The Chemical Age

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Notes and Comments

The Care of Steam Boilers

THE report has just been issued by the Board of Trade upon the working of the Boiler Explosions Acts of 1882 and 1890 during the year 1933. The report records 79 explosions during the year, attended with the loss of 11 lives and with 50 personal injuries. The chemical industry was not entirely immune from boiler troubles, and the moment is appropriate to draw certain conclusions from the report. The first of these is that in nearly 40 per cent. of the instances of failure the boiler was neither inspected regularly nor insured. The good work of the boiler insurance societies and of associations such as the Manchester Steam Users' Association is well known, but how valuable it has been can only be perceived from comparison with earlier times when inspection was in its infancy. One of the earliest—probably the very earliest—of the boiler inspection societies was the Manchester Association for Prevention of Steam Boiler Explosions, which issued monthly reports of its work.

One of these reports covering the period August 27 to October 21, 1864, recorded that during the period 565 engines and 692 boilers were examined. The defects found were four furnaces out of shape, 10 fractured, six having blistered plates, 10 internally and 23 externally corroded. In two the feed apparatus was out of order, 11 had defects in water gauges, 21 in blow-out apparatus, 10 in fusible plugs, three in safety valves and 24 in pressure gauges. "Of the omissions, 18 boilers had no glass water-gauge, two were without pressure gauges, 49 had no blow-out apparatus, and 70 were wanting in feed back-pressure valves. . . . Such a palpable neglect in respect to the fittings of boilers certainly requires censure and we trust that the parties have already remedied these defects." It is not surprising that the commentator added he was "satisfied that a close and constant inspection of boilers and their concomitants is the surest way to reduce to a minimum the frequent and fatal accidents which notoriously arise from the explosion of steam boilers." The pressures used in those days were commonly from 40 to 60 lb. per sq. in.; to-day they are usually not less than 100 lb. and not more than 600 lb. In spite of this increase in working stresses and the fact that far more boilers are now at work, the average death-rate from boiler explosions has decreased since 1882, when the first Act was passed, from 30 per annum to nine per annum, taking in each instance a six years' period. The advance is due primarily to a higher standard of manufacture and a better understanding of the principles involved for safe working, but it is questionable how far these improvements would have arisen if inspection and insurance had not been made the general rule. There is a prima facie case for making insurance of boilers compulsory.

Boiler Corrosion

CORROSION of boilers is still and has long been a subject of serious moment. With the higher pressures arise problems of the interaction of organic and inorganic substances carried into the boilers in the feed water. Turning the pages of industrial history back again to the year 1864, we find that in the experience of the officers of the Manchester Boiler Association with from 1,300 to 1,600 boilers always under their care, one boiler out of every seven, and in some years one boiler out of every four (1862 was such a year) becomes defective by corrosion alone, whilst of every eight boilers examined in the course of a year seven were found to be defective in some respects. Most of the boiler explosions of those days appear to be attributable directly or indirectly to corrosion or to over-heating of plates due to scale. In the 1933 report it appears that 15 per cent. of the boiler explosions of that year were also due to corrosion in one form or another. It is not entirely a question of feed-water since there are other corrosive influences at work. To-day there are few instances of boiler failure from over-heating due to scale, a fact for which we have to thank partly the more extended use of water-softening, but primarily the excellent system of inspection in vogue.

The principal causes of damage to boilers, as distinguished from fractures of valves and pipes and so forth in 1933 were over-heating due to shortage of water, corrosion, and the use of pressures higher than those for which the boiler was designed or for which its age rendered it suitable. Very few indeed of the 79 failures recorded—probably less than half a dozen in all—could be ascribed by any stretch of the imagination to defects in the manufacture, a tribute to the reliability of British boiler makers.

The Outlook in Canada

IF resistance to decay be a sign of vitality, the chemical industry, according to the Royal Bank of Canada, must be of all commercial enterprises the most healthy. Taking—in its monthly letter for October—the chemical industry of the Dominion as typical of the

wider view, the bank claims that it has come through the depression in a notable manner. Not only has there been little contraction in the volume of production, but the need for new products has led to the building of new plants and the installation of new equipment at a time when a large proportion of the plant of many other industries has been lying idle.

