The Chemical Age

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Notes and Comments

Training the Chemist

INDUSTRY is essentially a human undertaking and as such depends for its success upon the reactions of the individuals who engage in it. Mechanisation has done much—more in some industries than in others—to discourage individuality; perhaps one day we shall achieve a completely mechanised world in which nothing will be required for production save only a repair staff to keep the machinery working. When that day arrives, the working man will have disappeared and all industry will be directed and operated by those having pre-eminent mental abilities. We shall then achieve openly the position that in fact obtains to-day, namely, that the higher the mental capacity of the individual the harder he is compelled to work to obtain the necessities of life in his station.

Even when universal mechanisation has arrived, the world will stagnate if the individual does not play his part in planning new developments and in making new discoveries. To-day, when we are still so far from mechanical perfection, it is more than ever true that upon the individual depends the success or failure of an industry. "Workmen," said Mr. J. R. Clynes at the recent Sheffield meeting of the British Commercial Gas Association, "for the most part labour or move in a narrow circle, and, as a rule, are not in a position to measure the services of their superiors. . . . The complex aspects of industry and its international problems are beyond them." In other words, the industry, any industry, depends for its effectiveness upon the individual who guides the "complex aspects" of the daily work of the factory. It is possible, though it may not be economic, to replace the mechanical work of manufacture by machinery. It can never be possible to replace directive and creative work by machinery. Those who undertake this work are drawn inevitably from the more highly gifted, the chemists, the chemical engineers, and in the chemical industry pre-eminently, these groups of employees have the essential rôle to fulfil of developing the future.

The Chemist who Stagnates

THE letter from "External Graduate," published in THE CHEMICAL AGE of September 29, not only invites, but demands, comment, because of the implications contained in it. He suggests first that there is no prospect of advancement for the good chemist because he is valuable in his present capacity. That is an age-old problem, the solution of which depends upon the employer and upon the chemist himself. The wise employer knows that, by a proper system of training and replacement, even the best chemist (superlative men in specialised lines are excluded) can be replaced without much disturbance when the time comes to offer advancement. He knows too that by steady advancement the good chemist is likely to be retained in his service. The wise employer organises his staff by "keeping" spares who can step in virtually ready trained, to fill any emergency caused by the unexpected loss of any member of the staff.

But all employers are not wise and many a chemist must go through his work year after year feeling that he is at a dead end; in time he stagnates and settles down to a quiet existence in a middle-class suburban district, content if he can earn enough and save enough to enjoy himself a little and to be not too short of money when old age compels retirement. Such men may be the backbone of the country, but they are not and never can become the captains of industry. That such things are possible shows that the spirit of adventure is lacking. The chemist who stagnates should "take a chance"; he should strike out boldly. If he is content to stagnate, he is fit only to stagnate. "Men are at some time masters of their fate."

Adventurous Rôle of Administrator

ANOTHER complaint of "External Graduate" is that whilst some poor chemists are deservedly sacked, others through influence receive quite unmerited promotion. No one will deny that such things do happen, and that it seems at the time unreasonable. We can recall a friend who at one time had as assistant a chemist of but little ability, but that assistant is now a director of one of the largest steel firms in the country. The fact is, of course, that our correspondent confuses chemical ability with administrative ability. The administrator in the chemical industry should have been a chemist or a chemical engineer, but he need not necessarily have shone greatly at either vocation so long as he has imbibed enough of the essentials to recognise the experts' point of view and (most important) his own limitations. The fact that the "good" chemist is content to stagnate shows that he is not in fact fitted for the more adventurous rôle of administrator. Provided no misfits are allowed to persist, there can be nothing but good in the management finding by trial and error whether the bad chemist cannot be fitted in better in some other position in the organisation. "To each his destiny, to each his fate."

The third complaint is that the secondary school boy, having been assisted to become fully qualified, is then told that he cannot go farther because he has no University education. It must be recognised that there is far too much snobbery in respect of University education. Particularly is this so regarding University posts; it is harder for a camel to go through the eye of the needle than for external student, be he never so eminent, to attain to a Professorship. Frankly, we feel that our correspondent has been unfortunate if he has found this handicap in industry. The secondary school boy can only have found it in one of a small number of large laboratories unless, and here is the crux of the matter, his general education (manners, knowledge of literature, and speech and so forth) have failed to advance with his knowledge of chemistry.

The Secrecy Complex

OUR correspondent's fourth complaint is that the budding chemist is kept to himself in the laboratory and cannot learn anything about other branches of the firm. Where this is true it is just another example of the secrecy complex to which we have called attention on more than one occasion. We can possibly understand that certain old-fashioned firms still think it is good policy not to tell their competitors how they do things; but a firm that refuses to let its own employees know how things are done must have a terrible lack of confidence in its own employees, and also astounding ignorance of psychology. The surest way to induce untrustworthyness is to withhold trust. The surest way to induce a really forceful personality to find things out for himself is to tell him he is not allowed to know them. We cannot believe that such a policy still persists in this year of grace as the considered policy of any important concern. If a chemist expressed the desire to learn more about the working of other departments, we feel confident that he would be allowed in his spare time to visit those departments and to see how things are done.

Whether the individual employees would also part with their information is another matter; secretiveness is not confined to "firms," but it is to be found among individuals. The individuals who are secretive about their job, are those who are not highly competent and who have consequently so little confidence in themselves that they are terrified of letting someone else into what few "secrets" they think in their ignorance they possess. Ninety-nine out of every hundred such secrets could quickly be discovered and even improved upon by the reasonably efficient investigator. Before complaining that he is given no information about other departments, let our correspondent first ask himself whether he is willing to give up his recreation time to acquiring that information, and then let him ask for the necessary permission. Unless it is as part of a comprehensive training scheme, he cannot expect his employers to engage a locum tenens so that he can learn in their time about things which they do not deem it essential for him to know.

The Pupil System

FINALLY, there is the pupil system. There indeed our correspondent has manifest cause for grumbling. A pupil system such as he describes is nothing short of the payment of a bribe for the purpose of being "pushed" into a high-salaried position. There is a mistaken idea that by paying a premium to an individual connected with a firm a boy may be trained in science and may be fitted to take a high position. Training in science can only be obtained in schools and colleges where it is a whole-time job. The chief chemist or chief engineer who accepts premium pupils untrained is either taking his pupils' money under false pretences, or he is not giving to his firm that whole-time service which it has a right to expect from him.

At the same time there is much to be said for a system which permits trained pupils to come into a business to learn the fundamentals of management from all angles. It would hardly be fair to expect any firm to teach people in that way without some special recompense. Once the pupils have been trained, however, they should not be guaranteed high position; they should certainly not "absorb practically all the chances of promotion." If pupils are taken the best system is to give them the business and industrial training for which they pay, and then to give them a small-salaried job from which they will rise only when they are found to be worth promotion. The pupil system as described by our correspondent is wholly bad. It is calculated to disturb the whole staff of the undertaking.

Width of Outlook and Vision

HAVING supported "External Graduate" to this extent, we are bound to say that all who feel like he does should endeavour to imagine themselves in the position of the directors. The fact that they are good chemists or engineers is no reason for expecting promotion to the highest positions outside the purely chemical and engineering staffs. The directors must look for something a little different from skill with laboratory apparatus in those to whom the higher administrative branches of business are to be entrusted. To believe otherwise is a fault of inexperience. It is a sign that, in the words of Mr. Clynes, they are "not in a position to measure the services of their superiors . . . and the complex aspects of industry are beyond them." Width of outlook and vision are necessary in the young man, whatever his scientific and engineering qualifications, if he would rise in the world; and allied to these there must be a willingness to adventure, the sign of self-confidence.

The younger men in the chemical industry deserve all the assistance that can be given them by those who have been through the industrial mill from bottom to top, and if they can be thus instructed the chance that the next generation of the leaders of the chemical industry will be, if possible, superior to those of to-day is enhanced. It is to youth that we must look for the future. The subject must be of no little interest to heads of businesses, because too often the reactions of their staffs are not brought before them as vividly as is desirable. The successful management of a business depends so largely on an enthusiastic and contented staff that no small portion of their occupation must be that of oiling the human wheels of industry. We often feel that it would be most valuable if every member of the staff could have a heart-to-heart talk with the managing director once a year and could put before him, as in a confession, all those hopes and fears and aspirations and annoyances that had clouded or brightened the past twelve months.

Chemical Problems in Food Research

Engineering Investigations at the National Physical Laboratory

RESEARCHES conducted at the National Physical Laboratory under the direction of the Engineering Committee are referred to in the Annual Report of the Food Investigation Board for 1933. They relate chiefly to the viscosity of refrigerants, evaporation from wet surfaces, transmission of heat between metal pipes and a stream of air, insulated containers for use with solid carbon dioxide, convection in narrow air spaces, and corrosion in refrigerating plant.

The viscosity of the liquid refrigerant used in a refrigerating plant affects its working in two distinct ways. In the first place, it controls the power required to drive the refrigerant round the cycle, and in the second place it enters directly into the factors governing the heat-transmission in the evaporator and condenser. For these reasons, work has been commenced on the measurement of this property at temperatures from $-10°$ C. to $+15°$ C.

The method adopted is that of timing the rate of fall of a metal plug in a closely-fitting cylinder filled with the liquid. The container is of metal, and has glass windows near each end, so that the transit of the plug past these points can be observed. To avoid the formation of bubbles of vapour, the ends of the metal cylinder are of special form, and a heated reservoir is attached at one end, so that the pressure in the cylinder can be raised above that corresponding to the vapour-pressure at the temperature at which the viscosity is being measured. The apparatus has been calibrated with four fluids at different temperatures, the time of fall of the plug being practically a linear function of the viscosity.

Evaporation from Wet Surfaces

The heat-transfer accompanying evaporation is an important factor in many phases of refrigeration, and this investigation has been undertaken with a view to supplying data relating to the basic laws of evaporation of water from saturated surfaces. These experiments are being carried out in a horizontal open-circuit wind-tunnel of 53 cm. square cross-section and 3 m. in length.

The evaporation from the surface of a vertical cylinder, 18 cm. long and 8.6 cm. in diameter, moistened by water percolating through a linen cover, has been studied in some detail when uniformly heated to various temperatures and exposed to winds of velocities ranging up to about 300 cm./sec. The rate of total evaporation was determined from the quantity of water lost in a known interval of time, and also in terms of the additional electric energy required to maintain the surface at the same temperature excess when wet over that required when dry. In these experiments the highest difference of vapour-pressure attained between the saturated surface and the ambient air was equivalent to 50 mm. of mercury, and the rate of total evaporation within this range was found to be proportional to the difference, and, to a first approximation, to vary as the 0.7 power of the velocity of the wind. The rate of evaporation from different parts of the surface was also deduced from measurements of the energy dissipated in nine individual heating panels placed vertically and in close contact so as to cover the cylindrical surface. It was found to be greatest from the area facing the wind, and least from the elements of surface at an angle slightly greater than a right angle to the approaching stream; whilst that from the rear had an intermediate value which increased in relative amount with increase in the speed of the wind. The rate of evaporation was also found to be greatest near the base, and to decrease towards the top of the cylinder.

Determining the Rate of Evaporation

Experiments are now being made to determine the rate of evaporation from the upper surface of a horizontal plate, 18 cm. wide and 24 cm. long, subjected to a wind passing tangentially over the surface. The plate itself consists of a number of independently controlled heating strips, arranged side by side and perpendicular to the direction of the wind. Their upper surfaces are in one plane, and are covered with a tightly stretched linen cloth which can be maintained uniformly wet during an experiment. The distribution of evaporation in the direction of the wind is determined in terms of the electrical energy dissipated in the heaters, and is found to have a maximal value on the side at which the wind is incident.

A detailed investigation of the laws governing the transfer of heat between heated or cooled metal pipes and a stream of air, with particular reference to batteries for air-cooling, has been in progress for some time. It has now reached the stage where the experimental data can be collected together and correlated. This has been done in the course of a comprehensive paper ("Röhrenindustrie," 1931, *24*, 5, 18) in which the closed-circuit wind-tunnel used is described, as well as the experimental methods for measuring the quantities of heat.

Principle of Similitude

It is found that the principle of similitude enables the results to be represented concisely in the form of graphs connecting the two dimensionless variables $H/k\theta$ and Vd/ν, where H is the heat-transfer per unit length of pipe, k and ν the thermal conductivity and the kinematic viscosity of the air, θ the difference in temperature between the pipe and the air, V the air velocity, and d the diameter of the pipe. The results demonstrate the increase in heat-transmision which accrues from any increase in the eddy motion of the air. In the first place, this was indicated by the increase in the heat-transmission for layers of pipes after the front one, in a battery, and also from the higher coefficients in a "staggered" battery from those in a "square" one. The deduction was confirmed by using a frame of wooden laths to induce turbulence, when it was found that the transmission for the whole of the five layers of piping examined was improved; the percentage increase was greatest for the first layer.

In addition to batteries of pipes set transversely to the air-stream, longitudinal pipes have been studied. The laws for these differ in many respects from those for transverse pipes. Thus, the heat-transmission decreases downstream, instead of increasing, and the relationship between the two variables mentioned previously is linear, in the case of longitudinal pipes. The effect of eddy motion is, as before, to increase the heat-transfer, particularly in the sections first met by the air. It may be of interest to note that, other things being equal, the heat-transfer from a longitudinal pipe is of the order of one-half that from a transverse pipe.

Insulated Containers

Solid carbon dioxide is now an article of commerce, and many tons are transported daily by rail and road. To design containers for this material of such a thickness that the loss of the refrigerant is balanced financially against the cost of the container and other factors, necessitates a knowledge of the thermal conductivity at low temperature of the material used for the container.

