in the liquid or vapour phase and each has its own sphere of utility. In large installations where the question of fuel costs is of importance, the plant is similar to the " Merilene " system, and is either coal fired or heated by means of fuel oil or gas, and the only essential difference is that " Perolene " is used in place of oil. In other cases electricity is used, and the " Perolene " is heated in absorbers of the same general type as for the " Isolectric " system.

Heating by oil circulation has been applied successfully to many branches of the food industry. Usually, in cooking food on a large scale it is a question of heating vegetable oils and mantaining the desired working temperature for treating the product under definite conditions. A number of plants have been installed for making potato crisps, and the plant usually takes the form of a trough containing the heated vegetable oil through which the potato slices are continuously passed by suitable mechanical means. The troughs are heated by the circulation of hot oil through heating coils, and this ensures accurate temperature control which is so essential in a continuous process. Another interesting example of the use of fluid heat transmission is in oil deodorising.

Seven Points in Favour of Gas Heating

Dealing with gas heating in the food industry, Mr. Peter Lloyd, A.I.C., said the most important factors of town's gas as a fuel would seem to be (1) ease of application and control, (2) automatic regulation of temperature, humidity and other quantities, (3) hygiene, (4) flexibility and range of working temperatures, (5) reliability, (6) effective cost, and (7) absence of fuel handling and storage, ash, etc. The fact should be stressed that it is the effective cost and not the cost of raw fuel that counts, and that town's gas, which is more expensive therm for therm than solid fuels, is often cheaper in practice as a result of the greater thermal and manufacturing efficiencies obtained by its means and the incidental savings which it effects.

Biscuit baking is a process in which the appliances and the methods of heat application have reached a high degree of development. The evolution of the gas-fired biscuit oven, which is so largely associated with the firm of Baker Perkins, Ltd., has taken place during the last 20 years, and now the biscuit oven fired with solid fuel has been almost entirely displaced. The special advantages of gas firing in this process may be summarised as (1) ease of temperature regulation and control, the temperature gradient along the oven being adjusted to any desired form, (2) constancy of temperature throughout day, (3) low thermal capacity and consequently minimum time lag in changing from one setting to another, (4) less space occupied for a greater output and less weight to be supported, and (5) less wastage of product due to better control of temperature. The fuel costs, originally estimated as 33 per cent. greater than with solid fuel, have now been found to be approximately the same, even with relatively high gas prices, thus illustrating the effect of operating efficiency in levelling up effective fuel costs.

The Drying of Solid Materials

The drying of solid materials is now frequently carried out in drying rooms or ovens with forced air movement, where the material is laid out in shallow trays and is, if necessary, raked over by hand. Alternatively, continuous dryers are used, in which air movement is combined with agitation of the material. In one form of continuous drier the wet material is fed in at one end of a rotating drum, in which it is brought into intimate contact with a stream of hot air until finally it is discharged at the far end of the drum. The rotation of the drum and the movement of air through it result in very intimate contact of the material with the drying air. This allows drying to be carried out much more quickly, compactly and efficiently, with the added advantage of continuous operation. These drying operations require large supplies of air at temperatures varying from 150° F. to 1,000° F., and gas is ideally suited for supplying the drying air.

The evaporation of liquids is an important group of processes for which steam heating is widely employed and direct gas firing is relatively unimportant: however, town's gas is now being used in many such cases for steam raising, especially on a relatively small scale, up to about 500 lb. per hour, under which conditions the incidental advantages often outweigh the slight extra cost.

The development of spray drying was the subject of a paper by Mr. T. B. Philip, B.Sc., A.R.C.S., A.I.C., who said that the essential requirement of a spray-drying plant is that of providing for the direct transfer of heat between the sprayed or " atomised " particles of liquid and the surrounding gaseous medium. The aim of manufacturers of spray-drying plant has been to obtain this heat transfer in the shortest possible time and in a space of reasonable dimensions, and, of course, to control at the same time the properties of the dried product.

Counter-Current Operation

In the majority of heat-transfer problems it is usual to aim at some form of counter-current operation, but with spray drying this is only possible in very exceptional circumstances. The course of the sprayed liquid in the form of particles of about 1/200 in. to 1/1,000 in. diameter is controlled almost completely by the surrounding air currents, and only with most exceptional conditions is it possible to design a plant in which the sprayed particles travel counter-current to the air stream. Counter-current operation in general is therefore out of the question, and in considering the theoretical and practical aspect of spray drying we can confine our attention to heat transfer in parallel flow. Incidentally, the impracticability of arranging a plant to work in counter-current is not altogether a disadvantage, particularly in the case of foodstuffs or materials which are susceptible to deleterious changes by applied heat.

To produce suitable conditions for heat transfer in a spray-drying plant a spraying device is necessary, together with suitable arrangements for mixing the sprayed liquid with the gaseous medium. The earliest types of spray-drying plant employed simple pressure jet atomisers, and these devices have been improved and are used for dealing with solutions and emulsions. The Merrill-Soule plant employed a pressure jet, projecting the spray horizontally in a rectangular drying chamber, while the Gray-Jensen plant is one of the best-known types of spray drier employing a conical drying chamber with the spray projected downwards. Another form of pressure spray is that employed with the Milkal plant, in which a current of steam or air impinges on a stream of the liquid, projecting it into the drying chamber in the form of a fine spray. The rotating disc type of atomiser operates on an entirely different principle, the most familiar examples of this type being the Kestner in this country, the Krause and Ravo-Rapid in the Continent, and the Peebles Drier in America.

Heating Air for Drying Plant

Steam is frequently used as a means of supplying heat to the air required for the drying plant, and almost all of the earlier spray-drying plants operated with heated air from this source. Air heaters of two general types are employed—those in which the air passes on the outside of plain or gilled steam tubes, and those in which the air passes inside the tubes arranged in a steam shell. The first type has certain advantages, particularly with gilled tubes, as additional heating surface is available on the air side, where the co-efficient of heat transfer is so much lower than on the steam side. Where the heated air is afterwards to come in direct contact with foodstuffs the second type is preferable, in view of the greater ease of cleaning.

Steam as a means of supplying heat for spray-drying purposes, however, suffers from one great disadvantage—namely, the limited air temperature that can be obtained with reasonable steam pressures. A steam pressure of 160 lb. gauge gives a steam temperature of about 187° C., and unless the heating surface is of exceptionally large dimensions it is difficult to obtain an air temperature of above about 160° C. with this steam pressure.

By the combustion of oil or gas high temperatures are readily obtainable, and by heat interchange between the products of combustion of these fuels and air in a suitable air heater much higher air-inlet temperatures are available than is the case with steam heating. This type of air heater has been developed extensively by the Kestner Company, and heaters of this type giving air-inlet temperatures up to 300° C. are in use on a number of installations.

The CHAIRMAN asked if Mr. Reavell had information concerning the cost of oil heating as compared with other methods of heating. As to the objections that some people had to the contact of the products of combustion of gas with food, he said that sulphur and arsenic were apparently the two bugbears in people's minds. Some people still believed that gas possibly contained arsenic compounds, which was probably quite a fallacy. His company had had no bad experience whatsoever due to the arsenic content of gas, probably because particular precautions were taken, in the London area, to scrub the gas and to ensure that it was pure from that point of view. He did not know whether that was the case also in other parts of the country.

It was interesting that the first patent for spray drying was taken out in England. The process was invented by an Englishman but was developed in the United States, just as the patent covering the evaporation of milk was an English patent, but the process was developed in Switzerland. The original American type of spray drier used the square collecting chamber. The conical collecting chamber was first thought of by an American, who had been engaged to develop the conical collector and also the collection at one point of the directly-falling powder and that which was separated from the air stream. Spray drying was carried out by a whole series of types of processes and different types of plant, and the powders produced by different plants varied considerably. It was interesting, for instance, to analyse milk powders produced on six different types of plant; the degree of coagulation of the proteins, for example, or denaturation, was extremely variable.

Objections to the Use of Hot Water

Mr. F. R. JONES said it appeared that a temperature of 600° F. was not required in the food industry; if lower temperatures were sufficient it would seem that the advantages of oil were less pronounced, and, further, that at the lower temperatures water could be used. An objection to the use of water was that an excessive pressure was necessary; but that would not apply at the lower temperatures. Further, he had been told—and he asked if it were so—that there was a snag in connection with the use of oil, *i.e.*, its tendency to leak from the pipe system.

Mr. R. GRIFFITHS said that one of the most surprising blunders made with regard to spray driers was to contend, as Mr. Philip had contended, that the thermal efficiency could compare favourably with any other form of drying. He would not care to make that statement. The thermal efficiency of a spray-drying plant could be improved by increasing the temperature of the air; but in the case of food products there was a limit of temperature beyond which it was not advisable to go in practice.

Mr. J. ARTHUR REAVELL, replying to the Chairman's question with regard to costs, said that each job must be considered separately, bearing in mind the prices of electricity, and so on. The particular circumstances of each case must be taken into account in deciding whether to use fuel oil, gas, electricity or anything else. He did not think oil leakage would be very serious, and he had never received complaints about it. Anyone could make a bad joint in an oil pipe and equally in a water pipe. One must use remarkably high pressure to obtain the same temperature transmission with water as compared with oil, so that the possibility of leakage with water might be greater.

Arsenic Compounds

Mr. LLOYD, dealing with the reference to arsenic compounds in the products of combustion of gas, said that, although there were appliances in use in which the products of combustion of town's gas were brought into extremely intimate contact with foodstuffs in processes throughout the country, so far as he was aware there had never been a case confirmed in which arsenic had got into food material from gas. Indeed, he believed one could say justifiably that the chances of arsenic being drawn in with the air were greater than the chances of arsenic compounds originating in the gas itself.

Mr. PHILIP, dealing with the conical base to the cylindrical drying chamber, said that the secret was in having the drying plant symmetrical. A small obstruction in the drying chamber was quite sufficient to disturb the rotary velocity in the apparatus, which velocity was not very high, and to upset the collection of the powder. The figures in the paper, showing the quantity of powder collecting in the base of the drying chamber, indicated fairly well that it was quite an effective way of obtaining the spray-dried powder from the upper part of the plant. Different spray driers probably did produce powders which were somewhat different chemically. But the investigation of the subject was extraordinarily difficult, because, in dealing with milk powder, for instance, so much depended on the treatment of the milk before it reached the drier. It was easy to overheat it before it reached the drier and so decrease the solubility. The only way to get to the bottom of the problem would be to test three or four different makes of spray driers together and feed them under the same conditions. There was an appreciable difference in the physical properties of the powders produced, particularly by different systems of atomising.

As to the thermal efficiencies of spray-drying plants, he said that, working with a drying chamber and a downward current of air, and where none of the sprayed particles was passing through the hot air as it entered the drying chamber, very high thermal efficiencies were obtainable, particularly if useful evaporation could be carried out by a scrubber using the exit air. For the handling of food materials, many of them having a starch base, inlet air temperatures of 220° to 250° C. were being used regularly, the air exit temperatures being about 80° C. The total radiation loss on a well-lagged plant was only between 5 and 8 per cent. of the total heat input.

Chemical Matters in Parliament

Duty on Imported Oils

IN the House of Commons on June 5 Captain Macdonald asked the Chancellor of the Exchequer whether he would consider the desirability of arranging an inquiry to investigate the extent to which it might be possible to increase employment by imposing a differential duty on imported hydrocarbon oils so as to encourage the refining in this country of all the refined oils required here, in the same way as the differential duty on sugar imposed in 1928 had resulted in the bulk of sugar for consumption in this country being refined in British refineries.

The Chancellor of the Exchequer replied that the question had been examined from time to time and again quite recently in the light of the various considerations to which it gave rise. As at present advised, however, he did not consider that the comparatively small increase in employment which would be likely to result from the adoption of the policy suggested would be sufficient to counterbalance its disadvantages on other grounds, nor did he think any useful purpose would be served by such an inquiry as was suggested. The matter would, however, continue to receive the attention of the departments concerned.

Captain P. Macdonald later asked the Financial Secretary to the Treasury what proportion of the light hydrocarbon oils charged with duty in this country during 1934 was refined in British refineries, and what proportion was imported in a refined state.

Mr. Chamberlain replied that the accounts of light hydrocarbon oils charged with duty on delivery for home consumption did not distinguish between the light oils imported as such and those refined in this country, but it was estimated that out of the total imports and production of light hydrocarbon oils in 1934, available for home consumption of for exportation, the proportion refined in this country was not less than 12 per cent.

Chlorinated Rubber for Paint and Varnish

CHLORINATED rubber is now utilised by the German paint and varnish industry, and paints, varnishes and lacquers are being manufactured in which this ingredient is used. The outstanding features of paint products manufactured with this new material are said to be its resistance to acids, alkalis, gasoline and alcohol, and also to the fact that linseed and tung oils may be compounded with the rubber. Production of chlorinated paint products in Germany is a distinct industry entirely separate from the manufacture of chlorinated rubber itself. There are now four firms engaged in the manufacture of the raw chlorinated rubber, all of which are bound by a cartel agreement covering the control of prices and certain other phases of competition. Eight German firms are engaged in manufacturing chlorinated rubber paint products and each uses a different name for its product.

Progress in Bleaching, Dyeing and Finishing

The Dry-Spinning of Cuprammonium Rayon

NOW that nitrocellulose (Chardonnet) rayon is not being manufactured, cellulose acetate rayon is the only type of rayon which is made by a dry-spinning process. In this case, of course, an acetone solution of cellulose acetate lends itself particularly to a process in which the extruded threads are led through warm air for the purpose of removing the acetone by volatilisation, since acetone evaporates readily. But viscose and cuprammonium spinning solutions appear best spun into aqueous coagulating liquors. According to E. Schurz (" Textilber.," 1935, *16*, 195), however, there are several factors which suggest that dry spinning of cuprammonium rayon would be more economical and that it produces a superior rayon.

It will be remembered that in the usual spinning process the cuprammonium solution of cellulose is spun directly into water and the resulting threads are afterwards freed from copper and ammonia by suitable treatment with dilute acid and washing. Schurz notes that for spinning 1 kg. of rayon there is required 2,000 litres of softened water, so that the consumption of soft water is an important and not inexpensive item in the manufacture of this type of rayon. Many years ago, when cuprammonium rayon production was first attempted, dry spinning was tried; but when success came with wet spinning this early attempt at dry spinning was abandoned. Schurz now describes a plant by which a superior type of cuprammonium rayon has been produced recently, and in which the cuprammonium solution is spun into dry air. Under these conditions the extruded threads quickly coagulate (probably due to rapid loss of ammonia and moisture) and are then suitable for purification by chemical treatment and washing. The resulting rayon can be produced finer (in denier) and stronger than when wet spinning is employed. Air is cheap and it should be relatively inexpensive to maintain a closed system in which the air is continuously withdrawn from the spinning chamber (saturated with moisture and ammonia), and dried and neutralised by bubbling through concentrated sulphuric acid so that it can be returned to the spinning chamber again. The important point to note is that moisture-free *cold* air alone is satisfactory; warm unsaturated air produces an inferior rayon.