A note of romance, even, enters into the story when we are told how the fumes from Ontario's nickel stacks once drove people before it, like the molten scourge from Etna; whereas to-day chemists are extracting from it one of industry's most useful allies—sulphuric acid—at the rate of 150 tons a day. Is the chemical industry safe for investment? the bank asks; quoting, by way of reply, the view of chemical engineers that "it is far less dangerous to invest in chemical companies, which are making every possible effort to keep abreast of new developments, than in many older industries, particularly those which have failed to take cognisance of new chemical achievements." More and more industry is beginning to see its function as that of supplying a general need, rather than manufacturing a definite article from a particular material. Some glass companies, for instance, have come to realise that they are producers of containers rather than of particular glass objects, and that as producers of containers the new developments of chemistry may lead them into the production of articles made of other materials when such materials serve the purpose better or more cheaply. The conservationist of twenty years ago was afraid that world resources of some commodities would be quickly exhausted. The present theory seems to be that when a material is valued at a high price it is better to sell it quickly, ere the chemist brings on a new substitute with more satisfactory qualities.

The Wine and Food Society

THE Wine and Food Society, whose inauguration was recorded in THE CHEMICAL AGE of November 25 last year, has just held its first annual conference at Brighton. In less than twelve months the Society has enrolled over a thousand members, among whom almost every occupation is represented. Nine luncheons, dinners and tastings of wines have been held, and the Society has ably interpreted the object with which it was founded—the raising of the standard of eating and drinking throughout the country by practice, not by preaching. Its banquet at Brighton last Saturday consisted of eleven courses, presenting thirty dishes, divided into two services. The Society intends to oppose and stop the misdescription of wines and to work for the relaxing of the present licensing laws and for a better standard of food and wine in country inns.

Already a number of innkeepers have submitted their wine lists to the president and have corrected them in accordance with his suggestions, so as to give a better range of wines or wines of better quality. The council is encouraged by the growing numbers to see in the Society a force which will bring about a kitchen-cellar revolution in this country. A speaker at the conference said he did not know any civilised country in which the gastronome was so unhappy as in England. French cookery was *la cuisine au beurre*, English *la cuisine à la l'eau* and Soho cookery *la cuisine à la tomate*. Tomato sauce covered up a multitude of ills; it was the one ingredient used to disguise bad materials and to cover up lack of gastronomic skill. Speaking of the seven-course *table d'hôte* dinner served in London at lightning speed to a crowd of people afraid to be late for a theatre, he said that speed was probably its only merit. He criticised also the food served in the average country hotel, and described a meal in a Sussex town which included two inches of nondescript fish, "smothered in paste from the local stationers'," spring greens which smelt of dish-cloths, overdone meat, tinned fruit, and imported Cheddar cheese cut into cubes. He was not sure, he said, whether this meal was more atrocious than the others he had eaten in English inns.

An Ever-Present Danger

ATTENTION is drawn in the October issue of the I.C.I. Magazine to the danger of using unauthorised materials for purposes other than those for which they are intended—often in total ignorance of the properties of the materials and their dangerous nature. A few years ago there was the tragic case of two men who, because a liquid in use in a chemical process had a name which might indicate that it bore some resemblance to an intoxicating drink, drank a small quantity of the liquid and died in agony within a few hours. Cases have occurred where men have, without authority, used certain liquids for removing grease, paint, etc., from their hands, little thinking that they were running a risk of severe, if not fatal, poisoning.

A recent instance has been recorded which indicates the absolute necessity of obtaining proper authority before using liquids of which the worker has no knowledge or which he had not been told to use in connection with his job. A man was engaged in scraping off paint from parts of a building. He was told by another worker that a certain liquid would make the job easier. The liquid was used for about six hours, after which the worker felt ill, and was sent to hospital suffering from poisoning. Used for its proper purpose and under proper conditions the liquid is safe. Used in conditions where it may touch the skin of the worker it is extremely dangerous and may prove fatal in a short time. Workers are urged to help to avoid the consequences of acts of this kind by refraining themselves from using materials for unauthorised purposes and by warning their fellow workers of such possible dangers.