To ensure that the conductivity is measured over the actual range of temperature concerned in the commercial application of the container, the experiments have been conducted by measuring the rate of sublimation of a block of solid carbon dioxide in a container of such a form that the heat-transmission through the walls can be calculated, assuming the surfaces are isothermals. To obtain this uniformity of temperature, the container is metal-lined, and use is also made of natural internal convection by suspending the container from a balance by a wire passing through the lid and attached to a plate carrying the block of solid carbon dioxide; the latter is thus in contact with the lid of the box the whole time. To avoid the necessity of assuming a value for the latent heat of sublimation of the solid carbon dioxide, a heater is provided in the box, and this can be used to measure the increased rate of evaporation due to the supply of energy at a known rate.

A controlling factor in certain forms of insulation used in cold storage is the convective transfer across narrow air-gaps in the insulation. With a view to providing data in this connection, narrow air-gaps, consisting of the space between two parallel metal plates, one of which was electrically heated, and the other water-cooled, were used. The plates were 12 inches square, and the air-space between them was varied from 1 cm. down to 1 mm., both when the plates were vertical and when they were in each of the two horizontal positions, *i.e.*, with the hot or the cold plate uppermost. With a gap of 1 cm., the transfer was approximately proportional to the 5/4th power of the difference in temperature, but this figure falls, and the actual transfer rises, as the places are brought closer together. With a gap of 1 mm., the transfer was approximately proportional to the difference in temperature itself, showing that convection had been almost entirely suppressed.

Corrosion not infrequently causes trouble in the refrigerating industry, and where the cause is obscure, the Engineering Committee of the Board is glad to have examples brought to its notice. One such case was studied in the year under review. It was observed that the sides of the pistons of methyl-chloride plants had patches of the surface covered with a thin film of copper, whilst the piston heads and diaphragms had a coating of a thin brown deposit. The trouble was not confined to one particular plant. Some of the deposit was dissolved in acid and the flame-colour test applied. The characteristic colour of calcium was observed. This suggests that calcium salts are the cause of the corrosion. The deposit of copper is then accounted for by the fact that the copper pipes would be attacked by the calcium salt, and the compound formed would be carried on to the iron piston and react there, depositing copper.

On inquiry it was ascertained that this make of methyl-chloride machine utilises a drying tube containing calcium chloride to remove the traces of moisture from the methyl chloride, so this could account for the presence of the calcium. It was suggested as a remedy that a silica-gel dryer be used instead of calcium chloride.

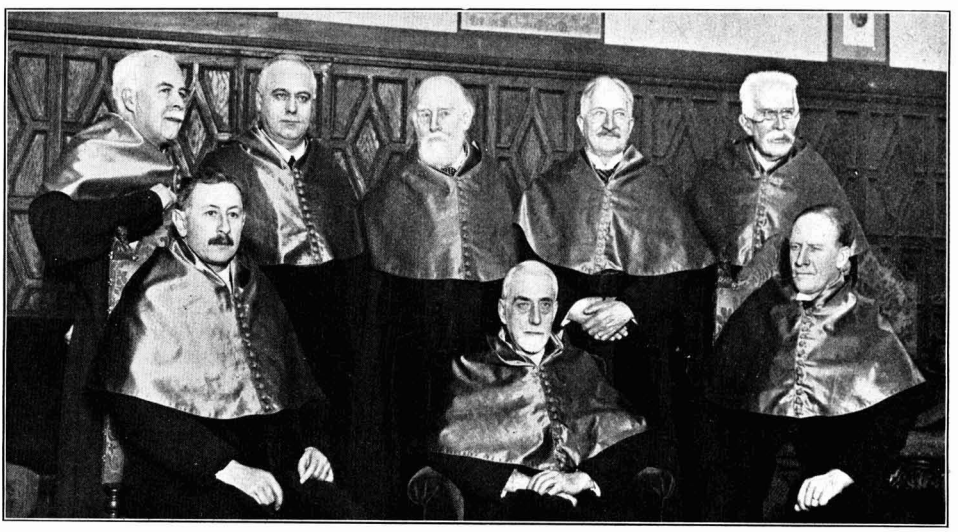
A survey of the literature relating to corrosion by refrigerating brines has been made, and the salient facts appear to be that pure brines free from oxygen are practically non-corrosive. Neutral brine slowly becomes acid upon exposure to the air, owing to absorption of carbon dioxide. The alkalinity produced by excess of calcium or sodium hydroxide is limited by the alkalinity of a saturated solution of the calcium oxychloride formed, and this varies with the composition, concentration and temperature of the brine. The corrosion of iron and steel is reduced to a negligible point under most conditions if the hydrate alkalinity (in terms of calcium hydroxide) is maintained at, say, 200 parts per million. Soda ash to produce alkalinity is not practicable, as calcium carbonate is precipitated. Finally, passivifying agents, such as potassium chromate, retard corrosion, and there is a minimal rate of corrosion with certain concentration of bi-chromate beyond which the rate increases with the addition of further amounts. One point of practical importance is to make bends in the piping system carrying brine of as large a radius as possible, since concentrated brines at high velocities exert a severe cutting action at such places.

Honours Conferred by the University of Madrid

At the Ninth International Congress

On the occasion of the ninth International Congress of Pure and Applied Chemistry, held in Madrid this year under the presidency of Professor Fernandez, a variety of honours were bestowed with true Spanish courtesy upon a number of the delegates. Professor H. E. Armstrong (London), Professor H. Le Chatelier (Paris), Professor N. Parravano (Rome) and Professor P. Walden (Rostock) were made honorary presidents of the Congress. The degree of Doctor Honoris Causa in the Faculty of Sciences was bestowed upon Professors Armstrong, Le Chatelier, G. N. Lewis (Berkeley), Parravano and Walden, and upon Professors E. Fourneau (Paris), P. Karrer (Zurich) and R. Robinson (Oxford) in the Faculty of Pharmacy.

Professor Parravano (Rome) was elected president of the Union and it was arranged that the next meeting should be held in Lucerne, Switzerland, in September, 1936.



Recipients of Degree of "Doctor Honoris Causa" conferred by the University of Madrid. Standing: G. N. Lewis (Berkeley), N. Parravano (Rome), H. E. Armstrong (London), P. Walden (Rostock), H. Le Chatelier (Paris). Seated: P. Karrer (Zurich) E. Fourneau (Paris), R. Robinson (Oxford).

At the Sign of the Cheshire Cat—III

Some More Reflections on the Aberdeen Meeting of the British Association

"THE time has come, the Walrus said, to talk of many things: of shoes—and ships—and sealing wax—of cabbages—and kings." A like inconsequence seems to have prevailed at Aberdeen. In Section A, the Address was a ten-page long discussion of so-called *Theories of Light*. However much the subject may be of present interest to a few specialists, it was out of place at a meeting meant to serve popular, not private, ends. Physicists are still not far from the mere guessing stage. The public has to be satisfied with the biblical dictum—"And God said, Let there be Light and there was Light"—at least, until smoky chimneys arose in crowded cities. Many would like to know what physicists are doing to help us to light our towns, now that we are learning that light has a health-promoting office which is not merely subjective. If we are to appear as nudists at Blackpool, clean air will be necessary there: is this in the official mind—if there be one? The burden clearly rests upon Section A. Unfortunately, physics is no longer a practical science and will soon be a lost academic art. What a feather it would be in the cap of the Association, if it were to rediscover this branch of science! Man lives not on electronics alone, still less on mathematical abstractions. Even the new, world-shattering pastime of atomic skittles can have interest only for a few skilled players of this most searching of games. Of late years, at the Royal Institution, I have often sighed for an hour of clear-cut demonstrations of heat and sound phenomena such as I heard Tyndall give, in years long ago, so that the young people might gain some ballast of fundamental fact. Faraday method is gone out of the Christmas lectures. These are no longer educative but mainly didactic and informative shows, set at the level of juveniles over sixty who are the main audience. The sober spirit of Faraday hovers but faintly in these days over the building. And yet I see hope. The publication of his "Laboratory Note Books" is a real achievement. When listening to Sir William Bragg, of late, the thought has come over me more than once that he is beginning to lose himself in the great philosopher's musings and to be impressed with their spirit. In time, he may turn to his unique lecture on "Mental Education" and, perhaps, strive to make its doctrine known and effective; give us less show and more substance!

"Charms strike the sight but merit wins the soul."

"Much Ado About Nothing"

In Section B, the President's Address was nominally on "Physical Methods in Chemistry"; properly described, it is on the President's methods, a chemical "Much Ado About Nothing," summarising the author's laboratory and journalistic wanderings.

". . . . the total matter
Was thinnest soup served on a platter."
[La Fontaine].

His talent for inventing unnecessary names; his lack of critical power and sense of probability; as well as his complete surrender to electronic mysticism, are fully displayed. To me, it is the story of the spiritual downfall of a once most promising, most skilful laboratory worker, under the sterilising influence of the unscientific outlook developed in the modern physical-chemical school, journalised into being, since the 1885 meeting in Aberdeen, by Ostwald, without any conscience of criticism. He clearly moves but in the shackles of an ecclesiastical spirit.

Chemistry is chemistry; it cannot be something else as well and remain a Science. When the new atomic breakdown gang has entered into its full estate, the time will be ripe for an alliance, not before. Every chemist who is a chemist and retains his sanity must know that the electron-proton speculation was an absurdity; no variety can be got out of two factors. The paraffins are all alike. Now that we have almost weekly additions to the number of letons to be got out of the poor battered atoms, some measure of probability is coming upon the scene. At the conclusion of my address in 1885, I said:

"The great outcome of the labours of carbon chemists has been the doctrine of structure. . . . Some of us look forward to the extension of the doctrine not only to compounds generally, but even to the elements. The relationships between these are in so many cases so exactly similar to those which obtain between carbon compounds, which we are persuaded differ merely in structure, that it is almost impossible to avoid such a conclusion, even in the absence of all laboratory evidence."

Not so bad this as a forecast. We should not now have to wait 50 years for proof that the elements are patterned structures, like carbon compounds. Obviously, the methods thus far developed are entirely primitive and brutal; the mathematicians are but seeking to paint models. A little attention to the exact science *Organic Chemistry* would do the workers good.

Repetition of Work of 50 Years Ago

If the President of B had had the least sense of humour, he would not have begun by stating that

"The physico-chemical theories which first attracted me to the study of chemistry were largely fallacious, since we now know that the concentration of ions in an aqueous solution cannot be deduced directly from its conductivity at different dilutions; nor does the catalytic activity of an acid afford a direct measure of the concentration of hydrogen ions which it contains, in view of the fact that the molecules of the acid may be even more active than the ions produced from them."

The fallacy of the doctrine he expounds is already only too obvious—it is so hopelessly incomplete and inconsiderate of fact: just words, like nearly all our so-called theoretical chemistry. The worst of it is, these disquisitions have their effect upon the innocent minds of young workers. Others too are writing with similar looseness of thought, producing speculative joy. Work is done, nominally with this or that speculation in view, which in the end leads nowhere. A large part of the output of to-day is repetition of work of fifty years ago expressed in language which is mere paraphrase of the old style, carrying us no further. In consequence, the Journal of the Chemical Society is made unreadable and the Society has sacrified many thousands of pounds in giving advertisement to matter which ought never to have been put into print. We have to eradicate this cancer of unwarranted speculation, leading nowhere, from our subject and get back to accurate work and thought.

In Section C, the President provided a long and learned essay, mainly dealing with the value of plant remains as geological evidence. Far too long for an address, it is too compressed to be read for general information, of which there is not a little. Thus we learn that coal was raised several centuries ago in large quantities and used in evaporating sea water, to produce salt.

Neglect of Geology in Schools

No better evidence can well be asked for of the failure of the Association to impress the public than that given by the almost complete neglect of geology in schools. It should be the basis of geography. Familiarity breeds contempt. No one cares for the soil. The "muddied oaf" regards clay just as dirt, nothing more. People who go to the sea take less notice of sand or shore than either Walrus or Carpenter did. No attention is paid in schools to Huxley's advocacy of the study of history through chalk. That geology has something to do with agriculture seems to be forgotten by most geologists. A great opportunity is before the coming President, who is a geologist. Let him cast academic geology to the winds and seek to tell us, in plain black and white, what the soil of our Empire is worth. Australia looks big on the map, it appears to have wide open spaces unfilled—how much of it is worth while? Let him explain the difficulties of water supply—the exhausted soil of South Africa, of Ceylon, of India—the need of mineral fertilisers and the narrow distribution of the supply. He will be giving politicians and others who can look ahead something to think of and provide against.

In D, Zoology, the topic was " The Study of Behaviour." The writer begins by saying that he agrees " that the organism has properties and potentialities as a whole which are not reducible to the properties shown at the chemical level." Being interpreted, this means, what? It sounds well, but can it have any meaning? What are the properties of an organism shown at the chemical level? Who can presume to know at present? A fair share of our behaviour has to do with adrenaline—a simple chemical.

However, it is useless to argue with a man who can smite you with such a peroration as the following:

" We must think of the organism as a four-dimensional whole or directive cyclical process and no longer attempt to contain it within the static scheme of the classical materialism. This does not lead to any form of dualistic vitalism. The relation of behavioural or ' psychological ' activities to physiological is not the relation of mental to physical activities but is, quite simply, the relation of a whole spatio-temporal directive process to its parts."

Obviously this has been written for Mr. Julian Huxley to have printed as a poster, to be exhibited everywhere at the Zoo and at Whipsnade. People will begin to look at the animals with real curiosity, when told they are "four-dimensional wholes."