Moisture Regain in Wool

The effect of temperature on the regain of wool has been investigated recently by A. C. Goodings (" Amer. Dyestuff Rep.," 1935, *24*, 109). The moisture content of wool is not only an important factor in the purchasing of raw and manufactured wools, but it gives a clue to other properties which affect the manufacturing processes. Although many researches have been carried out on this property of wool, for example, by Shorter and Hall (" J. Text. Inst.," 1924, *15*, 305 T), J. J. Hedges (" Trans. Farad. Soc.," 1926, *22*, 178), and J. B. Speakman (" J. Soc. Chem. Ind.," 1930, *49*, 209), no definite attempt has hitherto been made to determine the influence of temperature on the moisture absorption of wool. Goodings has therefore endeavoured to obtain information on this point.

Two types of wool were used in the experiments. One was a 64's Australian merino wool obtained " in the grease " and which was purified by scouring and extraction with various solvents. The other was a 70's merino wool obtained in the form of " tops." The moisture content of 0.1 gram samples of these wools was determined at 10° C. and 30° C. by suspension from a sensitive quartz spiral balance of the McBain-Bakr type (extension was 0.4 mm. per mg.) within a vessel containing air of controlled humidity (rising and falling). The humidity curves obtained show a definite hysteresis effect; that is, the moisture content of wool differs according to whether the wool is brought from a moist to a drier state or *vice versa*.

The conclusions drawn from these investigations are that the moisture regain of wool decreases with increase in temperature and that the hysteresis effect is less at the higher temperature. An important new fact is that the moisture-absorbing capacity of wool increases very rapidly at humidities approaching saturation and that the regain at saturation point is much higher than the value of 33 per cent. which has hitherto been accepted.

The absorption of water by cotton, viscose and other fibres can often be used as a criterion of their capacity to absorb dyestuffs, and also of their reactive power towards various reagents. Fibres which have absorbed moisture often swell much more in diameter than in length, and these dimensional changes can have important results in spinning, weaving and knitting processes. It is thus evident that the behaviour of textile fibres towards water is important. Probably no less important is the behaviour of these same fibres towards organic liquids, but, unfortunately, only scanty information is available on this point. It is therefore useful to note the recent publication of data on the absorption of organic liquids by cellulose (J. Wiertelak and I. Garbaczowna, " Ind. and Eng. Chem.," Anal. Edit., 1935, *7*, 110).

Cellulose has a comparatively small absorptive capacity for organic liquids, but this absorption varies with different types of cellulose. Wiertelak and Garbaczowna point out that the absorption is dependent on the degree of gradation of the cellulose, and that although most of the absorbed organic liquid can be removed by washing with ether or water it is not removed by prolonged heating at 105° C. The high absorption of alcohol-benzene mixtures is noteworthy.

Enhanced Weighting for Real Silk

In recent times the enhanced weighting of real silk has been obtained by treating the silk (already weighted in the usual manner with tin phosphate) with a solution of lead acetate or other lead salt, it being found that considerable quantities of lead can in this manner be fixed in the silk. Unfortunately, it is frequently found that this additional lead weighting interferes with subsequent printing discharge processes, in that it becomes impossible to obtain a clear white discharge, since lead sulphide is formed by interaction of the lead with the hydrosulphite present in the discharge paste. According to U.S. Pat. 1,966,991 it is now possible to avoid this difficulty by using zinc salts instead of lead salts. The weighting of real silk by this new process is carried out in the following manner: First, the silk material is degummed in a boiling soap bath. It is then steeped for about one hour in a cold solution of stannic chloride of 30° to 40° Tw., hydro-extracted and rinsed in cold water so that all residual stannic chloride is hydrolysed and the resulting insoluble tin hydroxide is fixed in the silk. After this, the silk is treated with a warm (145° F.) solution of di-sodium phosphate of 8° Tw. for about 20 minutes, whereby the tin hydroxide is mainly converted into tin phosphate. The silk is again thoroughly washed to remove any excess of the reagents and is finally rinsed with 1 per cent. hydrochloric acid solution. If the silk is now sufficiently weighted it is ready for the treatment with a zinc salt, but if further weighting is desired the various processes described are repeated once or several times before the zinc treatment.

For this final and special zinc treatment the weighted silk is first rinsed with a dilute solution of acetic acid of 3° Tw. at about 150° F. for twenty minutes. It is then immersed for 45 minutes in a solution of zinc acetate of 7° Tw., being then rinsed in cold, hot, and cold water successively. The silk is then treated for 20 minutes in a cold solution of di-sodium phosphate of 5° Tw., and, finally, well washed. These treatments may be repeated and in this manner the weighting of the silk can be raised to 140 per cent. above par. At this stage the weighting substance in the silk is mainly zinc-stanno-phosphate, and it is this substance which will discharge to a pure white colour.

FOR the first two months of 1935 exports of turpentine from Spain continued to advance and amounted to 436,392 gal., an increase of 42 per cent. over the corresponding month of 1935. Germany, the leading buyer, purchased over 40 per cent. of the total exports, followed by Italy, Switzerland, and Belgium. Rosin exports, however, declined from 3,192 metric tons for the 1934 period of 2,868 tons for the two months of 1935. Germany was also the largest purchaser, taking over 50 per cent. of the exports. The other chief countries represented in the trade were Netherlands, Great Britain, and Italy.

Empire Production of Beeswax

Technique of Refining and Bleaching

THE waxes are a group of solid substances of animal, vegetable or mineral origin. Among the commercial animal waxes are beeswax, spermaceti and insect or Chinese wax. Vegetable waxes include sugar-cane wax, candelilla wax and carnauba and other palm waxes. The chief of the mineral waxes are paraffin wax, ozokerite, ceresin and montan wax; these differ widely in composition from the animal and vegetable waxes and thus from the chemical standpoint form an entirely distinct class of substances.

Of all the animal or vegetable waxes, beeswax is the one most widely distributed in the world and capable of being used with the minimum amount of preparation. According to an article which is published in the April issue of the "Bulletin of the Imperial Institute," no exact figures are obtainable to show how much beeswax is produced in the United Kingdom. That it is of relatively small amount is obvious because the home production of honey is small, the total consumption of honey in the United Kingdom being about 4 oz. per head per annum. The imports in recent years average rather less than 80,000 cwt., or a little over 3 oz. per head, leaving under 1 oz. per head for home production. Bee-keeping in the United Kingdom is thus a very minor industry compared with Canada and New Zealand, in both of which countries, although large exporters of honey, particularly Canada, the home consumption is placed at about 2 lb. per head per annum.

A Considerable Industrial Demand

As there is a considerable demand for wax in the United Kingdom for various manufacturing purposes and this is not forthcoming from home production, beeswax has to be imported. Retained imports during the last three years have ranged between approximately 17,000 and 26,000 cwt. per annum. To the total imports (disregarding re-exports) Empire countries contributed about 15 per cent. in 1930, 18 per cent. in 1931, 31 per cent. in 1932 and 36 per cent. in 1933.

One point of great interest stands out prominently in considering the United Kingdom importations of honey and beeswax. It might reasonably have been anticipated that the countries which provide us with honey would also furnish beeswax. This, however, is not the case, as is shown in the following statement of the values of honey and beeswax imported into the United Kingdom in 1933 from the principal Empire sources of supply.

	Honey.	Beeswax.
	£	£
Australia	6,944	—
New Zealand	21,758	—
Canada	45,111	—
British West Indies	18,534	549
British East Africa	—	24,848
Anglo-Egyptian Sudan ...	—	3,192
Nigeria	—	1,958
British India	—	3,665

Empire sources of beeswax are predominantly the tropical African territories, in which bee-keeping is not largely practised, and not Canada, New Zealand and the West Indies. Similarly with our foreign sources of supply. Only Russia and Chile send us both honey and beeswax in important quantities. The United States, and to a lesser degree Cuba and Guatemala, send honey to the United Kingdom, whilst the chief foreign supplies of beeswax come from the French and Portuguese tropical African colonies, and smaller quantities from Abyssinia, Spain, Morocco and other countries. The reason for this state of affairs is that the honey of commerce is mainly the produce of domesticated bees in temperate countries, whilst the beeswax is to a great extent obtained from wild bees in tropical or semi-tropical countries. Amongst Empire tropical countries, however, Jamaica stands out as a marked exception.

During the last three years the value of the exports of honey from Jamaica has averaged about £12,000 per annum, whilst the corresponding figure for wax is only £500. Forty years ago the position was very different. Efforts were apparently made then to encourage wax production, the exports of which increased and reached a maximum in 1898. In that year 2,624 cwt. of honey valued at £2,124 were exported, and 1,590 cwt. of wax valued at £10,389. In 1933, when 13,566 cwt. of honey worth £11,643 were exported, the exports of wax were only 113 cwt., worth £512. The honey and wax exported in 1898 were obtained, as at present, from domesticated and not wild bees. But in 1898 nearly 1,600 cwt. of wax could be exported with 2,600 cwt. of honey, whereas now, when the export of honey has so greatly increased, the export of wax has declined to an almost negligible amount. It may be that much more wax is used locally for industrial purposes, but no evidence of this has been observed.

Surplus Wax from Honey Production

When attention is concentrated on securing the maximum honey production, using modern methods, the amount of surplus wax is comparatively small. In the first place, to relieve the bees of the necessity of having to use up a large amount of honey in making all the wax they require, they are provided with wax comb-foundation. Then, in the modern process of extracting honey, it is only necessary to remove the wax capping from the cells. The emptied honeycomb can be put back in the hives to be refilled. The result is that the wax produced is mainly that obtained from the cappings, brood comb and finally discarded honeycomb.

From statistics giving the sources of the imports of beeswax into the United Kingdom, it is apparent that the supplies received from Empire countries, although recently they have increased rapidly, are still small compared with those from foreign countries. This is not due to the Empire production being so small that it is not sufficient to meet the demand in the United Kingdom, but because, with the exception of Jamaica and the Gambia, which send all or practically all their small output to the United Kingdom, the wax is largely marketed elsewhere. Kenya and Uganda, with a total export of 954 cwt. in 1933, sent only 40 cwt. or 4.2 per cent. to the United Kingdom. In the same year Nyasaland exported to the United Kingdom 87 cwt. or 36 per cent. of a total of 241 cwt. Tanganyika, which exports a large quantity of beeswax, sent in 1933 to the United Kingdom 5,840 cwt. or 43 per cent. of the total of 13,600 cwt., a much larger proportion than in 1931, when from a total of about the same magnitude, 12,143 cwt., only 2,510 cwt. or 21 per cent. came to the United Kingdom. From British India, another large producing territory, the United Kingdom received in 1933 only 705 cwt., or 6 per cent. of the 11,645 cwt. of beeswax exported; in 1932 the proportion was about 8 per cent., and in 1931 only 2.5 per cent.

Qualities Peculiar to Different Sources

There would therefore seem to be an opportunity for these Empire countries to develop their production of beeswax to meet, to a greater extent, the demand in the United Kingdom, preferably, if possible, without sacrificing markets already won elsewhere. In order to do this it appears in the first place necessary to take steps to study the requirements of the United Kingdom market. Inquiries made recently in the trade elicited the opinion that the reasons for the greater import of foreign beeswax are principally its better sorting into grades distinguished by colours (white, yellow or dark yellow), the greater uniformity of particular grades, and the method of packing in one-hundredweight bales. The following observations include criticisms made on beeswax from various Empire sources.

Indian beeswax compares unfavourably with that from foreign sources. This is partly due to the fact that the pure beeswax itself is of somewhat different composition from that of other countries, and partly to faulty preparation and adulteration with paraffin wax and other substances. It has shown some improvement in the latter respects in recent years. The grades from Tanganyika known as "Dar-es-Salaam" and Tanganyika" are very good, but mixed in colour, and are shipped in lumps and slabs of irregular size; these two waxes generally command a good price. Zanzibar wax is a very good wax, but only small quantities come on the market. In Gambia steps have recently been taken to revive the beeswax industry, by preparing the wax in an inoffensive manner. Jamaica wax is excellent, though always mixed in colour. South Africa wax has been very little imported in recent years. Only small quantities of Australian wax come to the United Kingdom; it is of a very good quality of refined wax and well packed, but the price is too high for buyers in this country, who prefer to refine the wax themselves. The production of wax in Australia, however, has decreased with the more general use of frame hives and the imports now exceed the exports. In New Zealand the position is much the same as in Australia.

In order to market beeswax to the best advantage the following points should be noted. The principal requirements of a good beeswax are that it should be of good colour, clean in appearance, free from dross (dead bees, etc.), and pure (unadulterated). Hard beeswaxes are preferred.

Good beeswax is of an orange, or golden-yellow to lemon-yellow colour, and, other things being equal, lighter coloured samples are generally more highly valued. It is not possible to draw up a scale of grades corresponding to colours, nor is it expected that beeswaxes from different countries should be identical in characteristics. What is more important is that the product obtained from any particular source should be of uniform quality, so that purchasers can rely on getting what they require. Such uniformity, coupled with regularity of packing, is stated by a leading firm of importers to be worth a premium of about £5 per ton.

Refining and Bleaching

The following is a simple and effective method of cleaning beeswax, *i.e.*, of freeing it from various impurities. The crude wax is melted, preferably by steam heat, in a large double-jacketed tank or pan; the use of direct heat may involve the risk of darkening the wax and also of its catching fire. Solid impurities, together with any remaining liquid matter, such as honey or water, go to the bottom of the vessel, whilst the wax floats on the top, and on being allowed to cool solidifies into a solid block which merely requires the lower surface to be scraped to render it ready for market. These scrapings can be remelted with the next lot of crude wax. This method is more effective than skimming off the liquid wax.

To attain uniformity for export, wax from different centres received at the port of shipment can be well mixed, re-melted and cast into blocks of a regular size. The actual size of the blocks is not of great importance, so long as they are not too heavy, *e.g.*, they may be, say, 10 lb., 14 lb. or even 25 lb.

For certain purposes, *e.g.*, the manufacture of candles, it is necessary for beeswax to be white. The bleaching can be effected by the sun or by chemical means. Sun bleaching is the more satisfactory method, but can only be used where the sun's rays are sufficiently powerful, as in the tropics and southern Europe. In this process the wax is first purified by remelting in hot water to remove all traces of honey and other soluble impurities. The wax is then "shredded" by melting it and running thin streams of the molten wax over a revolving cylinder partially immersed in cold water. The wax solidifies in thin ribbons or shreds. These ribbons are exposed to the sun on canvas sheets stretched over wooden frames. Water is often sprinkled over them to minimise sticking, and they are frequently turned to expose fresh surfaces.

To accelerate thorough bleaching, which only takes place on the surface, the wax may be melted again and re-formed into fresh ribbons. The time taken in the bleaching process is dependent on the intensity of the sunshine and may be two or three weeks, or longer.