Carbon Dioxide—That Was

TECHNICAL Publication No. 75 of the Feedwater Specialists Co. reports that a gas company in a certain district had grave suspicions that a consumer was getting more gas than the coins in his meter-box should have allowed. All efforts to trap him failed, no counterfeit coins appeared, the lock and main connections were undamaged. The box was therefore emptied by a collector and a note made of the gas still "paid" for, but unconsumed. After a suitable interval the box was re-examined and found to be still empty, although more coins had certainly been placed in the box. Eventually the man was persuaded to spill the beans on condition that no proceedings were taken against him for past offences. The solution was ingenious, for the miscreant had been using "pennies" made of solid carbon dioxide. These worked the meter, but then evaporated completely, leaving not the slightest trace for the harassed gas officials.

Work of the Government Laboratory

Annual Report for 1933-34

THE annual report of the Government Chemist upon the work of the Government Laboratory for the year ending March 31, 1934 (H.M. Stationery Office, price 9d.), states that the total number of samples examined in the course of the year, including those dealt with at the Chemical Stations, was 503,592, as compared with 460,995 in the preceding year, an increase of 42,597. The principal increases occurred in importations of hydrocarbon oils, beer, wine and spirits, samples for duty under the Import Duties Act, 1932, tobacco exportations and in British sugar. There was a decrease in the number of imported samples examined for sugar.

Increased Amount of Work

The Hydrocarbon Oils Duty involved the examination of more than 13,000 samples for assessment of duty on importation, or drawback of duty on exportation, the increase in the number of samples being due to the duty of 1d. per gallon charged on oils other than light oils. The samples consisted largely of articles in which hydrocarbon oil was one of the ingredients and the quantity and character of the oil had to be determined. Many samples which are examined for oils may contain other dutiable substances, which must be tested for and determined, if present, such as alcohol, esters and chemicals listed by the Board of Trade under Part I of the Safeguarding of Industries Act, 1921. It is to be observed that the increase of more than 8,000 samples in connection with the duties under the Import Duties Act, 1932, constitutes a serious addition to the work of the Laboratory, seeing that the examinations required are frequently of a complicated and specialised character.

The increase of work involved in these examinations is by no means reflected in the actual number of samples. It has happened on many occasions that after discussion much work of an investigatory nature has had to be undertaken in order to define the category of the particular importation. This can scarcely be avoided owing to the want of precise definitions of many products of commerce. This difficulty is in many instances overcome by applying certain limiting values, chemical or other, which define the product, but it is clear that such limits must be those generally accepted as applying to the material in question. In addition to samples requiring examination under these Acts upwards of 1,000 papers were submitted for elucidation of technical matters arising from the incidence of the duties. Further, some 4,000 or more were received in connection with technical problems of various kinds, mostly Revenue subjects. While nearly 13,000 samples were examined solely for incidence of the new duties, many not shown separately in the total number of samples were also examined for specific and other duties.

The number of samples of cocoa, chocolate and wine submitted for examination was greater by some 8,500 than in the previous year; this nearly overtakes the drop in numbers previously reported. The number of samples of beer, imported and exported, submitted for test during the year increased by 1,773. Silk and artificial silk samples imported and exported remained stationary, but that part of the Laboratory concerned in the examination of silk was called upon to deal with the testing of other animal and vegetable fibres and hairs of all kinds, under the Import Duties Act, 1932.

Milk, Butter and Margarine

Forty-nine samples of condensed milk, including nine from Scotland and two from Northern Ireland, were sampled under the provisions of the Sale of Food and Drugs Act, and examined for the Ministry of Agriculture and Fisheries. These comprised sweetened and unsweetened milks and milk powders. The samples were examined with a view to ascertaining whether there was evidence of the removal of any of the normal constituents of milk other than water during the process of concentration, and, if so, whether the packages were marked to that effect. Three samples of milk powder and one of sweetened condensed milk prepared from machine skimmed milk, had been imported in packages which were not marked "Machine Skimmed Milk" as required by the Act.