Breathing Fresh Air

Reaching E, we begin to feel that we are breathing air that is no longer hot but even fresh. The subject discussed is " Co-operative Research in Geography," with an African example. Attention is called to the need of systematic inquiry into man and his doings and into the conditions generally in countries like Africa, with native populations. The address is an instructive essay for travellers and residents abroad.

Geography to-day is an almost meaningless term—it means so much and so little. Although the teaching has been greatly improved of late, it is still nondescript and far too much attention is paid to subjects beyond the scope and experience of boys and girls of school age. Much geography is learnt to-day from the wonderful pictures published in "The Times" and other papers. If taught properly, the subject includes all the natural sciences. It cannot be taught at all without fundamentally clear ideas in chemistry, physics, geology, astronomy and biology. As the attempt is made to teach it without these, the instruction can have but little value. If continued in a reformed Association, the outlook of the Section should be very different from that now prevailing—far wider and with some philosophy in it.

As F stands for Future, rail transport was appropriately considered in the section and a common management of all forms of transport advocated. It is to be regretted that no attention was drawn to the great scientific advance made during the year by the general introduction of water-softening plant on the L.M.S. system.

Sources of Cheap Electric Power

In G, the Engineering Section, discussing " Sources of Cheap Electric Power," the President directed attention to the great waste of fine coal at the pit head, and dwelt on the use that might be made of this as a means of generating electricity at low cost. It is fast becoming clear that there is no other rational way of disposing of the material. Engineers, too, are becoming experts in using dirty coal; in fact, they have difficulty in using it clean. Coal is to energy production what railways are to transport. Transport is coming into intelligent hands; coal has never been. Not many years ago, the engineers in the steel works in Sheffield did not know that they burnt air along with coal. People generally to-day have no idea what happens in the explosion chamber of the motor-car engine. It is astonishing how far our boasted knowledge extends, how much the schools consider the world.

The address in H, Anthropology, may be given a prize for brevity. The strange topic of " Paraguay Tea—Yerba Maté " is the theme discussed, as an illustration of the desirability of studying the history of valuable food plants before it be too late. In native minds, the tea was once endowed with magic powers. We are referred to the Handbook of Paraguay, of 1894, for an analysis: a little far back, perhaps. Still, it suffices the President, who concludes from it that the action of an infusion would be that of a cardiac and a nutritive. He adds that it is a little strange that the earliest authors who record its use quote it primarily as an emetic. We wonder what the Wellcome laboratory has to say on the subject.

In Physiology, I, Normal and Abnormal Colour Vision was the topic. Often at sales, when a lot does not raise a bid, two or three others are put up with it—even then the bidding is not spirited. We feel this to be true of I and put J, Psychology and Social Problems, with it. Prototropy, from Chemistry, might be thrown in. The psychologists have taken themselves seriously of late years and have made good fees out of their subject in commonsense ways. It is doubtful if the subject deserves a place in the Association. The latest effort does not help it much.

An address of real public importance was that delivered in Section K, Botany, under the far too modest title of " Some Aspects of Forest Biology." The complexity of the problem facing the forester are fairly displayed, but more should have been done to make clear the vast public importance of the subject.

The growth of trees is a subject second only in importance to that of the growth in intelligence of humans, discussed in L, Educational Science, under the title "Science at the Universities: Some Problems of the Present and Future." This was the one fighting address at the meeting—a challenge, long overdue, to the universities to consider their position. Whilst dropping bombs upon the head centres of training, the President went out of his way to act as apologist for the public schools, which were roundly condemned later on for their methods, by the late head of Harrow. The President is as yet but an amateur flyer, not long recovered from public school measles and Oxford mumps: all the signs of a robust constitution are there, however. Having built a " Queen Mary " and launched her in 54 seconds, operating with interest and knowledge, it should be possible by like methods to build as stately a ship of Education. If a stimulus to this end have been given at Aberdeen, L will not have worked 34 years in vain.

Progress in Agriculture

Last, but not least—in fact, actually the most important of all in subject—comes the address in M, Agriculture: " Scientific Progress and Economic Planning in relation to Agriculture and Rural Life." This was reinforced by Sir Daniel Hall's powerful advocacy of an agricultural policy, in a subsequent discussion in the Section. The chemist, more than anyone, can foresee the importance of a complete organisation and scientific development of farming industry—as he can foresee, as its chief objective, the production of crops of considered and assured nutritive quality, and the consequent great reduction, if not the extinction, of all disease due to faulty nutrition—by far the major cause of disease. He would, however, counsel caution against too hasty laying down of plans, on account of the extreme complexity of the problem. To take only a single issue: we have to settle what type of flour we may best use as bread, before we can decide what amount and what kind of wheat to grow, how much and in what form wheat shall be imported. Answer can only be given upon a basis of complete scientific study of the problem. The great cause for satisfaction the chemist has to-day is the advance made in the study of foodstuffs and conditions of health as affected by chemical factors in food. The coming age is clearly to be a Chemical Age.

The Walrus was in advance of the Association in asking for talk " of many things," including " Cabages and Kings." He must have foreseen that the time was to be when we should greet

Cabbages *as* Kings.

SPANISH production of sulphur ore during 1932 totalled 70,690 metric tons. In addition, approximately 4,539 tons of sulphur were produced by the Rio Tinto Company. It is reported that the 1933 output of sulphur from pyrites by the Rio Tinto Company rose to 18,000 metric tons. Imports of sulphur into Spain during 1933 declined to 4,016 tons from 10,518 tons in 1932. Concurrently, exports declined to 4,575 tons from 5,711 tons. Increased production caused the Government to prohibit importations until domestic prices exceed 300 pesetas a metric ton for crude sulphur in bulk. Spanish consumption of sulphur is estimated at slightly over 25,000 tons and production at 30,000 tons.

Low Temperature Carbonisation During 1933

By F. S. SINNATT, D.Sc., Director of Fuel Research

THE past year has been marked by an increase in interest in processes for the production of smokeless fuels, and in methods of heating without the production of smoke. The interest is not confined to any branch of the community, but is shared by the general public, the coal industry, the carbonisation industries and the electrical industries. The general feeling upon the development of processes for the carbonisation of coal at low temperature is due, in a measure, to the excellent results published by Low Temperature Carbonisation, Ltd. The chairman, Colonel Bristow, was able to report another year of progress and achievement, and at a later date stated that Low Temperature Carbonisation, Ltd., were erecting two new works in the next few months. The primary object of this company is to produce a solid smokeless fuel, "Coalite," suitable for all domestic purposes including the open firegrate, and it succeeds in this object by setting a high standard for its product, and by keeping it uniform in size and quality. The by-products obtained are of importance, and the motor spirit produced by the low temperature carbonisation of coal was used during the major part of 1933 for one Home Defence Squadron of the Royal Air Force. In view of the very satisfactory results of this trial a contract has now been placed to cover the requirements of seven squadrons, and Colonel Bristow, in a letter to "The Times," dated March 2, 1934, stated that the motor spirit produced in the new plants mentioned above would bring the total production of his firm up to a point sufficient to supply 17 squadrons of the Royal Air Force. The writer has pointed out that a manufactured solid smokeless fuel must possess special characteristics before the general public will use it in place of coal. The household coals of this country are of such high quality, and are so suitable and economical for domestic purposes, that the public cannot be expected to use solid fuels of inferior qualities. The coal industry is providing suitable sizes and qualities for domestic purposes, and the Coal Utilisation Council is playing an important rôle in placing modern developments in the utilisation of coal at the service of the consumer.

The 1934 "Fuel Economy Review," published by the Federation of British Industries, contains a Review of Coke Oven Technology (G. E. Foxwell), a Review of Gas-works Practice (H. D. Greenwood), notes on The Modern Industrial Drive and Electrification (R. C. Mortimer), articles on steam raising, water softening, boiler feed water conditioning, refractories, and a survey of the Development of Low Temperature Carbonisation during 1933 (F. S. Sinnatt). Dr. Sinnatt's article is reprinted in this page.

Production of Coke

The great carbonising industries are doing all in their power to produce cheaply, and in large quantities, cokes possessing the qualities required for all domestic purposes. Importance is attached to the speech by Sir David Milne-Watson at the annual meeting of the Gas Light and Coke Co. He said, "The company owes its great position to the fact that gas is a clean, economical, and efficient fuel. I should like also to point out that the company is a very large purveyor of solid fuel in the shape of coke and our specially prepared 'Cleanglow.' These fuels have the great advantage of being economical and reliable, and at the same time absolutely smokeless. We have found a ready market for 'Cleanglow,' and its use is increasing every day." The significance of these remarks will be realised when it is remembered that the Gas Light and Coke Co. carbonises about three million tons of coal per annum. A duty of 1d. per gallon on heavy imported fuel oil was imposed on the occasion of the last budget. At the above-mentioned meeting of the company Sir David Milne-Watson stated that the tax on fuel oil had directly stimulated the use of coke for central heating and other boiler installations.

The chairman of the Illingworth Carbonisation Co., Ltd., Mr. S. E. Illingworth, at the annual meeting on December 20, 1933, reported that the plant at Courrières had been doubled during the year, and now has a capacity of 250 tons a day. The plant at Maubeuge for Gaz et Carbonisation, capacity 250 tons a day, came into operation in September, 1933. The Italian plant has been in operation since October, 1931, but the smooth working of this plant has been interrupted by growth of the castings. It has been decided to replace the castings with a cast iron that does not grow, which has been developed in association with the French company. The capacity of the Illingworth plants abroad is 750 tons a day. The fuel commands a high price, and the reception is stated to be excellent. It is expected that it will be possible to recondition the plant at Allerton, which will serve as a demonstration plant for Great Britain. The plant of the Scottish Gas Utilities Corporation, Ltd., Glenboig, has treated over 17,000 tons of coal during the year, without interruption for mechanical adjustments. The coal used is washed caking doubles or singles from Lanarkshire. The smokeless fuel "Heatbright" is graded. A sample has been examined in the open grate at the Fuel Research Station and gave values comparable with other smokeless fuels. The gas produced in the plant has a calorific value of 200 B.Th.U. per cu.ft., and is equivalent to about 80 therms per ton. The whole of the gas is sold for industrial purposes, and the results have been satisfactory. The tar produced during the year has exceeded 20 gallons per ton, and the corporation has developed a treatment by which it remains fluid below 0° C.

Low Temperature Plant at Southall

The erection of the Salermo plant at the Southall Works of the Gas Light and Coke Co. has been completed. The unit has a capacity of 50 tons a day. The carbonising chamber consists of 24 semi-circular troughs, 16 in. in diameter and 7 ft. 6 in. long, made of special heat-resisting steel. The coal to be treated is passed through a pre-dryer heated by exhaust furnace gases. The furnace is an adaptation of the best type of gas furnace and individual burners are provided for each trough so as to permit of absolute control of temperature, and there is a special system of recuperation. The gases and vapours pass through a Salermo dust extractor where the dust is caught by a series of baffle plates which are continuously sprayed with the less volatile fractions of low temperature tar. The tar, which is under pressure in the circuit, carries away the dust and after separation from the dust it is cooled and returned to the sprayers. The higher boiling tar fractions are condensed at the dust removing stage and continuously removed. The condensers proper catch the low boiling fractions and water, and separation of the tar takes place owing to the absence of dust. The plant is designed to produce low temperature coke of a definite and constant volatile content, and forms an integral part of a blending plant. The ultimate aim is to produce coke possessing special properties by careful blending and carbonisation.

The Hird System

A unit of the Hird system of low temperature carbonisation, British Carbonised Fuels, Ltd., having a capacity of 50 tons a day, is being erected at the Nostell Colliery, Wakefield. It is intended that the ultimate capacity will be 200-250 tons a day. The coal used in the plant passes to a bunker of 100 tons capacity, and then through a coal dryer heated by gases bled from the battery heating, to a similar bunker of 40 tons capacity. From here it is delivered into a charging lorry with three doors pitched to suit the charging doors of the retorts. The retorts are made of heat-resisting cast iron, and are of corrugated design. The dimensions of the retorts are 10 ft. by 10 ft., with an average width of 12 in. and with an inverse taper. The capacity of the retorts is 2¼ tons a day.

The heating is effected by circulating a large volume of gas. The low temperature coke "Nostlite Smokeless Fuel" is discharged into a fuel car where it is dry quenched by a special method.

British Coal Refining Processes, Ltd., announced in August last that its first plant would be erected on the outskirts of Huddersfield, and later it was stated in the "Yorkshire Observer" that the company is co-operating with Huddersfield Collieries, Ltd., in the scheme.

One of the developments of great significance, particularly to the coke oven industry and gas making industry, is the employment of the blending system due to Roberts, operating at both high and low temperatures. Successful working is reported from the Continent using coals to which 10-20 per cent. of coke dust has been added. In the blending investigation at the Fuel Research Station which is being carried out in chamber ovens (Woodall Duckham system), blends of caking and non-caking coal with and without the addition of fine crushed low temperature coke have been carbonised. The results have been interesting in several respects.

The system of low temperature carbonisation in the narrow brick retorts which has been elaborated at the Fuel Research Station (Technical Paper No. 35) has been tried on seams of all types from the main coalfields, and after about 48 hours' preliminary experimental working to establish suitable conditions it has been possible to carbonise most of the coals. One of the retorts has been in continual operation for 22 months, and when the two retorts were examined at the end of 18 months both were found to be in excellent working condition.