Beeswax can be bleached chemically by the use of various oxidising agents, such as hydrogen peroxide and chromic acid. To bleach by the action of chromic acid the wax is melted and boiled in a lead-lined vessel with a solution of potassium dichromate and sulphuric acid. The solidified wax resulting from this operation is green, owing to residual traces of chromium salts. These can be removed by remelting and boiling with dilute oxalic or sulphuric acid. Such chemically bleached beeswaxes are not suitable for all purposes.

Uses for Beeswax

Unrefined beeswax is used in the manufacture of furniture and floor polishes and pastes, preparations for dressing and waterproofing leather goods, such as boots and harness, and for grafting, sealing and sewing waxes, etc. The prepara- of wax comb-foundation to which reference has already been made is also important. Refined beeswax enters into the composition of many cosmetics, ointments and other preparations. It is used also for encaustic paints, lithographic and other special inks, and for modelling flowers, fruits and anatomical and other exhibits. The refined wax is still used largely for the manufacture of church candles.

Injection of Fertilisers into Fruit Trees

Research in Progress at East Malling

MUCH of the work carried out at the East Malling Research Station under the auspices of the Kent Incorporated Society for Promoting Experiments in Horticulture is of importance to chemists, and for that reason we draw attention to one or two sections of the annual report for the twenty-second year of the station, covering the twelve months ended December 31, 1934.

The invigoration of trees by the injection of fertilisers as an alternative to applying them to the soil was one of the new developments of the previous year, and Mr. W. A. Roach, of the Biochemistry Department, presents in the 1934 report an account of the first attempt to test the tree injection methods on a larger scale in a commercial plantation. Cox's Orange Pippin apple trees were injected with a "complete fertiliser" solution containing 0.25 per cent. potassium phosphate, plus 0.25 per cent. urea at rates which varied from 1/30th to 1/6th lb. per tress or from 10 lb. to 50 lb. per acre. The report points out that urea supplies about twice as much nitrogen as an equal weight of sulphate of ammonia and is more easily utilised by the plant.

The trees under examination were divided into groups of three; one of each group was injected with fertiliser, one with water and the third remained untreated. The trees were injected early in June through a single hole ¼ in. in diameter drilled diametrically through the main stem. When Dr. A. M. Massee, of the Entomology Department, made an examination he found that the six trees absorbing at the rate of 20 lb. per acre and over not only had foliage of a healthier green than the uninjected trees but that this healthier foliage was much less heavily infested by leaf hopper and red spider than the others, the infestation of which was, in his opinion, sufficiently great to account for its unhealthy appearance.

The most striking character of the fertiliser-infected trees was the uniformity with which all the branches of the trees were invigorated. This was in marked contrast with the effect of the general remedial treatment (incorporation of weeds with soil and sulphate of potash dressing). On almost every tree one or more branches remained unaffected and the remainder were affected one more than the other.

The amount of shoot growth, as judged by the weight and number of prunings, was nearly doubled as a result of the injection. The increase was greater in the trees absorbing the larger amounts of fertiliser than in those absorbing smaller amounts.

Dr. Roach also contributes to the report an account of the diagnosis and cure of chlorosis in a peach tree at the Swanley Horticultural College. The cause of the disease was diagnosed by small-scale twig tip injections and a safe and effective concentration and time of absorption were determined by injecting solutions of iron salts through holes in small branches. The tree was cured by means of injections through holes in the two main branches.

A new method is described by H. B. S. Montgomery and M. H. Moore, of the Insecticides and Fungicides Department, for testing under laboratory conditions the toxicity of lime-sulphur and of Bordeaux mixture, used as protective fungicides, to spores of *Venturia inaequalis* Aderh. Their paper deals with the problems confronted in standardising the application of spray fluid and of spores and includes a discussion of the best means of raising in pure culture large supplies of viable spores.

Mineral Oil Refining in Great Britain

Nearly 22 per Cent. Increase in Crude Oil Imports in 1934

PARTICULARS indicating the extent of the petroleum-refining operations in Great Britain during the year 1934 were published in the "Board of Trade Journal" of June 6. The larger proportion of the material treated at the refineries consists of crude petroleum as it comes from the wells, but substantial quantities of other kinds of imported petroleum such as distillates, kerosene and heavy oil residues are also treated.

The following statement, compiled from the Customs Trade Returns, shows the imports of crude petroleum during the years 1929 to 1934. The figures include imports of crude distillate:—

Sources of Supply	1929	1930	1931	1932	1933	1934
			Million Gal.			
Iran (Persia)	339.7	338.8	243.2	232.5	221.9	216.5
Mexico	13.8	—	—	16.5	60.7	114.2
Peru	—	—	—	45.0	74.7	82.5
Venezuela	64.7	85.6	92.9	66.5	21.5	23.5
Iraq	—	—	—	—	—	13.4
Trinidad	20.9	24.5	7.1	1.2	12.9	11.0
Ecuador	—	—	—	—	—	6.5
United States ..	—	5.7	—	2.3	0.9	5.9
Straits Settlements	—	—	—	—	—	3.4
Roumania ..	0.7	—	—	—	—	0.2
Colombia	47.5	6.3	—	—	—	—
Other countries ..	—	0.1	1.2	4.5	—	—
Total ..	487.3	461.0	344.4	368.5	392.6	477.1

The total quantity of crude oil imported showed an increase of nearly 22 per cent. over the previous year. The outstanding feature of the above table is the large increase in imports from Mexico and the advent of Iraq oil. Although the pipeline from Iraq was operating only for the last few months of the year, 13.4 million gal. of crude oil were imported from that country.

The throughputs of material at the refineries for the past six years were as follows:—

THROUGHPUT OF THE REFINERIES.

	1929	1930	1931	1932	1933	1934
			Million Gal.			
Crude petroleum	458.5	429.0	363.3	361.2	402.3	464.6
Refined and partly refined products	206.4	223.7	231.1	164 6	114.4	66.4
Shale oil	42.3	41.8	36.5	29.7	29 4	31 5
Total ..	707.2	694.5	630.9	555.5	546.1	562.5

While there was a substantial increase in the quantity of crude oil treated the total throughput of the refineries was not much higher than in 1933, the reason being that there was again a considerable decrease in the quantity of partly-refined products submitted to treatment.

The information indicates that, as a result of the treatment of the material included in the foregoing statement, the following quantities of liquid products were obtained. In addition, considerable quantities of asphalt, pitch and wax were obtained.

Output of Liquid, Products of the Refineries.

Product	1929	1930	1931	1932	1933	1934
			Million Gal.			
Motor spirit ..	167.7	180.5	180.2	159.3	149.4	144.8
Other spirit ..	25.4	21.1	20.9	17.0	20.7	24.4
Kerosene	66.8	49.4	53.4	43.0	38.4	34.5
Gas oil	30.8	28.7	35.5	36.9	46.3	53.4
Lubricating oil ..	21.7	24.3	19.0	19.1	19.1	24.7
Fuel oil and diesel oil	286.9	271.1	193.8	159.1	141.7	133.4
Other liquid products	5.0	10.8	6.3	5.3	10.2	0.1
Total liquid products	604.3	585.9	509.1	439.7	425.8	415.3

In spite of an increase in the total throughput of the refineries of over 16 million gal. as compared with 1933, there was a further fall in the quantity of liquid products obtained. The production of motor spirit decreased by 4.6 million gal. compared with 1933 (or 3 per cent.); kerosene decreased by 3.9 million gal. (or 10 per cent.), and fuel and diesel oil decreased by 8.3 million gal. (or 6 per cent.). "Other liquid products" fell from 10.2 million gal. to 0.1 million gal., mainly due to the manufacture of solid instead of liquid bitumen. Increases in the output of the refineries were recorded in respect of other spirit (3.7 million gal., or 18 per cent.); gas oil (7.1 million gal., or 15 per cent.); and lubricating oil (5.6 million gal., or 29 per cent.).

The extent to which the refinery output meets the country's requirements is indicated by the following statement, which shows for Great Britain and Northern Ireland the import and export trade, the home production and the balance retained in the years 1933 and 1934. The proportion of the total home requirements of the principal petroleum products supplied by home refineries has fallen continuously over the past four years. In 1931, 15 per cent. of the quantity of motor spirit retained for consumption in that year was produced at refineries in this country; in 1934 the proportion was only 7.5 per cent.

Particulars	Motor Spirit		Other Spirit		Kerosene		Gas oil		Lubricating Oil		Fuel and Diesel Oil	
	1933	1934	1933	1934	1933	1934	1933	1934	1933	1934	1933	1934
						Million Gallons						
Total imports	1073.1	1128.4	15.3	19.8	185.2	222.2	113.7	134.9	102.6	103.5	559.0	665.6
Imports submitted to further refining	17.0	17.7	12.5	15.6	10.1	9.0	0.3	—	†	†	67.6	13.4
Re-exports	22.0	26.1	0.3	0.6	13.0	9.2	2.2	4.8	6.8	6.4	3.7	7.0
Retained imports	1034.1	1084.6	2.5	3.6	162.1	204.0	111.2	130.1	†	†	487.7	645.2
Home production from imported petroleum and from shale	149.4	144.8	20.7	24.4	38.4	34.5	46.3	53.4	19.1†	24.7	141.7	133.4
Ex'orts	45.3	56.9	2.0	1.6	9.2	10.5	18.8	24.4	7.1	10.1	10.5	9.8
Retained home production	104.1	87.9	18.7	22.8	29.2	24.0	27.5	29.0	†	†	131.2	123.6
Total retained*	1138.2	1172.5	21.2	26.4	191.3	228.0	138.7	159.1	100.9	100.9	618.9 (246.0)‡	768.8 (353.0)‡
Percentage of retained home production to total retained	% 9.1	% 7.5	% 88.2	% 86.4	% 15.3	% 10.5	% 19.8	% 18.2	% †	% †	% 21.2	% 16.1

* These figures, which take no account of changes in stocks, only give an approximate indication of the quantities made available for consumption.

† As the figures of home production from imported petroleum and from shale do not include lubricating oils manufactured at home from imported lubricants by blending or by further chemical treatment, it is not possible to differentiate between retained imports and retained home production.

‡ The figures in brackets, which are included in the total, represent the quantities shipped as bunkers for the use of steamers engaged in foreign trade and fishing vessels.

Boots Pure Drug Co., Ltd.

Profits Again Increased

PRESIDING over a record attendance of directors and shareholders at the 47th annual ordinary meeting of Boots Pure Drug Co., Ltd., held at Nottingham, on June 6, Lord Trent, chairman of directors, said by the issue of 400,000 ordinary shares, in accordance with the resolution passed at the last annual meeting, there accrued to the company a net premium of £195,806. Instead of carrying this sum to the general reserve fund, the directors recommend that it be placed to a contingencies fund, and so be available for any special non-recurring expense which it may become necessary to incur in the development of the business. Turning to the profit and loss accounts, he pointed out that repairs and renewals were down by £11,822. Last year this item was swollen by the cost of adjustments and modifications incidental to a "settling in" of the new plant. Now that the plant is in full running order, the outlay on such repairs is naturally reduced, but the depreciation charges remain at a substantial figure.

After payment of all preference and preferred ordinary dividends, and of four quarterly dividends of 6 per cent., less tax, on ordinary shares, the company had a balance from the year's profits of £269,287, which, together with the balance from last year, amounts to £506,572, as compared with £478,302 last year. The directors therefore recommended the payment of a bonus of 3d. per share, free of income tax, on the ordinary shares, absorbing £80,000, as against £75,000 last year.

Turning to details of trading, Lord Trent was able to report continued steady progress. On March 31, 1934, the company had a total of 1,025 branches, having increased the number during the year by 48 branches. By March 31 of this year they had added a further 54 branches, bringing the total up to 1,079. Sales transactions have continued to increase, and during the year reached the vast figure of over 148,000,000. In connection with special medical products, continuous research on insulin has not only enabled the company to perfect their product, but the result of these investigations, combined with the result of improving the plant, has enabled them to effect progressive economies, which they have passed on to the consumer.

The new works at Beeston have continued to receive wide publicity on account both of their unique architectural features and of the exceptionally agreeable working conditions which they afford. Applications to make a tour of the factory continue to increase, and the company have been particularly interested to observe the international character of their visitors, who have included parties from America, Germany, Belgium and Denmark.

Having successfully established the five-day week in their factories, the company are now turning their attention to the problem of increasing the holidays of the retail staff.

In conclusion, Lord Trent referred to the appointment during the year of Mr. W. E. Weiss as a director of the company. Mr. Weiss has been for many years the active head of one of the most successful companies in the United States. Messrs. G. N. Gales and W. E. Weiss were unanimously re-elected as directors, and the retiring auditors were also re-elected.

W. J. Bush and Co., Ltd.

Another Successful Year

MR. J. M. BUSH, chairman and managing director, presided at the 38th annual general meeting of W. J. Bush and Co., Ltd., held at the Great Eastern Hotel, Bishopsgate, E.C., on June 7. He said the accounts for the past year were very satisfactory, considering the unsettled economic conditions throughout the world. Even in the home market there may be a change of Government policy which may affect our interests, *i.e.,* the committee appointed by the Board of Trade to inquire what action should be recommended when the Safeguarding of Industries Act expires next year. He felt, however, that the advantage of the Safeguarding of Industries Act lies in its creating a position of stability over a number of years so that the company could judge to what extent it is wise to spend capital in continuing to develop the fine chemical section of its business. Accounts during past years show the large amount of capital the company has risked. Depreciation on plant alone during the existence of the Safeguarding of Industries Act amounted to £118,753, mainly due to the company's developments inspired by it. Any lessening of activity in this direction would result in restricting the number of skilled research and factory chemists whose knowledge and experience would be available, together with plant and machinery, for use in any national emergency that might arise.

Lord Hayter, in seconding the resolution adopting the statement of accounts for 1934, said that a shareholder friend of his had compared the present balance sheet with that of ten years ago, and had pointed out that during the intervening period the general reserve had increased from £115,000 to £250,000, and the carry-forward from £50,000 to £94,000, while the goodwill figure had been reduced from £112,000 to £70,000; his friend summed the position up by saying that in the ten years £221,000 had thus been retained in the business.

The resolution was carried unanimously, and a final dividend of 8 per cent. on the ordinary shares, making 13 per cent. for the year, was approved.

The chairman, in moving the re-election of Dr. P. C. C. Isherwood, Ph.D., F.I.C., as a director, said that most of the shareholders were aware of the valuable services rendered to the company by that gentleman, who had played a great part in building up the business during the last 34 years. Lord Hayter seconded this motion, and it was passed unanimously.

The chairman next proposed the confirmation of the election to the board of Mr. H. B. Bush, to fill the vacancy caused by the death of Mr. Ferdinand Bush. Mr. H. B. Bush, he said, had been working in the business for a good many years, and was a suitable person to occupy the position.

Lord Hayter seconded the motion, which was unanimously agreed to, and Mr. H. B. Bush thanked the shareholders for his re-election.