Premises on which butter is blended or re-worked, or on which margarine is manufactured, are inspected by officers of the Ministry of Agriculture, who are also empowered to take samples for analysis. Twenty-four samples of margarine were taken. No sample contained an excessive proportion of water.

During the year two fertilisers and 11 feeding stuffs were examined, three samples being received from sellers. The fertilisers consisted of a mixed fertiliser and a shoddy. The feeding stuffs included meat meals, meat asd bone meals, sharps, pig rations, laying meal and dairy nuts. Deficiencies or excesses beyond the limits allowed by the Regulations in oil, protein and/or fibre were found in two meat meals, meat and bone meals, laying meal and pig rations. The results obtained confirmed those of the agricultural analysts who had examined the samples in the first instance except in the following respects. Two samples of sharps were found to contain the deleterious weed seeds alleged to be present, but only in traces. Castor seed husk was not found in the portion of a sample of dairy nuts examined, and an excess instead of a deficiency in potash was found in a mixed fertiliser. This last sample had the appearance of a fine uniform powder, but contained large crystals of potash salts which tended to separate from the remainder and made satisfactory sampling very difficult. The variations in the two sets of analysis probably arose from this.

Chemical Stations

In order to avoid delay in the examination of samples for the Board of Customs and Excise, Chemical Stations have been established at the more important seaports where certain classes of samples are tested. The work of these stations has been performed mainly by Customs and Excise officers, trained for the purpose at the Central Laboratories. During the year the gradual return of these officers to general Customs and Excise duties, which was commenced during the previous year, has been completed and the chemical stations are now staffed by established officers on the staff of the Government Chemist.

The Liverpool Chemical Station is in charge of two chemists drafted from the central staff and in close touch with the work at headquarters. The work at this station has been extended to embrace classes of samples not dealt with at other chemical stations. The senior chemist at Liverpool also supervised the Manchester Chemical Station until March, 1934, when the latter station was closed and the work transferred to Liverpool. At the end of June, 1933, the Leith Chemical Station was closed and the work (except tea samples) transferred to the Glasgow Chemical Station, which is now in charge of a chemist drafted from the central staff in London and deals with all the Scottish Chemical Station work. The Chemical Station at London Dock forms part of the Custom House Laboratory organisation and is in charge of the Superintending Chemist of that Laboratory. The remaining chemical stations are under the general supervision of a member of the chemical staff of the Central Laboratory, who visits them periodically.

Twenty-three samples of imported colouring materials were examined to ascertain whether they contained synthetic organic dyes, the importation of which under the Dyestuffs (Import Regulation) Act, 1920, is prohibited except under licence.

Safeguarding of Industries Act

During the past year 9,198 samples were examined in connection with the Safeguarding of Industries Act, including 23 samples which were examined both for dyes and liability to Key Industry Duty. The object of the examination in most cases was to ascertain (*a*) whether the product was such as to come within the class of those liable to duty; or (*b*) whether, as in the case of the substances such as medical preparations bearing trade names without disclosure of their ingredients, the imported article contained any substance liable to duty, and, if so, in what proportion. Fifty-three of

the samples were examined in connection with claims for drawback of duties on exportation.

Wood spirit which consists mainly of methyl alcohol, and synthetic methyl alcohol, is not liable to spirit duty on importation unless it is purified so as to be potable, in which case it is charged as ordinary spirits (Spirits Act, 1880). Synthetic methyl alcohol is in any case liable to Key Industry Duty. Of 47 samples of imported methyl alcohol, four were found liable to duty on the grounds of potability.