An Electric Grinding Mill with Novel Features

A Refinement to Prevent Overheating of the Material

IMPROVED features have been periodically incorporated in the new EK type Kolloplex electro-grinding mill (Alpine Akt.-Ges. Eisengiesserei und Moschinenfabrik) as the outcome of experience accumulated in the many years since its introduction. As a consequence it is now claimed to be second to none in respect of grinding output, fineness of grind and low running costs. Fundamentally distinguishing it from the orthodox grinding plant is the absence of a bed plate for the motor which is now built in to the installation in which mill, motor and starter form a single aggregate.

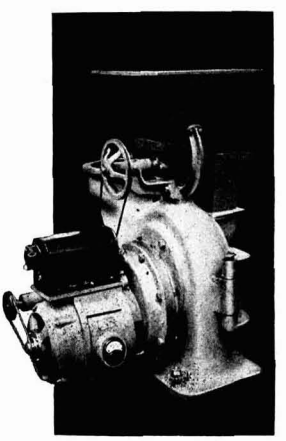
Evidence of the universal scope of the Kolloplex electro-mill is provided by its successful adoption in the grinding departments of an impressive range of industries. Its efficiency has been confirmed, for example, in the treatment of bleaching earths, pigments (leather colours, earth colours and lithopone), natural and synthetic resins, ferrous sulphate, copper sulphate, sulphur, magnesia, clays, starch, lactose, potato flakes, milk powder, soaps and soap powders, glue, waxes, tanning extracts, graphite, casein plastics, and bakelite. The Kolloplex mill will even grind oily and greasy materials to a degree of fineness which has never been equalled in the past. Among its many advantages are economy in space, low power consumption, simplicity of assembly, erection in any desired location, easy and rapid cleaning, adjustment of grinding output, extraordinarily simple supervision, and simplicity of construction.

Of outstanding interest among its new constructional features is the simple method of opening and easy cleaning. A mere turn of a hand wheel and the door can be swung open to expose the housing for cleaning. Being built on vertical hinges, the door can be easily opened and closed while its exact fit enables the mill to be opened without any exertion in a few seconds (clamping being unnecessary) even during operation. The grinding elements are thus exposed for cleaning by simple manipulation at any moment.

With the aid of a built-on star delta starter, the motor can be directly switched on and off, thus markedly simplifying both these operations. A load meter accurately adjusts the feed and prevents deviation from the previously ascertained correct grinding rate. Input of material is controlled by means of the slide bar attached to the oscillating feed, the correct rate being indicated by the arrival of the load meter pointer at a red control mark.

According to the size of the mill the material can be broken down from a maximum diameter of 10 mm. Through the medium of the oscillating feed it is uniformly and automatically fed into the mill, the movement being regulated by a slide bar. If preferred, a preliminary crushing disc may be inserted in the oscillating feed device. As a precaution against introduction of iron particles, the manufacturers of the Kolloplex mill can equip the machine with a permanent double magnet, an electro-magnet or a magnetic drum.

Compressed air which would otherwise accumulate in the mill is driven out by means of a de-aeration device, any particles of pulverised material which may be swept along being retained by the filtering tube. This de-aeration system is accompanied by the further advantage of preventing heating-up of the material during grinding. A separate dust-removing device is thus unnecessary and assembly and operation are simplified and cheapened. The filtering tube is firmly attached in a very simple manner to the roof of the grinding chamber by means of a tube cover. Special designs incorporating several filter tubes are also available for dealing with materials developing a considerable amount of dust during grinding.



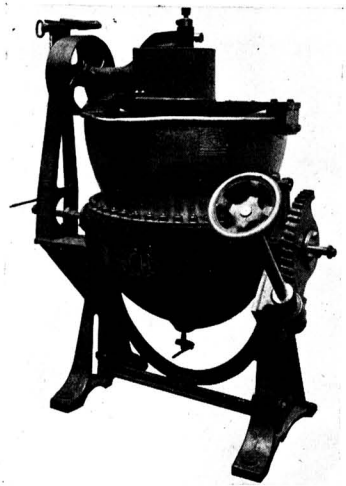
One of the novel features of the Kolloplex Mill is the absence of a bed plate for its electric motor. Mill, motor and starter form a single composite unit. Input of material is controlled by means of a slide bar attached to the oscillating feed.

The driving gear is located in an enclosed housing and runs continuously in an oil bath. The ball bearings are strong and self-adjusting, and are arranged in a double line, ensuring light, silent and safe running. Lubrication is effected automatically by oil circulation commencing from the driving gear. An oil level indicator permits exact control at all times of the correct oil quantity. Dust-proof cases enclose the shafts so that no oil ever comes into contact with the material under treatment. The mills can be run in both clockwise and counter-clockwise direction. Output and power consumption vary with the material which is being ground, its moisture content and the degree of fineness in view.

The newly introduced type E mill corresponds in its essential features with the EK mill, but can be operated from an independent belt. A belt pulley takes the place of the motor, whilst the altered transmission ratio calls for a larger driving wheel on the oscillating feed. Any mill constructed according to the latter design can be transformed into an electro-mill by building in a motor and starter. The makers of the Kolloplex mill also produce a water-cooled mill for dealing with materials which are liable to decompose when exposed to high temperatures.

Monel Metal and Nickel

Find Many Applications in the Soap Manufacturing Industry



Pure nickel mixing pan used in the manufacture of high quality soap.

MONEL metal and nickel are widely used in the soap making industry, both in this country and abroad, by virtue of their steel-like strength and toughness, coupled with resistance to caustic soda as well as the fatty acids which exist in pure lard, cocoanut oil, palm oil, cotton-seed oil, resins, etc.

Soap boiling kettles are generally made from steel or iron. Where white soaps are to be boiled in iron kettles, skirting of Monel metal or nickel can usefully be inserted round the top of the kettle in order to eliminate the corrosion which normally occurs at the air line. Monel metal and nickel have been successfully used for both top sections and covers. Monel metal kettles of small capacity are widely used in the leading soap manufacturing countries for the production of high quality soaps.

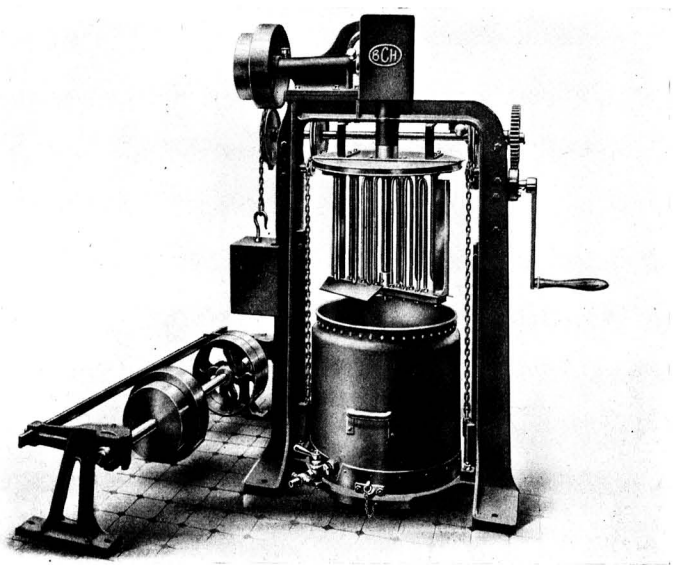
Pipe lines, valves, fittings, etc., are made from both Monel metal and nickel, the choice of material depending upon the particular product handled. Monel metal is used for the steam coils, valves and fittings of boiling kettles, but nickel is generally recommended for the coils. The range of products handled satisfactorily in such equipment includes liquid soap, alkalies, fatty acids, vegetable oils, alcohol, glycerine, perfumes, carbolic and cresylic acids, creosote, borax, naphtha, dyestuffs and brines.

Mixers made from, or lined with, Monel metal are used in many soap plants for the mixing of soap washing compounds, shaving soaps, toilet waters, cosmetics, etc. Such mixers are usually fitted with Monel metal agitators. Where portable mixers are used, Monel metal is employed for the shafts and propellers. Kneading agitators made from Monel metal are employed in the manufacture of tooth-paste.

Soap cooling frames are frequently lined with Monel metal or pure nickel to prevent discoloration of the soap when it comes in contact with the sides of the frames. Monel metal is used for the hoppers and working parts of plodders which are employed for squeezing soap under high pressure into a solid bar of the required size and shape. Amalgamators, which are used for incorporating perfume into the base, must be made from materials that are resistant to corrosion by perfumes and essential oils. Monel metal is employed for hoppers and linings.

Filter cloth made of Monel metal is used on all types of filters in soap plants. Plate and frame filter presses are mainly used; modern methods of gasketing Monel metal filter cloth have removed the difficulties of using metallic filter cloth in presses. Centrifugal extractors fitted with Monel metal baskets are employed in the production of various washing compounds, bath salts, etc. Spraying nozzles of Monel metal are used on machines employed in the production of soap flakes. In these machines soap is forced under pressure through hollow forged cones fitted in an inverted position. The soap emerges as a spray through fine holes drilled in the base of each cone. Monel metal has proved in service to have the strength and resistance to corrosion necessary in this application.

Drying is an important operation in the making of flake soap and conveyors are generally employed for this purpose. The use of Monel metal woven wire belts for conveying flakes through the dryer prevents discoloration. Both Monel metal and pure nickel are employed for components of filling machines handling toilet cream, liquid soap, shampoos and toothpastes.



Pure nickel water jacketted pan, 20 gallon capacity, with pure nickel stirrers used in the manufacture of face creams.

Smoke-Laden Atmosphere and Cancer

THE suggestion that the irritant qualities of the tarry matter contained in smoke may be the cause of cancer was made by Dr. H. A. des Vœux, in his presidential address to the National Smoke Abatement Society at its sixth annual conference at Glasgow on September 28. "Can we attribute cancer to a smoke-laden atmosphere?" asked Dr. des Vœux. "It is known that tar can produce this disease—this is a proved fact. Chemists have now isolated the element in tar which can do it, and I should not be surprised if before many years have passed further proof of the connection of tar and cancer will be forthcoming. Why has cancer of the lung from being an uncommon disease become a not infrequent one? From Glasgow came the great truth that frogs are a prolific cause of that death-dealing malady, bronchitis, and its consequent heart disease. The evidence has been corroborated with convincing strength by Manchester, and in the reports of nearly every Medical Officer of Health. And bronchitis and heart disease produced 37 per cent. of the deaths in this country.

Rickets and Tuberculosis

"One of the chief causes of rickets is darkness—absence of sunlight, and this disease is the early stage of much of the crippling of children, which unless cured in an early stage remains permanent. To those two may be added tuberculosis, both of lungs and bones, for although it is not claimed that that is the only cause it is certainly an ancillary one, and quite certainly it is almost impossible to cure it without the assistance of clean air and sunshine. Think of the expense of the sanatoria and homes for this disease alone," said the president, "and further consider for one moment the futility of this type of treatment—the only available one at present. A patient is sent to a home, remains a certain length of time until the disease is 'arrested,' for one cannot speak of cure for at least three years. He returns to his own home, and returns therefore to the same surroundings where the disease started. The after-history of these patients leads to the conclusion that as a cure for tuberculosis the greater part of the money spent on sanatoria is wasted. It would be far better spent on prevention, for tuberculosis is more easily prevented than cured."

There was a terrible waste of fuel itself—the throwing into the atmosphere daily and universally of precious by-products, tar, sulphur and oil, all of which were of use in yearly increasing quantities, but which were thrown by a thoughtless population into the air to befoul and destroy buildings, art galleries, clothes, books and furniture; which necessitated frequent painting both inside and outside the house in order to make residences look even reasonably clean, and added enormously to the cost of living by the necessary renewals of curtains, sheets, carpets, towels, and other perishable household goods.

Detectives of the Air

Dr. J. S. Owens, Superintendent of Observations for the Committee for the Investigation of Atmospheric Pollution, Department of Scientific and Industrial Research, said that an average figure from the 96 stations in Great Britain where atmospheric pollution was measured gave a fall of solid matter of 250 tons per square mile in 1933 and 240 tons in 1934. Dr. Owens described an ingenious instrument which had been evolved for the measurement of suspended impurities in the atmosphere. At intervals of from two to four hours a given quantity of air was drawn through filter paper and the impurity was determined by measuring the degree of blackness against a standard shade card, the impurity values of which were known. In view of the value of knowing the direction from which impurities come, a wind vane had now been added which automatically stamped the direction of the wind on the filter disc. In practically all cities the air after about midnight cleared rapidly and there was not much impurity until early the next morning. Then there was a rapid increase until a maximum was reached in the forenoon. On Sundays this maximum was an hour later. The quantity then decreased until it rose to a second maximum in the evening.

Increasing Lung Cases may be due to Atmospheric Pollution

A dust-counting instrument made it possible to take a sample of the air and precipitate the dust upon a glass cover for examination under a high-power microscope. This instrument shows that the air, even in the open country, is never free from dust. While here 200 or 300 particles per cu. centimetre might be counted, cities would give 4,000 to 5,000 and even 100,000 during the smoke fogs. The examination of the sulphur pollution in the air had become of increasing importance since it was known that this was the main cause of injury to buildings, while it was also a strong irritant when present in quantity, as it sometimes was during smoke fogs, and was then injurious to people suffering from respiratory diseases. Sulphur was detected in two ways, by passing air through an absorbent solution and then through a small gas meter, and by exposing for a given period a porcelain cylinder coated with lead peroxide and then determining the extent of attack on the lead peroxide by sulphur.

Glasgow park keepers finish a day's work in the shrubberies as black as coal miners, according to the statement made by Mr. Wm. D. Besant, Director of Parks. A more recent enemy to plant life in our cities has arrived in the form of motor traction. The carbon monoxide which is emitted from the exhaust of motor cars must have some effect on vegetation in a city like Glasgow with the large number of motor vehicles in use daily. One has only to note the damage done to a hedge or any other plant which comes in contact with the fumes from a motor exhaust, to realise that here we have another enemy of the city gardener.