Dr. Isherwood proposed the election of Mr. Eric Lionel Bush as a director. Mr. Eric Bush had for some years taken an increasingly active part in the affairs of the company, both at home and abroad, and also of the associated companies; he had travelled extensively both in the Far East and in the United States and Canada, and therefore had a very good knowledge of the whole of the organisation. This motion was also seconded by Lord Hayter and carried unanimously.

On the proposition of the Hon. C. A. Chubb, seconded by Mr. A. J. Drury, Turquand, Youngs and Co. were reappointed auditors.

Salt-Handling Equipment

Nickel Alloys as Constructional Material

A DESCRIPTION of the plant of the Worcester Salt Co., Silver Springs, New York ("Chem. Met. Eng.," 1935, *42,* 124), demonstrates the many uses of nickel alloys in the handling and processing of salt. Equipment used in all stages of salt refining is subject to highly-corrosive conditions, and it is therefore necessary to exercise extreme care in selection of materials of construction in order to ensure (a) reasonable length of life in the plant, and (b) satisfactory colour and purity in the salt product. An account is given of the various stages in the refining process, with particulars of the materials used for the different parts of the plant. It is noted that mechanical rakes faced with Monel metal are used for collecting the crystals in the evaporating pans, and that the same alloy is used for the lips of the grainers, and for the conveyors which separate the brine from the salt in the washing pans. The Oliver filters (in which all but 2 per cent. of the moisture is removed from the salt) are equipped with Monel metal screens, and the revolving dryers (which complete the operation) are lined with nickel-copper alloy.

At the close of this article, particulars are given of tests made on Monel metal, nickel and Ni-Resist cast iron under (1) saturated brine at 180° F. in salt grainers in absence of air (60 days); (2) saturated salt spray, steam and air, at 200° F. (30 days); (3) alternating exposure to saturated brine and hot air, in salt driers (145 days); and (4) attached to the lining of an oil-fired and steam-heated salt drier (86 days). In all of these cases the rate of corrosion was exceedingly low, indicating the eminent suitability of the materials for use in salt processing equipment.

Works Equipment News

Electrical Equipment at a Fertiliser Factory

AT the factory of Fison, Packard and Prentice, Ltd., of Ipswich, which is designed for an output of 70,000 tons of superphosphates per annum, and is probably the most up-to-date superphosphate works in the world, about 80 "Witton" motors, with their control gear, ranging from 1½ to 50 h.p. and aggregating about 900 h.p., are installed, together with low-tension switchgear, distribution boards and electro-magnetic vibrating screens, all supplied by the General Electric Co., Ltd.

Power is received from the Ipswich Corporation as 6,300 volt, 3-phase, 50 cycles, alternating current and is stepped down to 400 volts in the works substation, whence it is taken to a main l.t. flat-back switchboard in an adjacent building. This board consists of ten panels; the five left-hand panels are equipped with oil circuit breakers (three controlling the incoming supply from the transformers, one a synchronous condenser for power factor correction, and one a main feeder to the acid plant), while the remainder control feeders to various sections of the works. At the acid plant is installed a four-panel flat-back switchboard, one panel controlling the incoming supply and the others the works feeder circuits.

In the production of fertilisers a large number of handling and manufacturing processes are involved, and the application and control of the electric drives present many features of interest. Individual drives (with very few exceptions) from induction motors are used throughout the factory, a synchronous condenser keeping the power factor of the installation at a satisfactory level. In many cases the presence of dust-laden air or acid fumes necessitated the use of totally-enclosed motors, while ball bearings (and also dust-tight cases for distribution boards, control gear and back gears on conveyors) were standardised throughout; a particularly interesting feature is the use of a large number of totally-enclosed motors of the frame-cooled type, which embodies special cooling arrangements giving a much larger output without increasing the size. Except in a few special cases all the motors are equipped with automatic contactor starters operated by push buttons, the squirrel-cage machines being provided with direct-to-line of star-delta starters (according to the size of motor and the duty required), together with a triple-pole isolating switch and the slip-ring machines with rotor starting panels with time-limit control.

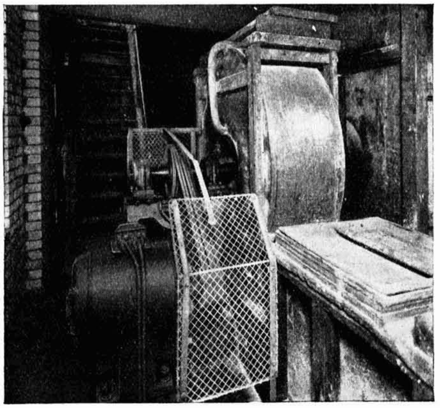


Fig. 1.—A 5-h.p. totally-enclosed Witton motor, coupled through vee-ropes to a 28-in. diameter suction fan drawing gases through the acid plant.

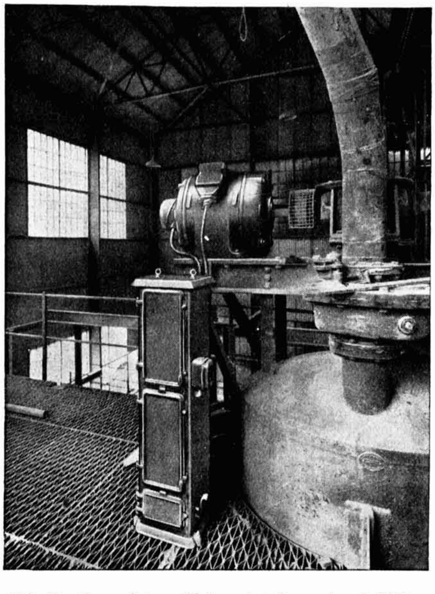


Fig. 2.—One of two 15-h.p. totally-enclosed Witton motors, with push button operated contactor starters, driving mechanical agitators for dust-charging hoppers.

The phosphate rock grinding plant consists of a fine crusher, three ring-roll mills and centrifugal separating equipment. The rock passes from the feed hopper into the fine crusher, which has a capacity of 10 tons per hour, reducing it to a maximum size of ¼ in., and is belt driven at 200 r.p.m. by a 30-h.p. motor running at 960 r.p.m. The product from the crusher is taken by an elevator (driven by a 5-h.p. motor) and a 9-inch Redler conveyor (4-h.p. motor) to 18-ton hoppers feeding the ring-roll mills. The control gear for the whole of this plant (including the elevator and conveyor feeding the crusher and the magnetic separator pulley) is mounted together and interlocked to ensure correct sequence of operation and also that the whole series of machines is automatically shut down if one of them is stopped for any reason. Each of the three ring-roll mills consists of an outer ring, which is belt driven by a 40-h.p. motor and itself drives three spring-held rolls. The ground material from each mill is taken to centrifugal air separators on the floor above by elevators, a 20-h.p. motor driving each separator and its elevator through belting and line shafting. From the separators the fine material goes by a 7-inch Redler conveyor (3-h.p. motor) and an elevator (5-h.p. motor) to a storage hopper in the next building, the coarse returning to the mills for further grinding. The starters for the centrifugal separators are mounted adjacent to those of the respective grinding mills on the ground floor of the building and are interlocked, additional push buttons for stopping any pair of machines in case of emergency being provided on the top floor.

The sulphuric-acid plant is of the latest Mills-Packard design and has a daily output of 90-95 tons of chamber acid, the raw material being pyrites and ammonia. Four mechanical roasting furnaces are provided, each having seven hearths 16 ft. in diameter; the total capacity (for all four furnaces) is 45-48 tons of green ore per 24 hours. In each furnace the rotating shaft and arms are driven by a 5-h.p., 720 r.p.m., motor, direct-coupled through a worm-reducing gear to bevel gears beneath the furnace, which rotate at the slow speed of about 40 revolutions per hour; the starters for these motors are provided with relays to ensure instantaneous operation of the contactors in case of overloads. The shafts and arms for each pair of furnaces are cooled by means of a fan direct-coupled to a 7½-h.p., 1,420 r.p.m. motor. All the motors in the furnace house are of the frame-cooled slip-ring type.

In the manufacture of sulphuric acid the gases from the furnaces (after cleaning in an electrostatic precipitation plant) and the nitric acid from the ammonia plant are first passed through two Glover towers, 32 ft. high × 13½ ft. diameter, and then through a series of five water-cooled acid chambers fitted with water sprays; these chambers have a total capacity of 187,500 cu. ft. and an acid storage capacity of 600 tons. Finally gases and acids are passed through three Gay-Lussac towers, each 45 ft. high × 17½ ft. diameter, whence the sulphuric acid is pumped to a 20-ton tank for feeding by gravity to a number of similar storage tanks outside the phosphate rock store. The gases are drawn through the towers and chambers by two 28-in. diameter suction fans (one for each furnace), each coupled by vee-ropes to a 5 h.p. totally-enclosed squirrel-cage motor (Fig. 1). The various acids are circulated by a battery of five double-plunger acid pumps, each having a capacity of 2,000 gallons per hour and being belt-driven through line shafting from a 20 h.p., 575 r.p.m., frame-cooled slip-ring motor; the pumps are fed from six 20-ton tanks and supply eight similar tanks for feeding to the towers.

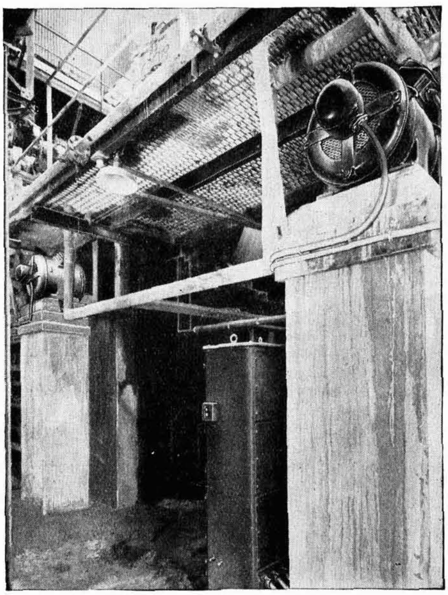


Fig. 3.—Two 30-h.p. 960 r.p.m. frame-cooled Witton motors driving, through gearing, autoclaves rotating at 4-5 r.p.m.

Water is fed at high pressure to the chamber sprays by two treble ram pumps, each coupled through vee-ropes to a 1½ h.p., 1,400 r.p.m. motor of the high torque type; the cooling supply is circulated from a pond to a 6,000-gallon storage tank (from which it descends by gravity) by two centrifugal pumps, each with a capacity of 12,000 gallons per hour and direct coupled to a 10 h.p., 1,440 r.p.m. motor.

The superphosphates themselves are produced by means of a chemical reaction between the ground phosphate rock and the sulphuric acid in digesters or "autoclaves" on the Oberphos system. The ground rock is taken out of the storage hopper (which has a capacity of 75 tons—enough to operate the plant for one shift) and passed through a weighing hopper to a worm conveyor (driven by a 2½ h.p. back-geared squirrel-cage motor) leading to dust-charging hoppers, each of which is fitted with a mechanical agitator direct coupled through bevel gears to a 15 h.p. slip-ring motor (Fig. 2). The sulphuric acid for the storage tank is diluted with water and passes under gravity through mixing coils to a further tank from which it is lifted by a centrifugal pump (driven through a flexible coupling by a 7½ h.p., 1,430 r.p.m. squirrel-cage motor) to a tank at the top of the building, whence it flows by gravity via a weighing tank to the acid charging tanks. Totally-enclosed motors are used throughout this section of the plant.

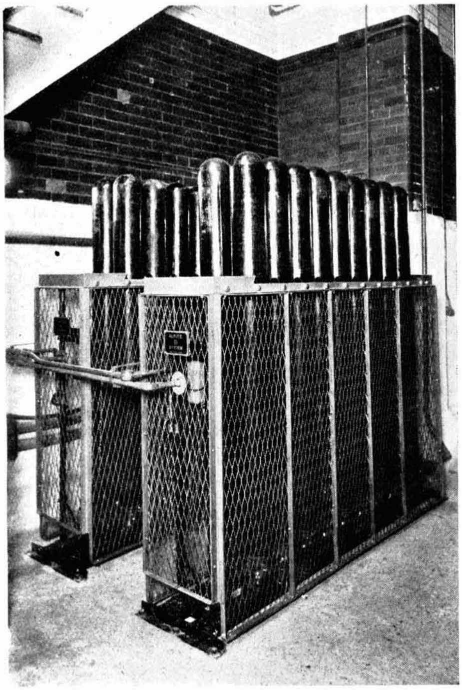
Weighed charged of ground rock and sulphuric acid are now ready for the autoclaves, each of which consists of a horizontal steam-jacketed barrel-shaped chamber, 21 ft. long and varying from 5 ft. 7 ins. to 6 ft. 7 ins. in external diameter. Simultaneous charging of ground rock and sulphuric acid is carried out through a mixing valve, through the centre of which the rock dust runs (under gravity assisted by an air pressure of 10 lb. per sq. in.), while the acid is blown through the annular space surrounding the rock dust at a pressure of 70 lb. per sq. in. and discharged into the falling stream of rock; in this way eight tons of the mixture can be charged into the autoclave in just over a minute. In order to ensure thorough mixing of the materials, each autoclave is rotated at 4-5 r.p.m. by a 30 h.p. frame-cooled slip-ring motor (Fig. 3) running at 960 r.p.m. and direct coupled through gearing. Push-button control of both the autoclave motors and the agitator motors is provided from either machine. The autoclaves are put under vacuum before charging begins and while the second half of the reaction (drying and granulation) is taking place; for the first half of the reaction, the internal pressure is allowed to rise to 95 lb. per sq. in. The autoclaves are connected by 24-inch pipes at the non-charging ends to two vacuum pumps and compressed air for both machines is supplied from a single compressor, pumps and compressor being each direct coupled to a 50 h.p. protected type slip-ring motors provided with manual control gear.

Superphosphate in granular form is discharged from the autoclaves (while revolving) through a central opening into a larger hopper feeding a 30-in. rubber belt conveyor (driven by a 3 h.p. motor) which takes it to a superphosphate store of 15,000-16,000 tons capacity. From here it is lifted as required by a crane and fed to a hopper provided with a grill, the lumps going to a cracker (belt-driven by a 50 h.p. motor with manual control gear) feeding an elevator (belt-driven by a 7½ h.p. motor) and the fines being taken to an elevator (driven by a 3 h.p. motor); both the latter elevators feed a main elevator (driven by a 30 h.p. motor through belts and line shafting) leading to two Fraser and Chalmers Sherwen vibrating screens of the electromagnetic type. These screens consist of two 6 ft. × 4 ft. single-deck a.c. units connected directly to the 400-volt, 3-phase, 50 cycle supply, the live frame being vibrated by means of solenoids connected in series with a half-wave metal rectifier, giving an intense vibration of 3,000 cycles per minute (which can be instantaneously varied, if desired). Screening is very efficient and the power consumption is less than 2 h.p. The rectifier and vibrating mechanism are totally-enclosed, pulleys and bearings are eliminated, and no lubrication is required—three important features in view of the prevalence of superphosphate dust in the surrounding atmosphere.