Fusel oil, which consists largely of propyl, butyl and amyl alcohols, is a by-product in the manufacture of ethyl alcohol, and is of considerable commercial importance as a raw material for the manufacture of solvents for lacquers, varnishes, etc. Whether imported or home produced, it generally contains ethyl alcohol as an impurity, but duty is not charged on such ethyl alcohol unless upwards of 15 per cent. of proof spirit is present. This was the case in four of the 123 samples of imported fusel oil submitted for examination. As an alternative to payment of duty, the importers were allowed by the Board of Customs and Excise to treat the fusel oil so as to reduce the proportion of proof spirit to the limit of 15 per cent. Thirty-six samples of fusel oil from British distilleries were examined. Of these, five were found to contain more than 15 per cent. of proof spirit, and delivery out of Revenue control was refused until the proportion of spirit had been reduced.

Preparations containing Sugar

Sugar is assessed for duty on importation or on delivery from a beet-sugar factory, as well as for repayment of duty (drawback) on exportation, in accordance with its polariscope reading by the scales prescribed in the Finance Acts, 1928 and 1932. Glucose, molasses, saccharin and other sweetening agents, as well as articles containing them, are also examined to determine their rate of duty. Glucose is largely used for brewing purposes, and in confectionery; molasses enters into the composition of cattle foods, sauces, and dyewood extracts, and is employed in the manufacture of spirits. As a synthetic sweetening material, saccharin is frequently substituted for sugar in the manufacture of table waters and in the preparation of foods for diabetic persons.

The variety of preparations containing sugar is so great that it has been found necessary to adopt fixed rates of duty in the case of those which are regularly imported and fixed rates of drawback for exported preparations, samples being examined only in cases of doubt as to their description or rating for duty purposes, and occasionally as a check on the fixed rate. There are, however, many articles for which it is not practicable to fix a special rate of duty, and these have consequently to be tested on each importation, or where repayment of duty is claimed. Among the articles sent for test were biscuits, canned fruits, condensed milk, egg-yolk, glue, honey, soap, pills, printer's roller compositions, tanning extracts, sauces, ketchups, confectionery, jams, syrups, ginger, canned vegetables and soups, and cereal foods. It has been necessary to subject a number of these to further examination in connection with the general Import Duties or the Ottawa Duties. The number of samples of sugar and articles containing sugar or other sweetening matter examined for assessment of duty or drawback was 70,852, as compared with 74,414 in the preceding year.

Glucose and Saccharin

In connection with the assessment of duty on British-made glucose, 288 samples were taken during the course of manufacture; 651 samples were examined for assessment of drawback on exportation, in addition to 59 samples of imported glucose and of glucose used in syrups made at sugar refineries. Investigations were also undertaken, and advice given in connection with proposed new methods of manufacturing glucose in this country.

Fifty-eight samples of imported substances were specially examined for saccharin, and in a large proportion saccharin was present. Most of the samples contained some other dutiable ingredient such as sugar, spirit or chloroform, and this has also to be determined. Four hundred and five samples of saccharin and articles containing saccharin were examined for the purpose of assessing the amount of drawback payable on exportation, and 97 samples of saccharin and of the materials used in its production were likewise examined in connection with the assessment of duty on saccharin manufactured in this country.

Samples of beet-pulp, beet juice, molasses and refined sugar, 3,926 in number, were examined in connection with the manufacturing operations, and for assessment of the duty to be charged and the subsidy to be paid.

One hundred and twenty-four samples of condensed milk were taken by Customs officers from imports under the Public Health (Condensed Milk) Regulations, which require that condensed milk shall contain not less than the following proportions of milk solids, including fat:—

Whole milk, sweetened or unsweetened	31 per cent. of milk solids, including 9 per cent. of fat.
Skimmed milk, sweetened ...	... 26 per cent. of milk solids.
Skimmed milk, unsweetened ...	... 20 per cent. of milk solids.

Nine samples were reported against. In seven cases the offence was connected with the labelling, and in two cases the statement of the quantity of whole milk to which the contents of the tin were supposed to correspond was incorrect, the actual quantity being overstated.

Other samples examined for the Ministry of Health included fruit in pulped condition for jam-making, and canned, drained and dried fruit, vegetables in brine and canned vegetables, sugar and molasses, wine and beer, fruit juices, syrups and cordials, chocolate, gelatine, butter, cream, margarine, condensed and dried milk, cornflour and pearl barley.