Plea for Gas Grid and Better Coke

Bailie W. Brownhill Smith, acting president of the Scottish branch of the Society, said that at least six per cent. of the bituminous coal burned in domestic fireplaces escaped unconsumed into the atmosphere as soot. 'This meant that nearly two and a half million tons of soot escaped into and polluted the atmosphere every year from domestic fireplaces alone. Valuable oils that could be got from British coal instead of buying them from abroad were obtainable only at certain temperatures. Why then did we destroy not only these but the easy-burning properties of coke by overheating as was done in the gasworks? The only way to stop smoke was to stop the burning of raw coal and the only way this could be brought about was by providing substances that were better than coal.

The carbonisation of coal must be freed from the trammels that surround it; monopoly must be cleared away. Every gas undertaking, whether owned by a local authority or a company, had a monopoly in its own area; there was absolutely no incentive to improve. In the Glasgow area there were three local authority gas undertakings adjoining one another; the average price of gas in one 5.3d., in another 8d., and in the third 1s. 3d. per therm! The installation of gas grids, in suitable areas, presented no more difficulty, probably less, than electricity grids, and the chances of an increased consumption of gas were even greater than that of electricity.

A scathing condemnation of the old type of Yorkshire range was made by Dr. J. Johnstone Jervis, Medical Officer of Health for Leeds, in an address on slum clearance and the smoke problem. In an area covering 19.8 acres there were 1,200 houses with an average weekly coal consumption of one and a half hundredweights. This meant that in that small area 280 tons of soot was emitted every year.

UNITED STATES production of pyroxylin plastic in 1933, according to preliminary data collected in the Biennial Census of Manufactures taken in 1934, totalled $12,103,048 in 1933, compared with $17,659,104 in 1931, the previous census year.

Vitreous Enamellers' Conference at Birmingham

First Assembly of the Newly-Formed Institute

A CONFERENCE in connection with the Institute of Vitreous Enamellers, which came into existence early this year, was held during the week-end at Birmingham and was well attended. The Institute, which embraces most of the leading firms of vitreous enamellers and supplying firms, has as its first president Dr. J. W. Mellor, F.P.S., the hon. general secretary of the Ceramic Society, an imposing list of vice-presidents and a Council representative of the industry, with Mr. W. H. Whittle as chairman, Mr. W. Todd (Birmingham) vice-chairman, Mr. W. S. Grainger hon. treasurer, and Miss E. C. Elliott hon. secretary. The constitution provides for the provision of facilities for the discussion and elucidation of technical problems arising in all processes involved in vitreous enamelling, the establishment of the optional use of firm-members of a registered mark or symbol signifying "genuine vitreous porcelain enamel," and the affording of a channel for making representations to Government bodies in respect of any matters appertaining to the welfare of the industry. Council meetings are to be held not less than four times in each year, one of which will be in London, two in Birmingham and one in Manchester.

A House of Industry

On Friday Dr. Mellor held a reception at the Grand Hotel, Birmingham, the guests including the deputy-Mayor (Alderman J. B. Burman); this reception was followed by a banquet at which the chief guest was the Rt. Hon. L. M. S. Amery, M.P. In proposing the toast of the "Vitreous Enamel Industry" he made a suggestion for the formation of a House of Industry in order to relieve the House of Commons of an overflow of legislation. He commended the decision of those engaged in the industry to come together in a corporate body to defend their common interests, to exchange information and to pool research. At present the great industries of the country were only accidentally represented in Parliament and he believed the time had come for a new Reform Act which would give the great industries of the nation direct representation, and offer to business men and working men who lived by industry opportunities for discussing their affairs in an atmosphere away from the abstract issues of party. He thought the time was getting very near when they could with advantage create something in the nature of a House of Industry. There was a need of a body representative of industry and commerce and he would like to see such a body take some of the burdens of the present overloaded House of Commons.

On Saturday morning the members attending the conference visited the works of the Parkinson Stove Co., Ltd., Stechford, and in the afternoon, following the presidential address, a paper on "Vitreous Enamelling" was given by Mr. A. England, M.Sc., consulting chemist, of Hagley. Mr. England said the records of enamels in this country appeared blank until the middle of the eighteenth century, when, at Battersea and Bilston, articles wrought in copper were being made and decorated with enamels. Vitreous enamelling on cast iron was most probably of French or German origin dating from about the end of the eighteenth century. In Britain, Dr. Sandy Hickling was granted a patent on February 28, 1799, for a method or methods of improving and beautifying certain vessels used for chemical, culinary and other purposes.

Dr. Hickling started a factory at Wednesbury, which, unfortunately, was not a success. Cast-iron pots were also made under this patent at the Eagle foundry in Birmingham. About 1830, T. F. Griffiths and Co., of Birmingham, worked a process, patented by Charles Henry Paris, for the production of hand-made and stamped hollow-ware, and soon after this for the production of enamelled advertisement plates, the latter branch being carried on in a separate factory which afterwards became the Patent Enamel Co. This factory was still in existence as a branch of Associated Enamellers, Ltd.

The first production of enamelled cast-iron hollow-ware on a commercial scale (after Hickling's attempt) was due to the late Mr. T. Clark, of the firm of T. and C. Clark, Wolverhampton. This firm was still producing enamelled goods,

The visit of the members of the Institute of Vitreous Enamellers to the works of the Parkinson Stove Co., Ltd., Stechford, on the occasion of their first Annual Conference at Birmingham on September 29.

and concentrated on acid-resisting products. Soon after this Archibald Kendrick, of West Bromwich, began to produce cast-iron hollow-ware The firm also owned the Anglo at Stourport, which was one of the pioneers of sheet-metal enamelled goods for household purposes. The Clarks and Kendricks had a monopoly of cast-iron enamelling for over forty years. About the middle of last century improvements were initiated by F. Walton and Co., Wolverhampton, for stamping wrought-iron hollow-ware for enamelling. Shortly after this period other now well-known firms commenced the production of sheet-steel hollow-ware.

The First Enamelled Bath

Apparently, the Cannon Ironfounders, about 1887, were the first to introduce white enamelled sanitary ware free from injurious matter. Up to this time enamels for cast-iron had been of a greenish tint. The person responsible for this new enamel was Mr. J. A Steward. The elasticity of the enamel was found to be much greater than hitherto, and to be applicable to many different shapes of castings. It was claimed that the first roll-edge cast-iron bath was produced

at the Cannon Foundry and was finished with this new enamel.

Modern workers commenced with the recipes and empyrical methods of their forefathers and by variation and consideration of scientific principles they had produced the modern enamel. Notwithstanding all their progress, they were still unable to make a definite compound, or mixtures of definite chemical compounds, in the production of enamels. There were certainly four essentials that had to be followed: (1) The melting temperature of the finished enamel; (2) the expansion of the enamel in relation to that of the metal on which it had to be applied; (3) the elasticity of the enamel; and (4) the durability of the enamel, which was closely related to its solubility in water, in acids and in alkali solutions. All good enamels were built up with the object of having the same expansion as the steel or iron. The time was rapidly approaching when the enameller would bend all his energies to the production of enamelled articles, and not try to make his works a blend of foundry, press-shop and chemical works.

The Use of Wrapping Paper for Foodstuffs

Some Problems which the Chemist has Solved

THE practical and scientific aspects of the manufacture and use of vegetable parchment and wrapping papers were dealt with at a meeting of the London Section of the Society of Chemical Industry on Monday. The authors were Mr. J. Strachan, of the British Vegetable Parchment Mills, Ltd., Northfleet, and Dr. W. L. Davies, who is associated with the National Institute for Research in Dairying, at Shinfield, Reading.

Mr. Strachan mentioned that the total production of paper in the world is about 20 million tons per annum, of which approximately one-third is used for wrapping. To-day, thanks very largely to food chemists and the demand for hygienic conditions of manufacture of foodstuffs and packing, a great deal of attention is paid to the production of pure wrapping paper. In the course of a brief outline of the various types of paper now used for wrapping purposes, Mr. Strachan said that 95 per cent. of the world's production is made from ground wood, and that kraft cellulose paper is almost equal to the best rice paper. Sulphite pulp, which existed before the discovery of kraft paper, was inferior to it in a general way, although there was a refined form of sulphite pulp paper for contact with foodstuffs. Although sulphite papers, bleached and unbleached, were used in shops to a large extent for wrapping foodstuffs they were deficient in strength as compared with kraft paper and were porous, their only advantage over kraft paper being in colour. Having mentioned some of the disadvantages of greaseproof and cellophane papers in regard to strength when subjected to the wet test, Mr. Strachan said that vegetable parchment is the only paper which will stand that test. Although attempts had been made to coat greaseproof papers with a cellulose varnish in order to render them waterproof there was the disadvantage that this gave a peculiar odour which might affect the foodstuff and such papers, after a certain length of time, lost their strength. Papers coated with gelatine hardened with formaldehyde were extremely waterproof, but this was not a very suitable material for contact with foodstuffs.

Vegetable Parchment

Vegetable parchment for contact purposes was an ideal wrapping paper. It was invented in this country by Gaine, in 1808, but was first developed on the Continent. In this country we were now making vegetable parchment successfully in competition with the Continent. This paper was not only airproof but also greaseproof to a very large extent, in addition to being the only paper which would stand the "wet test." At the same time, however, although it was waterproof it was permeable to water vapour. To overcome this difficulty, the paper had been lacquered on one side with a cellulose varnish, but this had certain disadvantages. For margarine there had been developed on the Continent a vegetable parchment paper coated on one side with paraffin wax and this had been found to prevent the evaporation of moisture from the margarine very successfully. This paper was used in Germany and in Scandinavian countries, but Mr. Strachan did not know whether we should be allowed to use it in this country.

The second paper discussed the physical chemistry of wrapping papers. Dr. Davies said that the requirements of a food-wrapping material generally are that it should be tasteless, odourless, able to prevent excessive moisture loss from the wrapped food and moisture penetration from the atmosphere, able to prevent the absorption of aromas from outside, to possess physical strength and to be hygienic and appealing. In the case of contact wrappers for fatty foods there should be no water soluble material in the wrapper capable of supporting micro-organic growth, and no soluble heavy metallic salts which would catalyse fat autoxidation. With transparent wrappers, the actinic rays of sunlight should be prevented from reaching the food and setting up autoxidative taints.

Ideal Wrapping for Fatty Foods

Hard neutral vegetable parchment approaches the ideal for the wrapping of fatty foods. This material, made from wood cellulose pulp, contains (in the dry matter) 22 parts per million of copper and 50 parts per million of iron; these amounts are almost identical with the amounts in the dry matter of the original wood cellulose pulp so that there is no metallic contamination of the product during manufacture. British samples of vegetable parchment contain slightly less copper and iron than that of Continental origin. From 10 to 14 per cent. of these heavy metallic compounds are water soluble, but the solubilities increase with acidity. Greaseproof paper and loaded vegetable parchment contain much greater amounts of heavy metals and their solubilities are always much higher than that in hard neutral parchment. Neutral and acid olive oil, however, only dissolved traces of copper and iron from vegetable parchment. The rate of autoxidation of a thin film of butter fat on finely ground vegetable parchment has been found to be not appreciably greater than on ground wood cellulose pulp or glass wool and less than on cotton wool, and although the amounts of heavy metal in the wrapper are comparatively high, the effect of the metals is not appreciable within the range of acidity met with in fatty foods or in the period that foods are usually stored in such wrappers.

Preventing Oxidation Changes

It is well known that sunlight can produce a tallowy or oxidised flavour in fatty foods. Thus, the carotene of butter fat is bleached by exposure to sunlight; this is followed by a tallowy taint. Meat fat develops tallowiness on exposure to strong sunlight, whilst a cardboard taint can develop and vitamin C become oxidised on exposing milk to sunlight or other actinic light. Storage of milk in coloured glass containers obviates these changes. It has been suggested that storage in green transparent paper retards the development of oxidative changes in dry fatty foods. In the examination of this phenomenon, variously coloured cellophane was used, the colour and light absorption of the samples being qualified in Lovibond units and their absorption spectra. It was found that although absorption of the wavelengths in the region of $\lambda 4{,}000$-$\lambda 5{,}000$ almost completely retarded the development of tallowiness, a more important factor was the depth of colour of the transparent material. Thus, light passing through deep green, blue, brown or red cellophane did not appreciably increase the peroxide oxygen of the fat of biscuit meal after exposure to strong sunlight for 40 hours,

but light tints of the above colours allowed a considerable amount of autoxidation to occur, most of them except light green and heliotrope being equivalent to direct exposure of the goods. It was obvious that it was the depth of colour, and not the colour itself, which was of importance. With respect to translucent material, hard neutral parchment completely cut out actinic rays; greaseproof paper allowed a certain amount to pass while transparent paper showed almost complete transparency. Wax paper was opaque to active rays, but when used as a contact wrapper the products of autoxidation of the wax itself, diffusing into the dry fatty food, initiated autoxidation of the fat.