Fire Protection by Carbon Dioxide

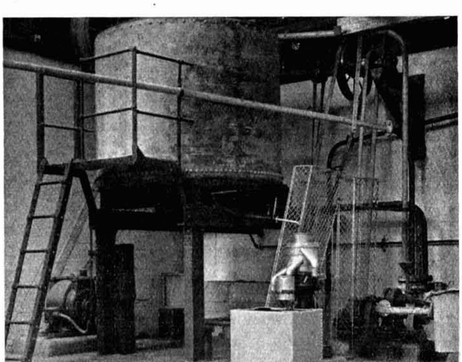
It is now recognised that liquefied carbon dioxide gas contained in steel cylinders, permanently installed at some central point and coupled up by narrow-bore pipes to the various danger zones, is an extremely efficient method of fire protection. With such an installation a vast volume of carbon dioxide under high pressure can be directed at close quarters upon the conflagration merely by operation of a switch or handle upon a control panel. This method, in which the flames are smothered by diluting the air with a non-inflammable gas, has a number of advantages compared with water. For example, in addition to the efficiency of carbon dioxide gas as a fire extinguisher for all kinds of dangerous products, direct contact with live electrical circuits does not cause trouble, since carbon dioxide is a non-conductor, and the serious damage and nuisance due to water flooding is eliminated.

Foamite-Firefoam, Ltd., have long specialised upon fire fighting, using a number of different methods including foam equipment in various forms and carbon dioxide gas systems. Examples of the firm's "Alfite" carbon dioxide gas plant are to be found at power stations throughout the country, but these installations are also of interest to the chemical industry. The equipment consists essentially of a battery of cylinders each containing 80 lb. of liquefied carbon dioxide installed in a special building. This building is connected



"Alfite" Carbon Dioxide Fire Fighting Plant, showing battery of gas cylinders.

by pipes to the various danger zones. Included are automatic thermostats so that when a fire starts a warning Klaxon horn sounds and an indication is given immediately upon the central control panel, showing the location, so as to enable the corresponding switches to be operated. The carbon dioxide cylinders are installed on the inverted principle, with the valve outlet at the bottom carried by supports or stirrups fixed in strong framework. Operation from the panel is carried out on an electrical principle, using a 24-volt accumulator, so that the cylinder drops a short distance and a small projecting cutter then pierces a sealing disc in the end of the cylinder, thus permitting the escape of the gas which passes by a short flexible metal connection to the main gas supply pipe. The thermostats come into operation when the temperature in the danger zone reaches 165 F.



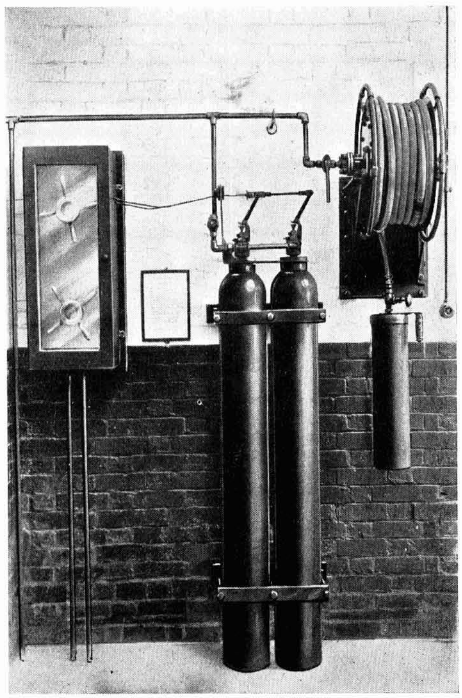
De Laval Centrifugal Varnish Clarifier, with capacity up to 100 gal. per hour, as installed at the works of Burt, Boulton and Haywood, Ltd., Silvertown, London.

A Centrifugal Clarifier Installation

ONE of the accompanying photographs shows a De Laval centrifugal varnish clarifier (Type 500) having a capacity of up to 100 gallons per hour, as installed at the works of Burt, Boulton and Haywood, Ltd., Silvertown.

The De Laval centrifugal clarifier and purifier is becoming more widely recognised as an indispensable accessory in the production of all types of product and in the recovery of industrial wastes. With this machine it is possible to remove suspended solids from liquids of all types and also to effect a separation of immiscible liquids. The separation is effected by centrifugal force generated in a bowl rotating at 6,000 to 8,000 r.p.m. The special design of the bowl involving the use of conical discs to separate the liquid into thin layers enables a complete separation to be obtained at these speeds, and the very high speed which would be necessary with a simple bowl is avoided, reducing the wear and tear on the mechanical parts of the centrifuge.

Centrifugal separators of the De Laval type are manufactured in a wide range of sizes having capacities from 10 to



"Alfite" Carbon Dioxide Fire Fighting Plant, showing cylinders connected to hose reel set.

2,000 gallons per hour, and are made in constructions suitable to resist corrosive materials and also to prevent the loss of volatile solvents. A recent development is the De Laval hermetic separator, in which the products are clarified without coming into contact with air at any point, and, if desired, the whole clarification may be carried out under pressure. This allows the clarification of easily-oxidised materials or of materials containing dissolved gases.

PROCESSES for large-scale production of vitamin B have been developed by Dr. Barnett Sure, agricultural chemist of the University of Arkansas College of Agriculture, after several years of research. Patents on the process have been granted to Dr. Sure by the United States (1,868,721, 1,889,427), as well as by Great Britain (354,421), Mexico, France, Belgium, Holland, and the Netherland Indies. The basic material used in Dr. Sure's process is rice polishings, a by-product of the rice-milling industry.

Continental Chemical Notes

France

A CONCESSION HAS BEEN GRANTED to M. Gaston Casteres, of Castres, for working sulphur deposits in the communes of Moussau, Cuxac d'Aude and Narbonne (Aude).

Germany

BOTH HOME AND EXPORT BUSINESS in explosives and allied products underwent considerable expansion last year, reports Dynamit A.G. vorm. Alfred Nobel. The turnover in plastics likewise increased. The net profit in round figures of 1,700,000 marks was utilised in accordance with the contractual arrangement with the I. G. Farbenindustrie.

Sweden

PATENTS HAVE BEEN GRANTED in Sweden and Germany to the Stockholm Superphosphate Works for the preparation of a product corresponding to the formula $NH_4NO_3 . 2HNO_3$. On dissolving ammonium nitrate in nitric acid of 90 to 99 per cent. concentration, and then cooling the solution to the freezing point of the acid salt, the latter separates out in the crystalline form.

Italy

OLIVE OIL IS PROPOSED AS AN INGREDIENT of lubricating oils, experiments recently carried out at the Air Ministry revealing efficient lubricating action on the part of a mixture of 90 parts castor oil and 10 parts olive oil.

EMULSIONS OF BERGAMOT OIL in 1 per cent. triethanolamine oleate or palmitate are claimed to possess a bactericidal action eight times greater than that of phenol. Another new outlet for bergamot oil has been found by Professor G. Carrosini who has introduced a preparation under the name of "saleol" for surgical purposes. The oil combines antiseptic and analgesic qualities.

Russia

A NEW TYPE OF PLATE GLASS developed at the Central Laboratory of the Constantinow Glass Works is stated to be six to seven times as strong as ordinary glass and to be unaltered by the action of light and temperatures of 350 to 400° C. It is believed to be capable of replacing the sandwich type of safety glass in motor vehicles and aircraft.

THE SLAKING OF LIME has been found to take place more rapidly and more efficiently when using dilute solutions of electrolytes in place of water, reports E. Poisin in the "U.R.S.S. Chemical Society Journal." Compared with the 5 minutes required to slake lime in a given test, only 3.5 minutes were required with a 1 per cent. aqueous solution of sodium chloride, 2.5 minutes with a 5 per cent. solution and 2 minutes with a 10 to 20 per cent. solution. Sugar and other non-electrolytes retarded the hydration of quick lime.

Far Eastern Chemical Notes

Japan

CITRIC ACID MANUFACTURE by a starch fermentation process is expected to be started up in September by Yukisan Kogyo K.K. (Organic Acids Industry Co.), recently founded with a capital of 500,000 yen.

SYNTHETIC ACETIC ACID AND CELLULOSE ACETATE in annual outputs of 1,000 tons and 120 tons respectively will be produced in a factory now under construction by Dainippon Celluloid K.K. in Arai-Cho (Niigata Province).

SODIUM AND POTASSIUM BICHROMATES are now being made by Nippon Seiren K.K. in monthly outputs of 500 and 200 tons respectively. This firm has also increased its chromium oxide output to 15 tons per month.

IN A REPORT ON CURRENT CONDITIONS in the Japanese aluminium industry the Ministry of Commerce gives 3,000 tons as the output capacity in 1934 of Nippon Deuki Kogyo K.K., the then sole producer. In that year, however, the works only produced 664 tons of aluminium. It is hoped to double the capacity in the present year, when a total capacity of 9,000 tons is anticipated in view of the impending entry into production of Nichiman Aluminium K.K. and Sumitomo Aluminium K.K., each with 1,500 tons output capacity.

Personal Notes

PROFESSOR I. M. HEILBRON, of Manchester University, has been appointed Sir Samuel Hall Professor of Chemistry and director of the chemical laboratories.

MR. R. CRICHTON, director and general manager of Scottish Oils, Ltd., has been appointed Convener of the County by the West Lothian County Council, in succession to the late Mr. D. Robertson.

MR. W. A. POSNETT, chairman of Barrow, Hepburn and Gale, has retired from the board, and Mr. Tom Walton, chartered accountant, has joined the board and has been elected chairman.

DAME HILDA BRENT RECKITT, of Keldy Castle, near Pickering, Yorks, and wife of Sir Philip Bealby Reckitt, founder of Reckitt and Sons, of Hull, left £56,382 with net personalty of £56,182.

MR. N. V. SIDGWICK, Fellow of Lincoln College, has had conferred upon him the title of Professor as long as he holds the office of University Reader in Chemistry at Oxford University.

MR. THOMAS RICHARD HEWLETT, of Homewood Lodge, Wythenshawe Road, Northenden, Cheshire, founder of the Anchor Chemical Co., Ltd., Manchester, who died on April 29 last, left estate value £91,825, with net personalty £90,183.

LIEUT.-COLONEL G. J. UNDERWOOD, of Chesterfield, formerly with Clay Cross Co., Ltd., has been appointed to a responsible commercial post on the staff of the Staveley Coal and Iron Co., Ltd.

MR. FRED CLEMENTS has been appointed a director of the Park Gate Iron and Steel Co., Rotherham. He has been associated with the company for 30 years and will retain the office of general manager, a position he has held since 1923.

PROFESSOR SIR FREDERICK GRANT BANTING, of the University of Toronto, the discoverer of insulin, was presented by the Society of Apothecaries of London, at a court dinner held in the society's hall, Blackfriars, on June 4, with its gold medal for valuable services rendered to the science of therapeutics.

DR. COLIN CAMPBELL, senior lecturer in chemistry, has been appointed assistant director of the chemical laboratories at the University of Manchester; Dr. C. E. H. Bawn, Mr. M. G. Evans and Dr. F. S. Spring, at present assistant lecturers, have been appointed lecturers in chemistry; and Mr A. E. M. G. Gillam, assistant in chemical spectroscopy, has been appointed special lecturer in spectroscopy.

MR. W. T. ASTBURY, B.A., lecturer in textile physics at the University of Leeds, has been awarded the Royal Institution Actonian Prize for 1935. The prize is awarded septennially, for the best essay "illustrative of the wisdom and beneficence of the Almighty" in any branch of science chosen by the managers of the Institution, and is given in the present instance in respect of Mr. Astbury's papers on X-ray studies of hair, wool and related fibres.

THE KING, through Sir John Gilmour, Home Secretary, has acknowledged the Society of Chemical Industry's address of loyalty and congratulation on the occasion of His Majesty's Silver Jubilee, and expressed his interest in the example of synthetic resin manufacture upon which the address was rolled. The roller which interested His Majesty was the latest achievement in the manufacture of plastics.

Fire Resistant Empire Timbers

WITH a view to extending the use of selected Empire timbers, the Imperial Institute Advisory Committee on Timbers, in collaboration with the London County Council, tested a number of Empire timbers which were considered as likely to offer a marked degree of resistance to fire, and in due course they approved Iroko and African walnut from British West Africa, Mora and Crabwood from British Guiana, and Andaman Padauk as fire-resisting materials. Following tests upon a further series of Empire woods, Queensland maple, Seccondee (Sekondi) mahogany from the Gold Coast, Pyinkado from Burma, Andaman Pyinma, Red Meranti from the Federated Malay States, and English ash have been approved. Further information regarding these woods can be obtained at the **Imperial Institute, South Kensington, S.W.7.**

Chemical and Allied Stocks and Shares

Current Quotations

The following table shows this week's Stock Exchange quotations of chemical and allied stocks and shares compared with those of last week. Except where otherwise shown the shares are of £1 denomination.

Name	June 11.	June 4.
Anglo-Persian Oil Co., Ltd. Ord.	62/6	63/9
,, 8% Cum. Pref.	37/3	37/3
,, 9% Cum. Pref.	38/-	38/-
Associated Dyers and Cleaners, Ltd. Ord.	1/10½	1/10½
,, 6½% Cum. Pref.	4/8¼	4/8¼
Associated Portland Cement Manufacturers, Ltd. Ord.	51/6	49/-
,, 5½% Cum. Pref.	27/9	27/9
Benzol & By-Products, Ltd. 6% Cum. Part Pref.	2/6	2/6
Berger (Lewis) & Sons, Ltd. Ord.	60/-	61/3
Bleachers' Association, Ltd. Ord.	5/6	5/-
,, 5½% Cum. Pref.	7/6	6/3
Boake, A., Roberts & Co., Ltd. 5% Pref. (Cum.)	21/3	21/3
Boots Pure Drug Co., Ltd. Ord. (5/-)	49/3	48/3
Borax Consolidated, Ltd. Pfd. Ord. (£5)	97/6	96/3
,, Defd. Ord.	16/-	16/-
,, 5½% Cum. Pref. (£10)	225/-	225/-
,, 4½% Deb. (1st Mort.) Red. (£100)	£109	£109
,, 4½% 2nd Mort. Deb. Red. (£100)	£103	£103
Bradford Dyers' Association, Ltd. Ord.	8/9	8/9
,, 5% Cum. Pref.	10/11¼	10/11¼
,, 4% 1st Mort. Perp. Deb. (£100)	£82/10/-	£83/10/-
British Celanese, Ltd. 7% 1st Cum. Pref.	27/-	26/9
,, 7½% Part. 2nd Cum. Pref.	22/6	20/6
British Cotton & Wool Dyers' Association Ltd. Ord. (5/-)	5/-	5/-
,, 4% 1st Mort. Deb. Red. (£100)	£91	£92
British Cyanides Co., Ltd. Ord. (2/-)	2/10½	3/-
British Drug Houses, Ltd. Ord.	18/9	18/9
,, 5% Cum. Pref.	22/6	22/6
British Glues and Chemicals, Ltd. Ord. (4/-)	4/3	4/3
,, 8% Pref. (Cum. and Part.)	26/10½	26/10½
British Oil and Cake Mills, Ltd. Cum. Pfd. Ord.	48/1½	47/6
,, 5½% Cum. Pref.	26/3	26/3
,, 4½% First Mort. Deb. Red. (£100)	£108/10/-	£108/10/-
British Oxygen Co. Ltd. Ord.	98/1½	94/4½
,, 6½% Cum. Pref.	31/10½	31/10½
British Portland Cement Manufacturers, Ltd. Ord.	87/6	85/-
,, 6% Cum. Pref.	29/6	29/6
Bryant & May, Ltd. Pref.	67/6	67/6
Burt, Boulton & Haywood, Ltd. Ord.	20/-	20/-
,, 7% Cum. Pref.	27/6	27/6
,, 6% 1st Mort. Deb. Red. (£100)	£105/10/-	£105/10/-
Bush, W. J., & Co., Ltd. 5% Cum. Pref. (£5)	105/-	105/-
,, 4% 1st Mort. Deb. Red. (£100)	£96/10/-	£96/10/-
Calico Printers' Association, Ltd. Ord.	15/7½	8/9
,, 5% Pref. (Cum.)	16/10½	15/7½
Cellulose Acetate Silk Co., Ltd. Ord.	13/6	13/1½
,, Deferred (1/-)	2/10½	2/10½
Consett Iron Co., Ltd. Ord.	6/-	7/3
,, 8% Pref.	20/-	20/-
,, 6% First Deb. stock, Red. (£100)	£101/10/-	£100/10/-
Cooper, McDougall & Robertson, Ltd. Ord.	36/3	36/3
,, 7% Cum. Pref.	29/-	29/6
Courtaulds, Ltd. Ord.	59/-	58/9
,, 5% Cum.	26/3	26/3
Crosfield, Joseph, & Sons, Ltd. 5% Cum. Pre-Pref.	25/-	25/-
,, Cum. 6% Pref.	28/9	28/9
,, 6½% Cum. Pref.	28/9	28/9
,, 7½% "A" Cum. Pref.	30/7½	30/7½
Distillers Co., Ltd. Ord.	95/-	93/-
,, 6% Pref. Stock Cum.	32/-	32/-
Dorman Long & Co., Ltd. Ord	16/3	16/10½
,, Prefd. Ord.	14/4½	16/-
,, 6½% Non-Cum. 1st Pref.	20/-	20/-
,, 8% Non-Cum. 2nd Pref.	15/-	16/-
,, 4% First Mort. Perp. Deb. (£100)	£101/10/-	£102/10/-
,, 5% 1st Mort. Red. Deb. (£100)	£102	£105
English Velvet & Cord Dyers' Association, Ltd. Ord.	4/4½	4/4½
,, 5% Cum. Pref.	7/6	7/6
,, 4% First Mort. Deb. Red. (£100)	£70	£70
Fison, Packard & Prentice, Ltd. Ord.	38/9	38/9
,, 7% Non-Cum. Pref.	30/-	30/-
,, 4½% Debs. (Reg.) Red. (£100)	£107	£107
Gas Light & Coke Co. Ord.	27/9	27/9
,, 3½% Maximum Stock (£100)	£87/10/-	£87/10/-
,, 4% Consolidated Pref. Stock (£100)	£106/10/-	£106/10/-
,, 3% Consolidated Deb. Stock, Irred. (£100)	£90/10/-	£90/10/-
,, 5% Deb. Stock, Red. (£100)	£115/10/-	£117/10/-
,, 4½% Red. Deb. Stock (1960-65) (£100)	£111/10/-	£113/10/-
Goodlass Wall & Lead Industries, Ltd. Ord. (10/-)	12/6	12/6
,, 7% Prefd. Ord. (10/-)	13/1½	13/1½
,, 7% Cum. Pref.	27/6	27/6
Gossage, William, & Sons, Ltd. 5% 1st Cum. Pref.	24/4½	24/4½
,, 6½% Cum. Pref.	28/9	28/9
Imperial Chemical Industries, Ltd. Ord.	37/-	35/3
,, Deferred (10/-)	9/-	8/7½
,, 7% Cum. Pref.	34/3	33/9
Imperial Smelting Corporation, Ltd. Ord.	15/-	15/-
,, 6½% Pref. (Cum.)	24/4½	23/1½
International Nickel Co. of Canada, Ltd. Cum.	$29	$28½
Johnson, Matthey & Co., Ltd. 5% Cum. Pref. (£5)	95/-	95/-
,, 4% Mort. Deb. Red. (£100)	£98/10/-	£98/10/-
Laporte, B., Ltd. Ord.	107/6	107/6
Lawes Chemical Manure Co., Ltd. Ord. (1/-)	5/7½	5/7½
,, 7% Non-Cum. Part Pref. (10/-)	10/-	10/-
Lever Bros., Ltd. 7% Cum. Pref.	32/3	32/9
,, 8% Cum. "A" Pref.	32/9	33/3
,, 20% Cum. Prefd. Ord.	79/4½	78/9
,, 5% Cons. Deb. (£100)	£109/10/-	£109/10/-
,, 4% Cons. Deb. (£100)	£105	£105
Magadi Soda Co., Ltd. 12½% Pref. Ord. (5/-)	1/3	1/3
,, 6% 2nd Pref. (5/-)	6d.	6d.
,, 6% 1st Debs. (Reg.)	58/-	58/-
Major & Co., Ltd. Ord. (5/-)	7½d.	7½d.
,, 8% Part. Prefd. Ord. (10/-)	9d.	9d.
,, 7½% Cum. Pref.	1/6¾	1/6¾
Mond Nickel Co., Ltd. 5½% Mort. Deb. Red. (£100)	£103	£103
Pinchin, Johnson & Co., Ltd. Ord. (10/-)	43/-	41/6
,, 7% Cum. Pref.	33/1½	33/1½
Potash Syndicate of Germany (Deutsches Kalisyndikat G.m.b.H.) 7% Gld. Ln. Sr. "A" and "B" Rd.	64/6	64/6
Reckitt & Sons, Ltd. Ord.	112/6	113/9
,, 4½% Cum. 1st Pref.	25/-	25/-
Salt Union, Ltd. Ord.	41/3	41/3
,, Pref.	46/3	45/-
,, 4½ Deb. (£100)	£109/10/-	£111/10/-
South Metropolitan Gas Co. Ord. (£100)	£130/10/-	£132/10/-
,, 6% Irred. Pref. (£100)	£149/10/-	£149/10/-
,, 4% Pref. (Irred.) (£100)	£106/10/-	£106/10/-
,, Perpetual 3% Deb. (£100)	£89/10/-	£89/10/-
,, 5% Red. Deb. 1950-60 (£100)	£115/10/-	£115/10/-
Staveley Coal & Iron Co., Ltd. Ord.	43/9	43/1½
Stevenson & Howell, Ltd., 6½% Cum. Pref.	26/3	26/3
Triplex Safety Glass Co., Ltd. Ord. (10/-)	71/3	72/6
Unilever, Ltd. Ord.	30/7½	30/7½
,, 7% Cum. Pref.	29/9	29/9
United Glass Bottle Manufacturers, Ltd. Ord.	41/-	41/-
,, 7½% Cum. Pref.	33/-	33/-
United Molasses Co., Ltd. Ord. (6/8)	20/7½	20/7½
,, 6% Cum. Pref.	25/-	25/-
United Premier Oil & Cake Co., Ltd. Ord. (5/-)	5/-	5/-
,, 7% Cum. Pref.	23/9	23/9
,, 6% Deb. Red. (£100)	£102	£102

Weekly Prices of British Chemical Products

Review of Current Market Conditions

THERE have been no price changes this week in the markets for general heavy chemicals, wood distillation products, coal tar products, pharmaceutical and photographic chemicals, essential oils and intermediates. In the rubber chemicals section the price of crimson antimony sulphide has been reduced by halfpenny per lb. Unless otherwise stated the prices below cover fair quantities net and naked at sellers' works.

LONDON.—Prices continue firm in the heavy chemicals section, with a good general steady demand. Potassium permanganate is slightly cheaper. Among coal tar products, pitch is quoted 5s. per ton cheaper than last week.

MANCHESTER.—Owing to the Whitsuntide holidays conditions on the Manchester chemical market during the past week have been extremely inactive, with the usual poor attendance on the Royal Exchange. New business of any consequence has been limited, and, in addition, there has been a marked interference with deliveries as many works in the immediate Manchester area have been closed down for varying periods. The beginning of next week, however, should see a resumption of trade or something approaching normal lines. In the meantime, prospects are regarded as reasonably favourable. The past week has witnessed only slight changes in prices for chemicals generally, though among the by-products a certain amount of easiness, more especially in pitch, continues in evidence.

SCOTLAND.—Business continues to be steady 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.—11¾d. per lb. less 5%. MANCHESTER: 11¾d.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

ANTIMONY SULPHIDE.—Golden, 6⅝d. to 1s. 3d. per lb.; crimson, 1s. 5½d. to 1s. 7d. per lb., according to quality.

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

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

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

BARYTES.—£6 10s. to £8 per ton.

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

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

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

CADMIUM SULPHIDE.—3s. 4d. to 3s. 8d per lb.

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

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

CARBON BLACK.—3¾d. to 4⅞d. 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.—£3 19s. per cwt. less 2½%. LONDON: £3 17s. per cwt. SCOTLAND: £4 2s. less 2½%.

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

DIPHENYLGUANIDINE.—2s. 2d. per lb.

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

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

LAMPBLACK.—£45 to £48 per ton.

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

MAGNESIUM SULPHATE.—Commercial, £5 per ton, ex wharf.

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

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

NICKEL SULPHATE.—£49 per ton d/d.

PHENOL.—7¾d. to 8¼d. per lb. to June 30; 6¾d. to 7¼d. from July 1 to December 31.

POTASH, CAUSTIC.—LONDON: £42 per ton. MANCHESTER: £38 to £41.

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

POTASSIUM CHLORATE.—LONDON: £37 to £40 per ton. SCOTLAND: 99¾/100%, powder, £37. MANCHESTER: £38.

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

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

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

POTASSIUM PERMANGANATE.—LONDON: 9¾d. per lb. SCOTLAND: B.P. crystals, 10d. to 10½d. MANCHESTER: B.P., 11¾d.

POTASSIUM PRUSSIATE.—LONDON: Yellow, 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 12s. 6d. per ton f.o.r in bags.

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

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

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

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

SODIUM BICHROMATE.—Crystals cake and powder 4d. per lb. net d/d U.K. discount according to quantity. Anhydrous, 5d. per lb. LONDON: 4d. per lot less 5% for spot lots and 4d. per lb. with discounts for contract quantities. MANCHESTER: 4d. per lb. basis. SCOTLAND: 4d. delivered buyer's premises with concession for contracts.
SODIUM BISULPHITE POWDER.—60/62%, £20 per ton d/d 1-cwt. iron drums for home trade.
SODIUM CARBONATE, MONOHYDRATE.—£15 per ton d/d in minimum ton lots in 2 cwt. free bags. Soda crystals, SCOTLAND: £5 to £5 5s. per ton ex quay or station. Powdered or pea quality, 7s. 6d. per ton extra. Light Soda Ash £7 ex quay, min. 4-ton lots with reductions for contracts.
SODIUM CHLORATE.—£32 10s. per ton.
SODIUM CHROMATE.—4d. per lb. d/d U.K.
SODIUM HYPOSULPHITE.—SCOTLAND: Large crystals English manufacture, £9 5s. per ton ex stations, min. 4-ton lots. Pea crystals, £14 10s. ex station, 4-ton lots. MANCHESTER: Commercial, £10 5s.; photographic, £14 10s.
SODIUM META SILICATE.—£14 per ton, d/d U.K. in cwt. bags.
SODIUM IODIDE.—B.P., 6s. per lb.
SODIUM NITRITE.—LONDON: Spot, £18 5s. to £20 5s. per ton d/d station in drums.
SODIUM PERBORATE.—10%, 9¾d. per lb. d/d in 1-cwt. drums. LONDON: 10d. per lb.
SODIUM PHOSPHATE.—£13 per ton.
SODIUM PRUSSIATE.—LONDON: 5d. to 5½d. per lb. SCOTLAND: 5d. to 5¾d. ex store. MANCHESTER: 5d. to 5½d.
SULPHUR.—£9 15s. to £10 per ton. SCOTLAND: £8 to £9.
SODIUM SILICATE.—140° Tw. Spot £8 per ton. SCOTLAND: £8 10s.
SODIUM SULPHATE (GLAUBER SALTS).—£4 2s. 6d. per ton d/d SCOTLAND: English material £3 15s.
SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 12s. 6d. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 2s. 6d.
SODIUM SULPHIDE.—Solid 60/62% Spot, £10 15s. per ton d/d in drums; crystals 30/32%, £8 per ton d/d in casks. SCOTLAND: For home consumption, Solid 60/62%, £10 5s.; broken 60/62%, £11 5s.; crystals, 30/32%, £8 7s. 6d., d/d buyer's works on contract, min. 4-ton lots. Spot solid 5s. per ton extra. Crystals, 2s. 6d. per ton extra. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8 2s. 6d.
SODIUM SULPHITE.—Pea crystals spot, £13 10s. per ton d/d station in kegs. Commercial spot, £8 15s. d/d station in bags.
SULPHATE OF COPPER.—MANCHESTER: £14 10s. per ton f.o.b.
SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quality.
SULPHUR PRECIP.—B.P. £55 to £60 per ton according to quantity. Commercial, £50 to £55.
VERMILION.—Pale or deep, 4s. 5d. to 4s. 7d. per lb.
ZINC CHLORIDE.—SCOTLAND: British material, 98%, £18 10s. per ton f.o.b. U.K. ports.
ZINC SULPHATE.—LONDON: £12 per ton. SCOTLAND: £10 10s.
ZINC SULPHIDE.—11d. to 1s. per lb.