Hydration Phenomena

An attempt has been made to study the moisture equilibria of a wrapping material by examining the behaviour of the moisture of the material itself at different temperatures and humidities, and the accumulated effect of the moisture and pore space by the evaporation of water from an enclosed space through layers of the wrapper. With respect to the activity of the differently treated cellulose of the wrappers, that of regenerated cellulose or cellophane is most active in "hydration" phenomena; the greaseproof papers, bleached or unbleached, and ordinary papers are approximately equal, whilst varnished, parchmentised or hardened-casein coated papers are much less active. Different degrees of "heating," or fibrillation of the pulp used for the final wrapping material, have no affect on the activity of the cellulose towards moisture. This varying hydration of the cellulose in the different types of wrappers is offset in practice by the lesser resistance to moisture diffusion through the pores except in the case of cellophane; in this respect varnished (one side) cellophane is the best wrapper to prevent moisture loss. Vegetable parchment and greaseproof are equal, letting through from 60 to 70 per cent. of the moisture diffusing through thin filter paper. The effect of doubling or trebling the wrapper does not lessen moisture diffusion proportionately.

The diffusion of outside aromas through the wrapper is best exemplified by the "wood taint" of butter. Dominion butter is stored for a considerable length of time in the box; if the timber used for constructing the box contains terpenes the outer layer of butter takes on a more or less clearly detectable taste—wood taint. Resin-proof conifers, such as the New Zealand white pine, have been found satisfactory for butter packing.

Commercial Grades of Lancashire Coals

High Reputation Endorsed by Survey

THE publication, by the Department of Scientific and Industrial Research, of the results of an impartial survey of a large number of commercial grades of Lancashire coal, as actually marketed by the collieries, endorses the general high reputation which Lancashire coal has long held. The work is part of the physical and chemical survey of the national coal resources which is proceeding along two closely related lines, namely, seam sampling and commercial sampling. Since its inception, the survey has been continuously engaged upon a detailed investigation of the seams in the various coalfields, as they exist below ground, with the object of obtaining fundamental data to enable the country's coal resources to be used to best advantage. Many of the seams occurring in the Lancashire coalfield have already been examined in this manner; the data are published from time to time and the work is continuing. The data yielded by this side of the work form the basis necessary for a correct interpretation of the results of the other and more recently instituted investigation, which is concerned with the sampling and analysis of the various grades of coal actually available to consumers.

Product of 28 Collieries

A report just issued (Fuel Research Survey Paper No. 33—The Lancashire Coalfield: Analysis of Commercial Grades of Coal—Part I. H.M. Stationery Office. 1s. 6d. net) gives the first results of a systematic examination of the numerous commercial grades of coal produced and marketed in Lancashire; 103 grades, the product of 28 collieries, are dealt with. A wide range of seams is represented in Lancashire and considerable variation in properties occurs, from coals with high caking qualities and low oxygen content to non-caking coals with high oxygen content. Typical samples of all kinds are included in the report, from those producing high-class metallurgical or foundry coke, through gas coal to poorly coking free-burning coals used for steam raising, with, in addition, many first-class house coals. The sizes range from large house coal to slack.

At most of the collieries several seams are worked and the products are sold either separately or mixed. The coal is usually dry-screened, with or without subsequent hand picking, and is often dry-cleaned or washed. Details of the method of preparation for the market, and of the sizes, are given in each case. As far as possible all samples were taken just prior to the coal passing into the wagons, dry slacks and other unpicked dry grades being normally sampled as they fell from the end of the chute. The larger sizes of dry grades were samples from a position as near the delivery end of the picking belts as practicable, while in the case of washed grades the samples were obtained either from the coal entering the storage bunkers or as it was being loaded into railway wagons or road vehicles.

The period over which increments were collected to give the gross sample was usually about three hours, although in some cases this was extended. It was found that a three-hour period gave a representative sample of the mine output, analyses of various types of fuels (both washed and dry) sampled over periods of three hours, at intervals of from two weeks up to twelve months, giving results which remained remarkably constant. The number and weights of increments taken were based on the figures laid down in the British Standard Specification.

Reduction of the Samples

In the early stages of the work the reduction of the gross sample was carried out on the lines already adopted in South Yorkshire, using a mechanical grinder and sampler mounted lorry, but later it was found that the work could be more efficiently done by transporting the whole of the gross sample to the laboratory, where a complete range of grinding and sampling equipment was available. Washed grades were first dried in a treble-cased gas-heated oven, in which the products of combustion were excluded from the coal, and the temperature was regulated so as not to exceed 50° C. A current of warm air was drawn by means of an electric fan over the coal placed on trays supported in an inclined position; this enabled about 4 cwt. to be dried in about four hours. The grinding equipment consisted of a jaw crusher, an automatic sampler and crusher, a rotary pulveriser and two end-runner mills. The samples were passed through these machines in the order given. With the exception of the determination of the caking index (agglutinating value) and of the phosphorus content, the methods of analysis used were those recommended by the British Standards Institution.

The report is arranged under headings, one section being devoted to each colliery. In these sections, the grades are enumerated and described. The seams from which they were obtained are listed and details are given of the size, method of preparation for the market, the commercial uses of the grade, and the date of sampling. This is followed by the analytical data, which includes proximate analysis, sulphur content, calorific value and the results of a laboratory carbonisation assay carried out at 600° C. in a Gray-King apparatus. In those grades used for coke manufacture, figures are given for the phosphorus content of the coal.

Continental Chemical Notes

Iceland

THE ERECTION OF A CHEMICAL FACTORY at Reykjavik is reported in "Chemische Industrie."

Hungary

PLANS FOR FOSTERING THE LIGNITE INDUSTRY, referred to in "Chemische Industrie," embrace extensive production of briquettes and the conversion of by-product tar into hydrogenated fuel oil.

Denmark

THE PRODUCTION OF ASPHALT, benzine, heavy oil and allied products from Mexican crude oil will be undertaken in the new factory of Dansk Asfaltfabrik A.-S. located on the harbour of Kalundborg.

Russia

RUSSIAN PROSPECTORS have discovered promising oil wells in the Central Asian district of Kirgisien after prolonged investigations, one well yielding 60 tons of crude oil per day from a depth of 465 metres. New oil deposits have also been detected on the left bank of the Surkan-Darja River in the Chandajsk district. Other Russian developments, as reported in the "Chemische Industre," of September 29, include the proposed erection of a coal hydrogenation plant in Western Siberia (annual capacity of 500,000 tons liquid fuel); starting up of the first synthetic methanol plant at Stalinogorsk; starting up of a fifth Migge furnace for ferrosilicon (capacity of 10,000 kilowatts) at Kitschkas.

Germany

TO AVOID DISSEMINATION OF CONTAGIOUS DISEASE among users of gas masks, disinfection with barium peroxide and formalin is advised ("Chemiker-Zeitung," September 29).

GERMAN ALCOHOL CONSUMPTION for motor vehicles steadily increased in the past year and a sale of about 1.2 million hectolitres is estimated for the year ending this September.

A COMPANY WITH A CAPITAL OF 150,000 MARKS has been registered with the object of examining, and, if satisfactory, exploiting the nickel ore deposits in the southern region of the Black Forest. Both the Reich Government and the State of Baden are financially assisting the preliminary work.

ABOUT 10,000 TONS OF BY-PRODUCT PROPANE and butane are obtained annually in the oil and coal hydrogenation processes of the I.G. Farbenindustrie. They are applicable in the compressed state for a variety of purposes including heat source in glass blowing, ampoule sealing machines and in forging work. An airship fuel with the same density as air has also been compounded from methane and butane or propane.

NON-TOXIC PLATING BATHS can be obtained according to H. Gockel ("Chemiker-Zeitung," September 26) by using thiourea complex salts in place of the poisonous cyanides. An excellent silver deposit results, for example, with a bath containing 25 to 30 grams silver nitrate and 60 to 70 grams thiourea per litre of water, forming the complex salt $Ag[CS(NH_2)_2]_3.NO_3$. Recommended working conditions, using a silver anode and a copper or brass cathode, are a temperature of 30° to 35° C., a bath tension of 1.5 volts and a current density of 0.2 amperes per square decimetre. Copper plating is satisfactorily carried out with the copper complex salt, $Cu[CS(NH_2)_2]_3.Cl$.

A SYSTEMATIC INVESTIGATION of four recently proposed antidotes for hydrocyanic acid poisoning—(a) sodium tetrathionate, (b) methylene blue, (c) sodium nitrite, (d) amyl nitrite—has been carried out by Wirth and Lämmerhirt. In animal experiments, preliminary treatment with any of these substances slowed down the toxic action of the subsequently inhaled gas, but (a) and (c) were the most effective, followed by (d) and (b). Omitting preliminary treatment, the effects of inhaling non-toxic doses of hydrocyanic acid were most satisfactorily countered by treatment with (a) and (d). But none of the four alleged antidotes were of value after administering a lethal dose of the gas ("Chemiker-Zeitung," September 29).

Spain

POTASH DEPOSITS at Balsareny are to be exploited with the aid of American capital.

France

RECENT COMPANY FORMATIONS include Soc. Nouvelle des Grandes Specialités pharmaceutiques, 155 boulevard Magenta, Paris (capital 1 million francs); Soc. de Productions chimiques et agricoles, 154 boulevard Magenta, Paris (capital 600,000 francs); Huileries alsaciennes (trading in all oils and fats), Port du Rhin, Strasburg (capital 1 million francs).

Czecho-Slovakia

GOOD PROGRESS HAS BEEN MADE in preliminary work on the liquefaction of coal from the Falkenau mines of the Aussig (Ossig) Company, and a plant may be erected at Falkenau or Ossig.

THE PHOTOGRAPHIC MATERIALS INDUSTRY has revived as a result of currency restrictions, one firm in particular, Aktinofot A.-G., of Prague-Pankrac, having established a footing both in other European countries and the Far East.

Paint Marketing Council

A Retrospect of the Council's First Year

THE Paint Marketing Council will wind up its first year of activity with a short, intensive advertising campaign to make the public "paint-minded." The Council set out nearly a year ago to educate people on the subject of the preservative, hygienic, and aesthetic qualities of paint, and it is succeeding in its task. Its members believed that if the public could learn what they proposed to teach them, work would be found for more painters in the slack season. That is just what has happened. In a normal year, the first big drop in unemployment among painters and decorators occurs in March and April. This year, it occurred in January and February. In other words, the painting season (both indoor and out) began at least two months earlier this year than usual.

Paint manufacturers and decorators on every hand report that the year has been an improvement on 1933. Several Government Departments, such as the Office of Works and the Post Office, have co-operated with the Council in its work and have given the public a lead by putting in hand a good deal of work at a season when employment among painters and decorators is usually bad. The Ministry of Labour has pointed out to local employment committees throughout the country the advisability, and indeed the urgency, of spreading over paint work as much as possible. Here, again, is an example of practical co-operation which has helped enormously.

When the Paint Marketing Council was formed in 1933, it hoped to have the practical co-operation of every member of the National Federation of Associated Paint, Colour and Varnish Manufacturers of the United Kingdom. Half the members did not feel disposed to support the campaign. The remaining half, however, had so much faith in the idea of a co-operative campaign to sell "paint" that they went boldly on with their scheme, with the results outlined above. The non-subscribing half has benefited equally with those who subscribed. The council proposes making an autumn appeal to paint manufacturers for support in its campaign during 1935 and 1936. The appeal will be addressed, not only to members of the National Federation, but also to the other paint, colour and varnish manufacturers in the country. It will be in the form of a letter from the chairman of the Paint Marketing Council, outlining what the council has already done and what it hopes to do if it has increased financial support. An appeal in similar terms is to be sent to the manufacturers of raw materials and makers of paint machinery, several of whom have already indicated to the council that, as a result of its campaign, there has been a sharp upward rise in their sales this year.

Notes and Reports from the Societies

Ceramic Society

THE next meeting of the Pottery Section of the Ceramic Society will be held on Monday, October 8, at 7.30 p.m., in the North Staffordshire Technical College, Stoke-on-Trent. Mr. Wm. E. Box will give a lantern lecture describing and illustrating new electro-magnetic separators for the pottery industry.

Institution of the Rubber Industry

THE London and District Section of the Institution of the Rubber Industry will hold a meeting on Tuesday, October 9, at 7.30 p.m., at the Institution of Mechanical Engineers, Storey's Gate, London, S.W.1, when a paper on "The Production, General Properties and Distribution of Latex" will be read by Mr. R. O. Bishop, F.I.C., A.C.G.I., late head of the Chemical Division, Rubber Research Institute, Malaya. Mr. G. E. Coombs will be in the chair.

The Chemical Society

PROFESSOR P. M. S. BLACKETT, F.R.S., will deliver a lecture entitled "Induced Radioactivity," under the auspices of the Chemical Society, in the lecture theatre of the Royal Institution, Albemarle Street, W.1, on Thursday, October 18, at 8 p.m. Admission for Fellows and guests will be by ticket only. Applications for tickets should be made to the Assistant Secretary, the Chemical Society, Burlington House, Piccadilly, London, W.1, by October 15.

Oil and Colour Chemists

THE opening meeting of the Oil and Colour Chemists' Association for session 1934-35 will be held at 7.15 p.m. on October 11 at the Palace Hotel, Bloomsbury Street, W.C.1. Members and friends will meet for an informal dinner, after which Mr. G. A. Campbell, M.Sc., will deliver his presidential address on "Fine Pigments." Members unable to attend in time for the dinner should note that the presidential address is timed to commence at approximately 8.15 p.m., and that arrangements have been made for those arriving about that time.

British Association of Chemists

THE London Section of the British Association of Chemists will hold a concert on Friday, October 19, at the Broad Street Station Restaurant, E.C., at 7.45 p.m., for 8 p.m. Tickets may be obtained from the General Secretary, British Association of Chemists, 175 Piccadilly, London, W.1.

The Manchester Section will hold a smoking concert on Wednesday, October 24. Further particulars may be obtained from Mr. A. Hill, 8 Strain Avenue, Hill Lane, Blackley, Manchester, 9.