Intermediates and Dyes

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

Wood Distillation Products

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

Coal Tar Products

ACID, CARBOLIC.—Crystals, 7¾d. to 8¼d. per lb.; crude, 60's, 1s. 1½d. to 2s. 2½d. per gal. MANCHESTER: Crystals, 7½d. per lb.; crude, 2s. per gal. SCOTLAND: 60's, 2s. 6d. to 2s. 7d.
ACID, CRESYLIC.—90/100%, 1s. 8d. to 2s. 3d. per gal.; pale 98%, 1s. 5d. to 1s. 6d.; 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, 9½d to 10d. per gal.; standard motor, 1s. 3d. to 1s. 3½d.; 90%, 1s. 4d. to 1s. 4½d.; pure, 1s. 7½d. to 1s. 8d. LONDON: Motor, 1s. 3½d. SCOTLAND: Motor, 1s. 6½d.
CREOSOTE.—B.S.I. Specification standard, 5½d. to 5¾d. per gal. f.o.r. Home, 3¾d. d/d. LONDON: 4½d. f.o.r. North; 5d. London. MANCHESTER: 5d. to 5¾d. SCOTLAND: Specification oils, 4d.; washed oil, 4½d. to 4¾d.; light, 4½d.; heavy, 4½d. to 4½d.
NAPHTHA.—Solvent, 90/100%, 1s. 5d. to 1s. 6d. per gal.; 95/160%, 1s. 6d.; 99%, 11d. to 1s. 1d. LONDON: Solvent, 1s. 3½d. to 1s. 4½d.; heavy, 11d. to 1s. 0½d. f.o.r. SCOTLAND: 90/160%, 1s. 3d. to 1s. 3½d.; 90/190%, 11d. to 1s. 2d.
NAPHTHALENE.—Purified crystals, £10 per ton in bags. LONDON: Fire lighter quality, £3 to £3 10s.; 74/76 quality, £4 to £4 10s.; 76/78 quality, £5 10s. to £6. SCOTLAND: 40s. to 50s.; whizzed, 70s. to 75s.
PITCH.—Medium soft, 40s. per ton. LONDON: 40s. per ton, f.o.b. East Coast port. MANCHESTER: 32s. 6d. to 35s. f.o.b. East Coast.
PYRIDINE.—90/140, 6s. to 8s. 6d. per gal.; 90/180, 2s. 3d.
TOLUOL.—90%, 1s. 11d. to 2s. per gal.; pure, 2s. 2d.
XYLOL.—Commercial, 1s. 11d. to 2s. per gal.; pure, 2s. 1d. to 2s. 2d.

Nitrogen Fertilisers

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

Latest Oil Prices

LONDON, June 12.—LINSEED OIL was easier. Spot, £23 15s. per ton (small quantities); June, £21 5s.; July-Aug., £21 7s. 6d.; Sept.-Dec., £21 10s.; Jan.-April, £21 15s., naked. SOYA BEAN OIL was dull. Oriental (bulk), June-July shipment, £19 per ton. RAPE OIL was steadier. Crude extracted, £33 per ton; technical refined, £34 10s., naked, ex wharf. COTTON OIL was quiet. Egyptian crude, £23 10s. per ton; refined common edible, £28 10s.; and deodorised, £30 10s., naked, ex mill (small lots £1 10s. extra). TURPENTINE was steady. American, spot, 44s. 6d. per cwt.

HULL.—LINSEED OIL, spot, quoted £22 5s. per ton; June, July-Aug., and Sept.-Dec., £21 15s. COTTON OIL.—Egyptian, crude, spot, £24 10s. per ton; edible, refined, spot, £27 5s.; technical, spot, £27 5s.; deodorised, £29 5s., naked. PALM KERNEL OIL.—Crude, f.m.q., spot, £21 per ton, naked. GROUNDNUT OIL.—Extracted, spot, £33 per ton; deodorised, £36. RAPE OIL.—Extracted, spot, £32 per ton; refined, £33 10s. SOYA OIL.—Extracted, spot, £23 10s. per ton; deodorised, £26 10s. CASTOR OIL.—Pharmaceutical, 41s. per cwt.; first, 36s.; second, 33s. COD OIL.—F.o.r. or f.a.s., 25s. per cwt., in barrels. TURPENTINE.—American, spot, 46s. 6d. cwt.

Chemical Age Query

Tanning Material.—A subscriber wishes to obtain the name and address of the manufacturer of "Tannalite," understood to be a tanning material, possibly of Scottish origin. (C.A. 833).

Books Received

Fortschritte des Chemischen Apparatewesens. Band: Elektrische Oefen, Lieferung 2 and Lieferung 3. Leipzig: Akademische Verlagsgesellschaft m.b.H. RM.28.

Patents and Trade Marks. By Benj. T. King. London: King's Patent Agency, Ltd.

The Chemistry of Cement and Concrete. By F. M. Lea and C. H. Desch. London: Edward Arnold and Co. Pp. 430. 25s.

Inventions in the Chemical Industry

Patent Specifications and Applications

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

Applications for Patents

(May 23 to 29 inclusive.)

ANTIMONIAL LEAD, treating.—American Smelting and Refining Co. 15181.

THIAZOL DERIVATIVES, manufacture.—W. Baird, J. S. H. Davies and Imperial Chemical Industries, Ltd. 15679.

EMULSIONS, manufacture.—A. G. Bloxam (Soc. of Chemical Industry in Basle). 15396.

HYDROCYANIC ACID, manufacture.—H. A. Bond, E. I. du Pont de Nemours and Co., and C. R. Harris. 15677.

TITANIUM WHITE PIGMENTS, manufacture.—A. Carpmael (I. G. Farbenindustrie). 15222.

DYEING WITH SULPHUR DYESTUFFS, process.—A. Carpmael (I. G. Farbenindustrie). 15311, 15552.

DYESTUFFS, manufacture.—A. Carpmael (I. G. Farbenindustrie). 15682.

AGGLOMERATES, ETC., manufacture.—L. Czajko. (Belgium, May 31, '34.) 15439.

SYNTHETIC RESINS.—E. I. du Pont de Nemours and Co. (United States, May 24, '34.) 15251, 15252.

DERIVATIVES of hydroabietyl alcohol, etc., manufacture.—E. I. du Pont de Nemours and Co., C. O. Henke, and M. A. Prahl. 15678.

CONVERTING ACIDS into stable colloidal systems.—H. D. Elkington (J. Bloch). 15681.

FROTH-FLOTATION OF ORES.—H. G. C. Fairweather (American Cyanamid Co.). (Sept. 29, '34.) 15664.

DYES, manufacture.—Gevaert Photo Producten Naamlooze Vennootschap. (Austria, July 21, '34.) 15207.

QUINOLINE COMPOUNDS, manufacture.—W. W. Groves (I. G. Farbenindustrie). 15395.

POTASSIUM CRYOLITE, treatment.—E. Hene. 15188.

AZO DYESTUFFS, manufacture.—I. G. Farbenindustrie. (Germany, May 26, '34.) 15397.

THIOUREA DERIVATIVES, manufacture.—I. G. Farbenindustrie. (Germany, May 29, '34.) 15551.

PHENOLS, recovery.—Imperial Chemical Industries, Ltd. 15097.

PROCESS for the destructive hydrogenation of distillable carbonaceous materials.—International Hydrogenation Patents Co., Ltd. (Germany, June 23, '34.) 15473.

CARBONACEOUS FERTILISERS, manufacture.—J. Y. Johnson (I. G. Farbenindustrie). 15064.

ACETALDEHYDE, manufacture.—J. Y. Johnson (I. G. Farbenindustrie). 15066.

AZO DYESTUFFS, manufacture.—J. Y. Johnson (I. G. Farbenindustrie). 15641.

HYDROSULPHITES, manufacture.—J. Y. Johnson (I. G. Farbenindustrie). 15642.

PIGMENT DYESTUFFS, manufacture.—J. Y. Johnson (I. G. Farbenindustrie). 15643.

MALONIC ESTERS, manufacture.—J. D. Kendall. 15303.

CYANINE DYES, production.—J. D. Kendall. 15304.

CORROSION-RESISTANT CONSTRUCTIONAL ELEMENTS.—A. L. Mond (I. G. Farbenindustrie). 15376.

CELLS FOR ALKALI CHLORIDE ELECTROLYSIS.—P. Pestalozza. (Italy, May 23, '34.) 15075.

ALUMINIUM ALLOYS, production.—J. Stone and Co., Ltd., and S. A. E. Wells. 15053.

SODIUM SULPHIDE, process for making.—A. Zieren. (Austria, May 25, '34.) 15429.

Complete Specifications Open to Public Inspection

HIGH-PRESSURE LUBRICANTS.—Standard Oil Development Co. Nov. 21, 1933. 21540/34.

PREVENTING SOAPS from becoming rancid.—V. Dabsch and J. C. Vredenburg. Nov. 24, 1933. 26486/34.

ORGANIC DISULPHIDES, methods of preparing.—Wingfoot Corporation. Nov. 23, 1933. 26913/34.

MIXED POLYVINYL RESINS and method of making same.—Shawinigan Chemicals, Ltd. Nov. 25, 1933. 29107/34.

DISTILLABLE CARBONACEOUS MATERIALS, treatment with hydrogenating gases.—International Hydrogenation Patents Co., Ltd. Nov. 24, 1933. 30332/34.

CRYSTALLINE ANHYDROUS SODIUM METASILICATE, production.—J. Crosfield and Sons, Ltd. Nov. 25, 1933. 31780/34.

ORGANIC CARBOXYLIC ACIDS, concentrating.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. Nov. 21, 1933. 3520/34.

AQUEOUS HYDROCHLORIC SOLUTIONS, method of and apparatus for the evaporation, distillation or concentration.—Dr. F. Raschig Ges. Nov. 27, 1933. 33633/34.

LUBRICANTS.—W. V. Gilbert. Nov. 23, 1933. 33642/34.

VINYL ALCOHOL, manufacture.—Chemische Forschungsges. Nov. 25, 1933. 33840/34.

CYCLIC AMINES, manufacture.—Soc. of Chemical Industry in Basle. Nov. 25, 1933. 33841/34.

AZO DYESTUFFS, manufacture.—I. G. Farbenindustrie. Nov. 25, 1933. 33857/34.

SUBSTANCES OF HORMONE ACTION, production.—Schering-Kahlbaum A.-G. Nov. 25, 1933. 34011/34.

Specifications Accepted with Date of Application

HYDROCARBONS, purification.—National Benzole Co., Ltd., W. H. Hoffert and E. Hancock. Oct. 14, 1933. 428,931.

CONDITION OF ALCOHOLIC LIQUIDS to that normally obtained by ageing, method of effecting a corresponding improvement.—Katadyn A.-G. Aug. 16, 1932. 428,853.

DRYING OILS and their application.—Imperial Chemical Industries, Ltd., A. Hill and E. E. Walker. Nov. 15, 1933. 428,864.

AZO DYESTUFFS on the fibre, process for producing.—I. G. Farbenindustrie. Nov. 17, 1932. 429,025.

ODOROUS CHEMICAL COMPOUNDS and products resulting therefrom, process of manufacture.—Descollonges Frères. Nov. 16, 1932. 429,096.

SYNTHETIC LUBRICATING OILS.—J. Y. Johnson (I. G. Farbenindustrie). Nov. 17, 1933. 428,936.

DYESTUFFS, manufacture.—I. G. Farbenindustrie. Nov. 18, 1932. 429,176.

AQUEOUS FORMALDEHYDE SOLUTIONS, stabilisation.—E. I. du Pont de Nemours and Co. Nov. 21, 1933. 428,871.

SYNTHETIC RESINS and compositions containing them, manufacture.—British Celanese, Ltd., and W. H. Moss. Nov. 22, 1933. 428,938.

HYDROGENATION OF FURFURANE or derivatives thereof.—E. I. du Pont de Nemours and Co., and W. A. Lazier. Nov. 22, 1933. 428,940.

DIPHENYLOLPROPANE, process of making.—W. W. Triggs (Resinous Products and Chemical Co.). Nov. 24, 1933. 428,944.

INSECTICIDAL, fungicidal, and bactericidal compositions.—C. Lean (Alox Chemical Corporation). Nov. 25, 1933. 429,185.

SUBSTITUTION OR CONDENSATION PRODUCTS OF ANTHRONES, manufacture and production.—J. Y. Johnson (I. G. Farbenindustrie). Nov. 25, 1933. 429,187.

TREATMENT OF GLAUCONITE.—United Water Softeners, Ltd. (Permutit Co.). Dec. 30, 1933. 429,201.

DYEING WITH DIRECT DYESTUFFS, processes.—A. G. Bloxam (Soc. of Chemical Industry in Basle). Feb. 9, 1934. 429,209.

CHROMIFEROUS AZO DYESTUFFS, manufacture.—Soc. of Chemical Industry in Basle. March 31, 1933. 428,965.

RELATIVELY HEAVY HYDROCARBON OILS, method of treatment.—A. J. Paris, jun. Sept. 2, 1932. 428,971.

SULPHUR, production.—A. R. Lindblad. June 12, 1934. 428,979.

HIGH-STRENGTH LITHOPONE.—New Jersey Zinc Co. June 22, 1934. 428,986.

DISPERSIONS, preparation.—Dr. H. Hunsdiecker and Dr. E. Vogt. Dec. 14, 1932. 428,987-8.

POLYMERISATION OF FATTY OILS.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. Aug. 29, 1933. 428,993.

HYDROCARBON OILS and the like, process of dispersing and stabilising.—M. Ernotte. Sept. 18, 1934. 428,908.

CELLULOSE ESTERS, manufacture.—Soc. of Chemical Industry in Basle. Oct. 7, 1933. 429,152.

GRANULES OF CARBON BLACK.—H. E. Potts (United Carbon Co.). May 2, 1934. 429,088.

Lawn Tennis Tournament

Bad Weather Delays First Round

The first round matches in the fifth annual CHEMICAL AGE Lawn Tennis Tournament should have been completed by Whit-Monday, but quite a number of fixtures had to be postponed on account of the inclement weather during the past few weeks. In order to give all competitors an opportunity of playing their matches the first round period has been extended until next week. The Editor will, however, be glad if all players will send in the results of their matches at the earliest possible opportunity, so that the draw for the next round may be made with as little delay as possible.

Results of all matches played to date, together with details of the second round, will be published next week.

From Week to Week

THE REGISTERED OFFICE of the English Velvet and Cord Dyers' Association, Ltd., will be at Ordsall Dyeworks, Salford, 5, Manchester, from June 17.

THE NOMINAL CAPITAL of Orr's Zinc White, Ltd., has been increased by the addition of £200,000 in £1 ordinary shares beyond the registered capital of £75,000.

RONSHEIM AND MOORE, on June 24, will change their address to Roman Wall House, 1 Crutched Friars, London, E.C.3. Their new telephone number will be: Royal 1133 (2 lines). Inland telegraphic address: "Assist, Ald, London."

An ORDER IN COUNCIL published in the "London Gazette" appoints January 1, 1936, as the date on which certain provisions of the Pharmacy and Poisons Act, 1933, shall come into force. May 1, 1936, is named as the appointed day for all purposes for all provisions of the Act not previously brought into operation.

THE FOSTER INSTRUMENT CO. celebrated its twenty-fifth anniversary at the termination of the British Industries Fair on May 31, by holding a dinner at the Criterion Restaurant, London. Mr. C. E. Foster, J.P., F.Inst.P., was host to a gathering which, in addition to the agents and sales representatives of the firm, included many persons well known in industrial and scientific circles.

DAMAGE ESTIMATED AT THOUSANDS OF POUNDS was caused by fire at the factory of Burdall's, Ltd., manufacturing chemists, Shalemoor, Sheffield, on Wednesday. The factory was destroyed and six sales shops were damaged. The fire burned for over three hours and was the biggest in Sheffield for some years. The fire occurred only 15 minutes after the workpeople had left, and at the time of the outbreak the premises were empty.

THE ENGINEERING INDUSTRIES were well represented at a welding and cutting demonstration which was held at the Rosehill Works, Polmadie, Glasgow, of the British Oxygen Co., Ltd., last week. The demonstration showed the latest processes and equipment in connection with electric welding and metal cutting. Special plant was installed for the purpose of illustrating what can be done with the facilities which these methods of construction have introduced.

THE DEFERRED SHAREHOLDERS' COMMITTEE has held a number of meetings on the Imperial Chemical Industries' capital reorganisation scheme, submitted by the company on May 1 and shortly to be brought before the Court for confirmation. The committee is about to issue its report to the deferred shareholders. The committee, which consists of J. K. Carruth (chairman), G. B. Puckle, H. E. Ault, P. H. Antrobus, C. H. Bevan, F. E. E. G. Schreiber, A. J. Toms, and G. Handley (co-opted), will be represented by counsel on the hearing before the Court.

THE LONDON SECTION of the Society of Glass Technology has made arrangements for a visit to Oxford on Saturday, June 29. The programme includes a visit to the marmalade factory of Frank Cooper, Ltd., and a tour of several of the colleges. The summer outing of the Yorkshire Section will take place on June 30, to Richmond, Yorkshire. Further particulars regarding these functions may be obtained on application to the hon. secretary of the London Section, Mr. T. C. Crawhall, The Science Museum, London, and to the hon. secretary of the Yorkshire Section, Mr. A. Garstang, of King, Taudevin and Gregson, Ltd., Melbourne Chambers, Cambridge Street, Sheffield, 1.

THE INDIAN CENTRAL COTTON COMMITTEE has decided to make experiments in the manufacture of artificial silk from the short-stapled Indian cottons, and with that end in view has appointed Dr. Thoria, an Indian expert with German training and experience, to carry on investigations into the textile strength and elasticity of the acetate material prepared from the various cottons. A competent chemical engineer will be engaged to advise in regard to the method. The Government of India have given a grant of Rs.38,000 for initial expenditure. A recent experiment carried on at Coimbatore, in the Madras Presidency, by the agriculturist chemist there has shown that art silk can be manufactured from waste cotton at a cost comparable to that manufactured from wood pulp.

THE GOLDEN JUBILEE of Ashmore, Benson, Pease and Co., Ltd., of Stockton-on-Trees, designers and constructors of chemical, gas and iron and steel works plant was celebrated on Tuesday, when the chairman, Mr. Emile Mond, presided over a luncheon given by the firm to nearly 900 employees and their friends. Two special trains from Stockton conveyed the guests to Scarborough, where they assembled in a large marquee specially erected on the hockey ground on the outskirts of the town. The chairman and Mrs. Mond had previously entertained the members of the staff, heads of departments and pensioners at a reception, and after lunch, 200 long-service medals were presented to employees who had completed 25 years of uninterrupted service with the firm. A pleasing feature of the celebration was the presentation of an illuminated address to the chairman and directors recording the happy relationship between the management and the employees during this long period.

THE NOMINAL CAPITAL of Bakelite, Ltd., has been increased by the addition of £100,000 in £1 ordinary shares beyond the registered capital of £200,000.

NON-FERROUS METAL PRODUCTS, LTD., has increased its nominal capital by the addition of £22,000 beyond the registered capital of £10,000. The additional capital is divided into 440,000 ordinary shares of 1s. each.

THE GENERAL ARTIFICIAL SILK UNION (Holland) in their report for 1934 state that in the first half of the year production was increased, and with consumption growing, stocks were being reduced. In the second half, however, production had to be cut down, as the export trade grew more and more difficult.

A DECREE of May 27, but effective as from March 22 last, increases French import duties on oil seeds and fruits, fatty bodies and their derivatives, and manufactured goods containing these products. Details of the increases were published in the "Board of Trade Journal" of June 6.

AN EXTRAORDINARY GENERAL MEETING of Associated Fireclay Companies, Ltd., will be held in Northumberland Rooms, Northumberland Avenue, W.C., on June 28, to consider the necessary resolution to alter its title so that this may embrace all the activities of the various subsidiary companies which have been taken over. The proposed new name is "Associated Clay Industries, Ltd."

RESOLUTIONS will be submitted to reduce the capital of International Bitumen Emulsions, Ltd., from £350,000 to £187,233 2s. 6d. at a meeting of shareholders convened for June 25. This is to be effected by writing down the issued shares from 5s. to 2s. 6d. each. The unissued shares are to be sub-divided in two shares of 2s. 6d. each, and the capital increased to its former amount of £350,000 by the creation of 1,302,135 shares of 2s. 6d. each.

AT A GATHERING OF EMPLOYEES of Imperial Chemical Industries, Ltd. (Metal Group), at Garston on June 6, 95 long-service awards were presented to employees of John Bibby, Sons and Co. (Garston), Ltd., and the Broughton Copper Co., now with the I.C.I. The presentations were made by Mr. H. O. Smith, chairman of the Metal Group companies, and consisted of clocks, gold and silver watches, and medals, according to length of service, which ranged from 63 to 25 years.

THE RANGE OF VISCOSE PRODUCTS has been further extended by the addition of artificial sponges, the product of Sponcel, Ltd., a subsidiary of the Viscose Development Co., Ltd., of Bromley, Kent. The new sponge will be sold in standard sizes and qualities at retail prices ranging from four shillings down to ninepence and apart from its domestic appeal, it is already proving of much interest to hospitals and the medical profession on account of its hygienic qualities. The sponge is not affected by soap and grease and does not go slimy. Freedom from grit is an important factor recognised by the motor trade and industrial users generally.

HORSES owned by J. and W. Whewell, Ltd., chemical manufacturers, of York Street, Radcliffe, gained a cup, four first prizes and three second prizes in the horse classes at the Darwen Agricultural Society Show. The firm's exhibits won the championship cup for the best mare or gelding in the open class, a first prize for brood mare, a first for filly or colt foaled this year, a first for filly, colt or gelding foaled in 1934, and a first for a pair of horses any age or any height. Their other awards were a second for a three-year-old gelding or filly, a second for a gelding three years old and upwards, and a second for gelding or barren mare three years old and upwards.

A DECLARATION OF SOLVENCY has been filed relating to the N.C. Zinc Oxide Co., Ltd. This follows similar declarations in respect of the Zinc Manufacturing Co., Ltd., the N.C. Metal Co., Ltd., and the Metallic Ore Reduction Co. Later it is announced that these companies were to go into voluntary liquidation and a new company to be formed. The new company will own the whole rights of the Coley process as regards zinc and tin, and it will be able to operate free of any payments in respect of royalties. Stewarts and Lloyds will act as managers of the merger company. The necessary meetings to consider the scheme are to be held on Monday, June 17.

MORE THAN SIXTY MEMBERS OF PARLIAMENT are supporting an amendment tabled by Major the Rt. Hon. J. W. Hills, M.P. for Ripon, asking for a rebate of 7d. per gal. on all light oils used for industrial purposes. Among those supporting Major Hills are Sir Herbert Samuel, Sir John Wardlaw-Milne, Mr. P. J. H. Hannon, Mr. Noel Lindsay and Mr. J. C. Wilmot. The industries affected by the present duty of 8d. per gal. on light hydrocarbon oils—paint and varnish, dyeing and cleaning, chemical, india rubber, boot and floor polish, wall paper, seed crushing and bone using—employ about 500,000 people. The duty on light hydrocarbon oils was first imposed in 1928, and the industries affected contend that the duty is a direct tax on an essential raw material used in important home industries.

Company News

British Oxygen Co.—The dividend is announced for the half-year to June 30 last, on the 6½ per cent. cumulative preference stock.

Wintershall Co.—A reduction of dividend to 4 per cent. from 5 per cent. a year previously, is announced by this firm, the largest German potash-producing concern.

United Indigo and Chemical Co.—The payment is announced of dividend on 5 per cent. cumulative preference shares for the six months ending June 30, 1935.

Boots Pure Drug Co.—The directors have declared the usual quarterly dividend of 6 per cent. on the ordinary shares. This is the same as a year ago. Last year's total dividend was maintained at 24 per cent., less tax, and a tax-free bonus of 5 per cent.

Sangers, Ltd.—A final dividend of 13¾ per cent. is announced on the old ordinary shares, making 22½ per cent. for the year to March 31 last, compared with 20 per cent. for 1933-34. The shares issued to shareholders in March do not rank for the above dividend.

British Bemberg Co.—The trading profit for 1934 was £75,465. Depreciation provision is raised from £31,755 to £43,552, and, after charging expenses, interest and fees, the net loss is £43,299, compared with one of £24,163 for the previous year. The total debit on profit and loss now amounts to £288,250.

Celanese Corporation of America.—The directors have declared a quarterly dividend of $1.75 per share on the 7 per cent. cumulative series prior preferred stock, payable on July 1 next, and a dividend of $3.50 per share on the 7 per cent. cumulative first participating preferred stock, payable on June 30.

Thos. W. Ward.—The directors announce that a further six months' dividend will be paid on the second preference and employés' share capital, bringing the payments up to June 30, 1934. Warrants for this dividend and for the current quarterly dividend on the £500,000 first preference share capital will be posted on June 29, 1935.

Bradford Dyers' Association.—The directors announce postponement of the half-yearly payment to June 30 on the 5 per cent. cumulative preference stock. Issued preference capital totals £2,549,237, and no payment has been made since December, 1932. The usual half-yearly payment will be made on the 4 per cent. debenture stock on July 1.

Crossley Brothers.—A total income for the sixteen months to April 30 last of £32,585, is reported, against £21,902 for the year 1933. The figures include respective dividend contributions of £12,500 and £20,000 from subsidiary interests. After deducting interest and rents, net profit is £9,235, against £3,233, and the carry-forward is raised by this amount to £25,751.

British Alkaloids.—The report to March 31 states that capital expenditure was £749 on freehold property. The net profit was £18,083, against £10,174, plus £739 brought in; there has been written off preliminary expenses, £1,500; advertising account, £7,000; to taxation reserve, £3,000; dividend, 9.0115 per cent., less tax, on 8 per cent. participating preference, against 8 per cent.; £2,153, 10 per cent., less tax, on ordinary 2½ per cent., leaving to be carried forward, £3,625, subject to directors' additional remuneration, £1,543.

Zinc Corporation.—A participating dividend of 1s. per share has been declared on both the preference and the ordinary shares, less tax, making a total of 1s. 6d. for 1934. In the case of the ordinary shares, this is equal to 15 per cent., and compares with a total of 12½ per cent. in 1933. The total dividend on the preference shares, including the 20 per cent. fixed dividend, is raised from 26¼ per cent. to 27½ per cent. A dividend of 2s. per share on the preference shares is also announced, being the first half of the fixed dividend for 1935.

"Shell" Transport and Trading Co.—For the year 1934, a total of "dividends and interest from sundry companies, interest on investments, loans, etc., and other credits, etc., less debits," at £3,852,601, is stated to be rather more than £1,000,000 higher than the 1933 level, and is substantially better than for any year since 1930, when a profit of £5,074,415 was returned. Expenses and fees absorb £15,126, and preference dividends £800,000. The ordinary dividend is raised from 7½ per cent. to 12½ per cent., tax free. On the issued ordinary capital of £24,121,361 this latter distribution takes £3,015,170, and the carry-forward is then slightly lower at £381,683.

Bleachers' Association.—For the year to March 31 last the report shows gross profit of £419,455, after providing for central charges, interest, etc., compared with £386,827 for the previous year. A sum of £149,325 is provided for repairs and maintenance, leaving the trading profit £70,841 higher at £270,130, against £199,289 for 1932-33, when £30,000 was transferred from tax reserve, and a credit included of £16,735 profit on sale of investments. A net profit of £26,531 remains after providing £140,000 for depreciation, the same as a year ago, and debenture interest. This compares with £2,425 last year, after the transfer from tax reserve. This net profit, together with the amount of £151,582 brought in, is carried forward. No dividends are recommended on either the preference or ordinary shares. The former is paid to June 30, 1933, and the last dividend on the latter was 6⅞ per cent. paid for 1929-30.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

Mortgages and Charges

(NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

JAMES HANCOCK AND SON, LTD., Worcester, colour mfrs. (M., 15/6/35.) Reg. June 1, £250 mort., to West Bromwich Building Soc.; charged on 8 Furlong Lane, Burslem, and land at rear. *£3,760. Mar. 15, 1935.

MILTON BLEACHING AND CHEMICAL CO., LTD., Chapel-en-le-Frith. (M., 15/6/35.) Reg. May 28. £600 deb., to J. Davies, 2 Princes Avenue, Didsbury; general charge.

Satisfactions

CHARLES NORRINGTON AND CO., LTD., Plymouth, mfrs. of sulphuric acid, etc. (M.S., 15/6/35.) Satisfaction reg. June 3, £20,000, outstanding July 1, 1908.

LEVER BROTHERS, LTD., Port Sunlight, soap mfrs. (M.S., 15/6/35.) Satisfactions reg. May 31, of deb. stock reg. May 4, 1932, to extent of £68,800 and of deb. stock reg. Nov. 1, 1932, to extent of £45,763.

County Court Judgments

(NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court Judgments against him.)

CASWELL, H. H. (male), Edgerton House, Great Sutton, metallurgist. (C.C., 15/6/35.) £23 4s. 10d. April 15.

London Gazette, etc.

Companies Winding-up Voluntarily

VAPORISING INDUSTRIES, LTD. (C.W.U.V., 15/6/35.) By reason of its liabilities, June 3. Mr. Oliver Campbell Railton, 7 Norfolk Street, Manchester, appointed liquidator.

Chemical Trade Inquiries

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

Belgium.—An agent established at Brussels wishes to obtain the sole representation, on a commission basis, of United Kingdom manufacturers of essences and flavours for confectionery, mineral waters, etc. He is desirous of appointing sug-agents. (Ref. No. 520.)

Argentina.—The Argentine State Oilfields Directorate is calling for tende s, to be presented in Buenos Aires by July 10, 1935, for the supply and delivery of six Diesel-driven piston pumping sets—capacity 10 cubic metres of water per hour at a normal working pressure of 30 atms. (Ref. G. Y. 15227.)

Forthcoming Events

June 18 and **19.**—Society of Glass Technology. June 18, Meeting of Glass Standards Committee. 6.30 p.m. Informal dinner for members and friends. 7.30 p.m. Council meeting. 8.30 p.m. Adelphi Hotel, Liverpool. June 19. Morning visit to the Mersey Tunnel and to the works of Lever Brothers, Ltd., Port Sunlight. Ordinary meeting, 2.30 p.m. at University Liverpool: "Method for Determining the Resistance of Refractory Materials to Slagging," A. E. J. Vickers and R. A. Bell; "Influence of Iron Oxide, Carbon, Sulphur, and Selenium in Colouring Soda-Lime-Silica Glasses," A. Ally and W. E. S. Turner; "Decomposition of Sodium Nitrate and its Reaction with Silica," W. Maskill and W. E. S. Turner; "Influence of Carbon Dioxide on the Melting of Glass," M. A. Besborodov, A. A. Sokolova, and G. A. Shinke.