A social evening has been arranged by the Scottish Section for Wednesday, October 10, at 7.45 p.m. Further particulars may be obtained from Mr. R. W. Dunlop, 31 Garthland Drive, Glasgow, E.1.

Society of Chemical Industry

THE Bristol Section of the Society of Chemical Industry will hold a joint meeting with the Road and Building Materials Group, on Thursday, October 11, at 7.30 p.m., in the University Chemical Department, when a paper on "Asphalt, Bitumen and Tar: Their Respective Uses in Road Construction," will be read by Mr. D. M. Wilson, B.Sc., of Highways Construction, Ltd. The author will deal with sources and properties of asphalt, bitumen and tar, the uses of these materials in the construction of different types of road surfacing mixtures, and special methods of analysis in dealing with road materials for avoidance of pitfalls.

A joint meeting of the Bristol Section of the Society and South Western Counties Section of the Institute of Chemistry, to be held at 5.30 p.m., on Monday, October 8, in the University Chemical Department, when a lecture, illustrated by a film, will be given by Dr. A. E. Dunstan, F.I.C., on "Oil Finding and Oil Refining in Persia."

Leather Trades' Chemists

THE British Section of the International Society of Leather Trades' Chemists hold their next meeting at the Shoe and Leather Fair, Royal Agricultural Hall, Islington, London, N.1, on Thursday, October 11, at 10 a.m. The report of sub-committees on emulsions and tannin analysis will be presented. Papers to be read include "Unfamiliar Properties of indicators and Organic Acids and their Use" (Dr. G. M. Richardson, of the Bland-Sutton Institute, Middlesex Hospital); "Mechanism of Discoloration of Vegetable Leather by Iron Compounds" (Dr. M. P. Balfe); "Comments on the Thuau Wear Testing Machine" (Dr. E. W. Merry).

Safety in the Chemical Industry

United States Congress

WITH "Let's Tell the World About Safety" as their slogan, some 6,000 to 8,000 delegates met at Cleveland, Ohio, from October 1 to 5 for the twenty-third annual Safety Congress and Exposition. They represented industrial, educational, civic and official bodies from all parts of the United States and several foreign countries. The official programme, issued by the National Safety Council, showed a total of 120 sessions and more than 350 speakers. Separate programmes were prepared for almost every branch of industry, thus making the congress in effect a joint safety convention of some 30 different groups. In addition, sessions were planned for school executives, street traffic authorities, and those interested in safety in the home. In order to complete this vast programme in the short space of five days the facilities of three hotels were taxed to the utmost, and it was necessary at times to run as many as fourteen sessions concurrently.

A feature of the meeting this year was a series of "Subject Sessions" planned and sponsored by the American Society of Safety Engineers—Engineering Section of the National Safety Council. These included "Fusion Welding and Cutting," "Mechanical Methods of Handling Materials," "Safe Use of Electricity in Industry," "New Workers," "Safe Use of Chemicals in Industry," "Dust in Industry," and "Why People Fall." Leading Cleveland business establishments and civic organisations carried out a city-wide safety campaign during the week to synchronise with the congress, and the city was decorated for the occasion.

An interesting programme was developed for the chemical section of the National Safety Council. The officials of the section were: General chairman, John Roach, Deputy Commissioner of Labour, Trenton, New Jersey; vice-chairman in charge of programme, A. L. Armstrong, Eastman Kodak Co., Rochester, New York; vice-chairman in charge of Engineering, G. H. Miller, E. I. du Pont de Nemours and Co., Wilmington, Del.; secretary, Ralph O. Keefer, Aluminium Company of America, Massena, New York.

The first session included an address of welcome, and the following papers: "Our Objectives—Past, Present and Future," by John Roach; "Helping New Employees to Avoid Injury in the Chemical Industry," by S. D. Kirkpatrick; "Using Our Statistics to Advantage," by G. H. Miller, assistant manager, Safety and Fire Protection, E. I. du Pont de Nemours and Co., Wilmington, Del.; and "The Importance of Maintenance and Repair Work in the Chemical Industry," by Albert Vaksdal, plant engineer, Corning Glass Works, Corning, New York.

On October 3, three further papers were given, as follows: "Proper Protective Equipment for the Chemical Industry," by F. J. O'Connor, superintendent, Service Department, dye works, E. I. du Pont de Nemours and Co., Deepwater Point, New Jersey; "Safety in Unloading Tank Cars—Methods and Protection," by A. C. White, Technical Sales Division, The Dow Chemical Co., Midland, Michigan, and "Preventing Injuries to the Hands and Feet of Workers in the Chemical Industry," by A. L. Armstrong, general supervisor of Safety and Fire Protection, Eastman Kodak Co.

Inventions in the Chemical Industry

Patent Specifications and Applications

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

Complete Specifications Open to Public Inspection

ALKYL DERIVATIVES of phenolic compounds, production.—Sharpes Solvents Corporation. March 24, 1933. 4046/34.

SEPARATION OF OILS from mixtures thereof with solid matter and/or asphalts obtained as residues in the destructive hydrogenation of distillable carbonaceous materials.—International Hydrogenation Patents Co., Ltd. March 24, 1933. 4456/34.

CONVERTING CARBON MONOXIDE with steam.—Oesterreichisch Amerikanische Magnesit A.-G. March 24, 1933. 7316/34.

ORGANIC DISULPHIDES, manufacture.—I. G. Farbenindustrie. March 21, 1933. 8098/34.

HORMONES, manufacture or preparation.—I. G. Farbenindustrie. March 18, 1933. 8463/34.

SELENIUM COMPOUND of the benzanthrone series, manufacture.—E. I. du Pont de Nemours and Co. March 18, 1933. 8648/34.

LUBRICATING OILS and the like.—E. I. du Pont de Nemours and Co. March 18, 1933. 8649/34.

FIREPROOFING AGENTS.—G. Schwedler and Dr. H. Schweitzer. March 20, 1933. 8746/34.

HYDROGENATED HETEROCYCLIC CARBONYLIC ACIDS and their salts.—E. I. du Pont de Nemours and Co. March 21, 1933. 8934/34.

SYNTHETIC RESINS and their applications.—E. I. du Pont de Nemours and Co. March 21, 1933. 8935/34.

COLLOIDAL ALUMINIUM HYDROXIDE and the colloidal aluminium hydroxide produced thereby, production.—P. S. Moyer. March 23, 1933. 9003/34.

DYESTUFFS of the azine series, manufacture.—I. G. Farbenindustrie. March 23, 1933. 9199/34.

WETTING AGENTS for the textile and like industries, manufacture.—I. G. Farbenindustrie. March 24, 1933. 9201/34.

Specifications Accepted with Dates of Application

ARTIFICIAL RESINS, production.—I. Kreidl. Dec. 19, 1931. 416,661.

SENSITISING PHOTOGRAPHIC SILVER HALIDE EMULSIONS, process. I. G. Farbenindustrie. Jan. 19, 1932. 416,664.

PURIFICATION OF COPPER.—British Non-Ferrous Metals Research Association and G. T. Callis. Feb. 8, 1933. 416,572.

AZO DYES and application thereof.—Imperial Chemical Industries, Ltd., S. Coffey and W. A. Sexton. Feb. 14, 1933. 416,778.

AZO DYESTUFFS and application thereof.—Imperial Chemical Industries, Ltd., S. Coffey and W. A. Sexton. Feb. 14, 1933. 416,779.

PHOTOGRAPHIC DYESTUFF IMAGES, method of producting.—Dr. B. Gaspar. Feb. 15, 1932. 416,666.

PRESS-MOULDING MATERIALS by condensation of phenols with formaldehyde or substances that yield formaldehyde, production. —Dr. F. Raschig Ges. Feb. 27, 1932. 416,847.

4-AMINODIPHENYLAMINE DERIVATIVES, manufacture.—I. G. Farbenindustrie. March 9, 1932. 416,579.

DIAZO DYESTUFFS and their application.—Imperial Chemical Industries, Ltd., and A. H. Knight. March 11, 1933. 416,580.

SAFETY EXPLOSIVES, manufacture.—J. S. B. Fleming and Imperial Chemical Industries, Ltd. March 14, 1933. 416,586.

SULPHUR, apparatus for the manufacture and production.—J. Y. Johnson (I. G. Farbenindustrie). March 18, 1933. 416,852.

CELLULOSE ETHERS, manufacture.—J. Craik, L. Rubenstein, and Imperial Chemical Industries, Ltd. March 18, 1933. 416,690.

DILUTE ACIDS, production.—I. G. Farbenindustrie. March 24, 1932. 416,860.

HALOGENATED ETHANOLS, process for the manufacture.—I. G. Farbenindustrie. March 23, 1932. 416,861.

POLYMERISATION PRODUCTS from aldols, manufacture.—Distillers Co., Ltd., J. V. Eyre and H. Langwell. April 1, 1933. 416,734.

CYANURIC ACID, manufacture and production.—J. Y. Johnson (I. G. Farbenindustrie). May 8, 1933. 416,599.

VAT DYESTUFF PREPARATIONS in powder form, particularly suitable for printing, manufacture.—I. G. Farbenindustrie. July 23, 1932. 416,878.

LEAD CHROMATE and substances containing lead chromate, manufacture.—Harshaw Chemical Co. Jan. 17, 1933. 416,744.

TITANIUM PIGMENTS, production.—*Titan Co., Inc. Oct.* 28, 1932. 416,615.

ARTIFICIAL COMPOSITIONS, manufacture and production.—I. G. Farbenindustrie. Dec. 10, 1932. 416,885.

SALTS OF HEXAVALENT CHROMIUM and other valuable oxygen compounds, simultaneous production.—H. D. Elkington. Bozel-Maletra *Soc. Industrielle de Produits Chimiques*). Dec. 21, 1933. 416,624.

DIOXAZINE COMPOUNDS, manufacture.—I. G. Farbenindustrie. Dec. 31, 1932. 416,887.

DIHYDRO-RESORCINOL, process for manufacture.—F. Hoffmann-La *Roche and Co. A.-G. April 3, 1933. 416,892.*

NITRILES of unsaturated fatty acids, manufacture.—W. W. Groves (I. G. Farbenindustrie). Feb. 1, 1934. 416,631.

REMOVING BISMUTH from lead.—American Smelting and Refining Co. Feb. 10, 1934. 416,634.

Applications for Patents

(September 13 to 19 inclusive).

HIGHLY-VISCOUS OILS, manufacture.—J. Y. Johnson (I. G. Farbenindustrie). 26296.

ELASTIC MASSES, manufacture of tough.—J. Y. Johnson (I. G. Farbenindustrie). 26297.

DYEING LEATHER.—J. Y. Johnson (I. G. Farbenindustrie). 26298.

KETONES OF ANTHRACENE SERIES, manufacture.—J. Y. Johnson (I. G. Farbenindustrie). 26299.

IMPROVING PROPERTIES of artificial horn.—J. Y. Johnson (I. G. Farbenindustrie). 26430.

2.3-DIHYDROINDOLES, manufacture.—J. Y. Johnson (I. G. Farbenindustrie). 26536.

APPARATUS FOR SEPARATION of undissolved liquid, etc., constituents from liquids.—J. Y. Johnson (I. G. Farbenindustrie). 26660.

DYEING LEATHER.—J. Y. Johnson (I. G. Farbenindustrie). 26931.

MAGNESIA AND NITROGENOUS FERTILISERS, etc., manufacture.—Klöckner-Werke. (Germany, Oct. 2, '33.) 26300.

DYES, manufacture.—Kodak, Ltd. (Eastman Kodak Co.). 26490.

PRODUCTION OF HYDROCARBONS from distillable carbonaceous materials.—H. E. Potts (International Hydrogenation Patents Co.). 26271.

FERRIC OXIDE CATALYSTS, preparation.—Rütgerswerke. (Germany, Oct. 12, '33.) 26711.

THERAPEUTICALLY-ACTIVE HYDANTOIN DERIVATIVES, manufacture.—*Soc. of Chemical Industry in Basle. (Switzerland, Sept.* 30, '33.) 26433.

INDIGOID VAT DYESTUFFS, manufacture.—Soc. of Chemical Industry in Basle. (Switzerland, Sept. 22, '33.) 26941.

CONDENSATION PRODUCTS, production.—J. Tankard, W. H. Watson and F. C. Wood. 26878.

(September 20 to 26 inclusive).

SUBSTITUTED AMIDES of aliphatic-aromatic acids, manufacture. A. G. Bloxam (Soc. of Chemical Industry in Basle). 27366.

SYNTHETIC BALSAM, manufacture.—Brick Trust, Ltd. (Switzerland, Sept. 30, '33.) 27486.

ALKALINE EARTH METALS, preparation.—Calloy, Ltd. 27209.

LAKE COLOURS, preparation.—S. F. W. Crundall, A. Hancock, and P. Spence & Sons, Ltd. 27451.

MOTOR FUELS, stabilisation.—E. I. du Pont de Nemours and Co. (United States, Sept. 21, '33.) 27211.

HYDROXY ACIDS and lactones, manufacture.—E. I. du Pont de Nemours and Co. (United States, Sept. 22, '33.) 27434.

HALOGENOALKYLSULPHONIC ACIDS, manufacture.—E. I. du Pont de Nemours and Co. (United States, Sept. 22, '33.) 27435.

β-BROMETHYLBENZENE, manufacture.—E. Ellis and L. S. E. Ellis (Soc. des Usines Rhône-Poulenc). 27515.

AMINONITRILES, production.—Ges. für Kohlentechnik. (Germany, Sept. 21, '33.) 27231. (Germany March 31.) 27232.

Latest Oil Prices

LONDON, Oct. 3.—LINSEED OIL was lower. Spot, £20 (small quantities 30s. extra); Nov.-Dec., £18 10s.; Jan.-April, £18 12s. 6d.; May-Aug., £19 2s. 6d., naked. SOYA BEAN OIL was quiet. Oriental (bulk), Oct.-Nov. shipment, £14 12s. 6d. per ton. RAPE OIL was quiet. Crude extracted, £27; technical refined, £28 10s.; naked, ex wharf. COTTON OIL was firmer. Egyptian crude, £14 10s.; refined common edible, £17 15s.; and deodorised, £19 5s. naked, ex mill (small lots 30s. extra). TURPENTINE was steady. American, spot, 42s. 3d. per cwt.

HULL.—LINSEED OIL, spot, quoted £19 per ton; Oct., £18 7s. 6d.; Nov.-Dec., £18 10s.; Jan.-April, £18 15s.; May-Aug., £19 2s. 6d., naked. COTTON OIL.—Egyptian, crude, spot, £15; edible, refined, spot, £17; technical, spot, £17; deodorised, £19, naked. PALM KERNEL OIL.—Crude, f.m.q., spot, £16, naked. GROUNDNUT OIL.—Extracted, spot, £22; deodorised, £26. RAPE OIL.—Extracted, spot, £26; refined, £27 10s. SOYA OIL.—Extracted, spot, £16 5s.; deodorised, £19 5s. per ton. COD OIL (industrial), 25s. per cwt. CASTOR OIL.—Pharmaceutical, 36s.; first, 31s.; second, 28s. per cwt. TURPENTINE.—American spot, 44s. 3d. per cwt.

Weekly Prices of British Chemical Products

Review of Current Market Conditions

PRICES of chemical products have remained practically unaltered during the week, and business has been steady. Increased interest has been shown in caustic potash, whilst the position of arsenic is weak and unsteady. Chief interest has been shown in formic acid, oxalic acid, acetone, sal-ammoniac and sodium hyposulphite. Business in formaldehyde is on a fair scale, but keen competition is being experienced. Very little business has been transacted in lithopone, barium chloride and sodium sulphide. Coal tar products have been rather quiet, but most prices have been maintained. Slight reductions have, however, been reported for toluol and xylol. A good trade is being transacted in all grades of creosote oil, and there is a steady inquiry for cresylic acid and naphthalene. The demand for solvent naphtha is disappointing and toluol and xylol continue rather dull items. Only a few orders have been received for coal tar pitch. Business in pharmaceutical chemicals has been on a moderate scale. About the best inquiry has been for aspirin, hexamine, potassium permanganate and sodium benzoate, and more interest has been shown in phenazone, salicylic acid and salicylates. Citric and tartaric acids are now rather dull items and keen competition is being felt for business. The essential oils market has been fairly active this week.

Price Changes

Coal Tar Products.—TOLUOL, 90%, 1s. 10d. to 1s. 11d. per gal.; pure, 2s. 1d. to 2s. 2d.; XYLOL, commercial 1s. 11d. to 2s.; pure, 2s. 1d. to 2s. 2d. CREOSOTE (Manchester), 3d. to 4d. per gal.

All other prices remain unchanged.

LONDON.—Prices still remain steady and firm with a good general demand. In the coal tar products market prices continue firm with no change to report from last week.

MANCHESTER.—Little in the way of trade development in chemical products has been experienced on the Manchester market during the past week. Perhaps the best that can be said of conditions at the present time is that the movement of most descriptions of materials seems to be gradually getting back to the pre-holiday. On the whole, the usual beginning-of-the-month flow of specifications has not been unsatisfactory. So far as new orders are concerned, however, these have been only on a moderate scale during the past few days, and, for the most part users are content to confine fresh commitments to relatively early delivery periods. Prices, however, maintain their general steadiness and it is extremely doubtful if buyers will derive any advantage by holding off. The by-products market has been a little more active in one or two sections; the light materials, however, continue to be the weakest spot, both from the point of view of values and of the volume of business.

SCOTLAND.—Continued improvement is shown 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.—9d. per lb. less 5%. MANCHESTER: 9½d.

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

ACID, FORMIC.—LONDON: £43 10s. per ton.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

BARYTES.—£6 10s. to £8 per ton.

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

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

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

CADMIUM SULPHIDE.—2s. 5d. to 2s. 9d.

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

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

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

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

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

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

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

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

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

DIPHENYLGUANIDINE.—2s. 2d. per lb.

FORMALDEHYDE.—LONDON: £26 per ton. SCOTLAND: 40%, £25 to £28 ex store.

IODINE.—Resumblimed B.P., 6s. 3d. per lb. for quantities not less than 28 lb., increasing to 8s. 4d. per lb. for quantities less than 4 lb.

LAMPBLACK.—£45 to £48 per ton.

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

LEAD, NITRATE.—£28 per ton.

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

LEAD, WHITE.—SCOTLAND: £39 per ton, carriage paid. LONDON: £37 10s.

LITHOPONE.—30%, £17 10s. to £18 per ton.

MAGNESITE.—SCOTLAND: Ground calcined, £9 per ton, ex store.
METHYLATED SPIRIT.—61 O.P. Industrial, 1s. 6d. to 2s. 1d. per gal. Pyridinised industrial, 1s. 8d. to 2s. 3d. Mineralised, 2s. 7d. to 3s. 1d. 64 O.P. 1d. extra in all cases. Prices according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.
NICKEL AMMONIUM SULPHATE.—£49 per ton d/d.
NICKEL SULPHATE.—£49 per ton d/d.
PHENOL.—8¼d. to 9d. per lb. without engagement.
POTASH, CAUSTIC.—LONDON: £42 per ton. MANCHESTER: £38.
POTASSIUM BICHROMATE.—Crystals and Granular, 5d. per lb. net d/d U.K. Discount according to quantity. Ground 5½d. LONDON: 5d. per lb. with usual discounts for contracts. SCOTLAND: 5d. d/d U.K. or c.i.f. Irish Ports. MANCHESTER: 5d.
POTASSIUM CHLORATE.—LONDON: £37 to £40 per ton. SCOTLAND: 99¾/100%, powder, £37. MANCHESTER: £38.
POTASSIUM CHROMATE.—6½d. per lb. d/d U.K.
POTASSIUM IODIDE.—B.P., 5s. 2d. per lb. for quantities not less than 28 lb.
POTASSIUM NIRATE.—SCOTLAND: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.
POTASSIUM PERMANGANATE.—LONDON: 9¾d. per lb. SCOTLAND: B.P. crystals, 9d. MANCHESTER: B.P., 9½d.
POTASSIUM PRUSSIATE.—LONDON: 8½d. to 8¾d. per lb. SCOTLAND: Yellow spot material, 8½d. ex store. MANCHESTER: Yellow, 8¼d.
SALAMMONIAC.—First lump spot, £41 17s. 6d. per ton d/d in barrels.
SODA ASH.—58% spot, £5 15s. per ton f.o.r. in bags.
SODA, CAUSTIC.—Solid 76/77° spot, £13 17s. 6d. per ton d/d station. SCOTLAND: Powdered 98/99%, £17 10s. in drums, £18 5s. in casks, Solid 76/77°, £14 10s. in drums; 70/73%, £14 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts 10s. per ton less. MANCHESTER: £13 5s. to £14 contracts.
SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.
SODIUM ACETATE.—£22 per ton. LONDON: £23.
SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags. SCOTLAND: Refined recrystallised £10 15s. ex quay or station. MANCHESTER: £10 10s.
SODIUM BICHROMATE.—Crystals cake and powder 4d. per lb. net d/d U.K. discount according to quantity. Anhydrous, 5d. per lb. LONDON: 4d. per lb. net for spot lots and 4d. per lb. with discounts for contract quantities. SCOTLAND: 4d. delivered buyer's premises with concession for contracts.
SODIUM BISULPHITE POWDER.—60/62%, £18 10s. per ton d/d 1-cwt. iron drums for home trade.
SODIUM CARBONATE (SODA CRYSTALS).—SCOTLAND: £5 to £5 5s. per ton ex quay or station. Powdered or pea quality 7s. 6d. per ton extra. Light Soda Ash £7 ex quay, min. 4-ton lots with reductions for contracts.
SODIUM CHLORATE.—£32 per ton.
SODIUM CHROMATE.—4d. per lb. d/d U.K.
SODIUM HYPOSULPHITE.—SCOTLAND: Large crystals English manufacture, £9 5s. per ton ex stations, min. 4-ton lots. Pea crystals, £14 10s. ex station, 4-ton lots. MANCHESTER: Commercial, £10 5s.; photographic, £15.
SODIUM META SILICATE.—£16 per ton, d/d U.K. in cwt. bags.
SODIUM IODIDE.—B.P., 6s. per lb. for quantities not less than 28 lb.
SODIUM NITRITE.—LONDON: Spot, £18 to £20 per ton d/d station in drums.
SODIUM PERBORATE.—LONDON: 10d. per lb.
SODIUM PHOSPHATE.—£13 per ton.
SODIUM PRUSSIATE.—LONDON: 5d. to 5¼d. per lb. SCOTLAND: 5s. to 5¾d. ex store. MANCHESTER: 4¾d. to 5¼d.
SULPHUR.—£9 15s. to £10 per ton. SCOTLAND: £8 to £9.
SODIUM SILICATE.—140° Tw. Spot £8 per ton. SCOTLAND: £8 10s.
SODIUM SULPHATE (GLAUBER SALTS).—£4 2s. 6d. per ton d/d SCOTLAND: English material £3 15s.
SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 15s. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 5s.
SODIUM SULPHIDE—Solid 60/62% Spot, £10 15s. per ton d/d in drums; crystals 30/32%, £8 per ton d/d in casks. SCOTLAND: For home consumption, Solid 60/62%, £10 5s.; broken 60/62%, £11 5s.; crystals, 30/32%, £8 2s. 6d., d/d buyer's works on contract, min. 4-ton lots. Spot solid 5s. per ton extra. Crystals, 2s. 6d. per ton extra. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8 2s. 6d.
SODIUM SULPHITE.—Pea crystals spot, £13 10s. per ton d/d station in kegs. Commercial spot, £9 10s. d/d station in bags.
SULPHATE OF COPPER.—MANCHESTER: £14 5s. per ton f.o.b.
SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quality.
SULPHUR PRECIP.—B.P. £55 to £60 per ton according to quantity. Commercial, £50 to £55.
VERMILION.—Pale or deep, 3s. 11d. to 4s. 1d. per lb.
ZINC CHLORIDE.—SCOTLAND: British material, 98%, £18 10s. per ton f.o.b. U.K. ports.
ZINC SULPHATE.—LONDON: £12 per ton. SCOTLAND: £10 10s.
ZINC SULPHIDE.—11d. to 1s. per lb.

Coal Tar Products

ACID, CARBOLIC.—Crystals, 8⅛d. to 8¾d. per lb.; crude, 60's, to 2s. 2½d. per gal. MANCHESTER: Crystals, 7½d. per lb.; crude, 1s. 11d. per gal. SCOTLAND: 60's, 2s. 6d. to 2s. 7d.
ACID, CRESYLIC.—90/100%, 1s. 8d. to 2s. 3d. per gal.; pale 98%, 1s. 6d. to 1s. 7d.; according to specification. LONDON: 98/100%, 1s. 6d.; dark, 95/97%, 1s. 3d. SCOTLAND: Pale, 99/100%, 1s. 3d. to 1s. 4d.; dark, 97/99%, 1s. to 1s. 1d.; high boiling acid, 2s. 6d. to 3s.
BENZOL.—At works, crude, 9d. to 9½d. per gal.; standard motor, 1s. 3½d. to 1s. 4d.; 90%, 1s. 4d. to 1s. 4½d.; pure, 1s. 7½d. to 1s. 8d. LONDON: Motor, 1s. 6½d. SCOTLAND: Motor, 1s. 6¼d.
CREOSOTE.—B.S.I. Specification standard, 4d. to 4½d. per gal. f.o.r. Home, 3¾d. d/d. LONDON: 3¼d. f.o.r. North; 4d. London. MANCHESTER: 3d. to 4d. SCOTLAND: Specification oils, 4d.; washed oil, 4¼d. to 4¾d.; light, 4¼d.; heavy, 4¼d. to 4½d.
NAPHTHA.—Solvent, 90/160%, 1s. 6d. to 1s. 7d. per gal.; 95/160%, 1s. 7d.; 99%, 11d. to 1s. 1d. LONDON: Solvent, 1s. 3½d. to 1s. 4d.; heavy, 11d. to 1s. 0½d. f.o.r. SCOTLAND: 90/160% 1s. 3d. to 1s. 3½d.; 90/190%, 11d. to 1s. 2d.
NAPHTHALENE.—Purified crystals, £10 per ton in bags. LONDON: Fire lighter quality, £3 to £3 10s.; 74/76 quality, £4 to £4 10s.; 76/78 quality, £5 10s. to £6. SCOTLAND: 40s. to 50s.; whizzed, 70s. to 75s.
PITCH.—Medium soft, 57s. 6d. per ton, in bulk, at makers' works. LONDON: £3 per ton f.o.b. East Coast port for next season's delivery.
PYRIDINE.—90/140, 7s. 6d. to 9s. per gal.; 90/180, 2s. 3d. per gal.
TOLUOL.—90%, 1s. 10d. to 1s. 11d. per gal.; pure, 2s. 1d. to 2s. 2d.
XYLOL.—Commercial, 1s. 11d. to 2s. per gal.; pure, 2s. 1d. to 2s. 2d.

Intermediates and Dyes

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

Nitrogen Fertilisers

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