Two samples of stones were submitted by the Mines Department for examination to ascertain the proportion of "free silica." Twenty-three samples of water were examined as to their suitability for use as pit-head baths. Eleven of these were also examined chemically and bacteriologically for potability. Samples of disinfectants and galvanised steel sheet were also submitted for analysis.

The total number of samples received from the Post Office was 3,891. Paper, pigments and gum used in the manufacture of postal, fiscal, national health and unemployment insurance stamps, postcards and embossed envelopes were systematically examined for quality and freedom from deleterious substances. Other samples examined included miscellaneous stores, such as creosote oil, white and red lead, soap, carbide, waterproofed clothing and fabrics, gold thread, postal ink, oils, sealing wax, cycle parts, tubes and covers. Investigations into the corrosive effects of certain fluids, soils and clinker on the lead sheathing of cables were continued, and the lead coverings themselves were also examined for signs of electrolytic action.

Alleged Passing Off

Soap Firm's Motion

In the Chancery Division on Friday, October 19, Mr. Justice Crossman had before him a motion by Palmolive-Colgate-Peet, Ltd., against Ophir Soap Works, Samuel Kitter and Eric James Clarke, for an injunction to restrain alleged passing off. Harry Green, Ltd., were joined with defendants.

Mr. Bray said the motion was brought to put an end to certain activities. A number of lorries left a London garage daily loaded with people and soap in cartons which bore the words "Palm and Olive." These people went to districts in the home counties calling at house to house and saying: "This is palm olive soap and if you buy one carton one is given away as an advertisement." Sometimes it was said that the soap was Colgate's. He understood that the firm Harry Green, Ltd., were the manufacturers of the soap. At the moment counsel was not moving against Harry Green, Ltd. As far as counsel knew there was nothing going on now as the defendants, other than Harry Green, Ltd., had given an undertaking in the terms of the notice of motion. He now asked that the matter should stand over for a week for the completion of the defendants' evidence, the undertaking being continued in the terms of the notice of motion, except as to Harry Green, Ltd.

Mr. Holroyd Pearce, for the defendants, said he would continue the undertaking for the defendants, other than Harry Green, Ltd.

His Lordship directed the matter to stand over for a week.

At the Sign of the Cheshire Cat—V

THE advance in Chemistry, in most fields, since the B.A. met in Aberdeen in 1885, is almost incredible. We have succeeded in so sorting out the elements that we know the number and relative values of all the pieces upon our chemical chess board. A new science is in the making, to tell us of the internal mechanism which enables them to strut about like the Doll in the *Tales of Hofmann*. The pursuit, at present, is much like that of the Snark but has an accompaniment of bold advertisement which gives spice to the hunt, though disturbing to the peace of mind of more ordinary workers and a bad example. Perhaps the new terror brought into life by one Nobel has something to do with the unholy way in which workers are tumbling over one another in their hurry to bring their produce, too often unripe fruit, first to market. It were well if, like the Butcher, they

> " . . . contrived an ingenious plan
> For making a separate sally
> And fixed on a spot unfrequented by man,
> A dismal and desolate valley,"

to which no *Nature* had access. We should all cry out to them: *Glück auf*! and quietly await their return with real treasure. Maybe our ethical downfall is due to the bad example set by radio-active elements—the most disconcerting discovery in the history of chemistry.

Placing the Elements

The discovery of X-rays has not only enabled us, through Moseley's inspired vision, to place the elements; with their aid we can now see things, more or less, rather less than more, perhaps, as they are. Workers in the organic field have been encouraged by finding that the pictures in the X-ray gallery are replicas of those they have painted in the past—X-ray benzene is just Kekulé's benzene. A difference between the two schools is, that the organic worker is satisfied to work in his valley; the X-ray worker, being a novelty, enjoys publicity at every turn. The public value of the organic worker has yet to be recognised. Soon he will be able to go upon the house-tops and cry out to all, telling them how and what to eat—no misleading advertisements of foodstuffs and drugs will then be allowed to appear in the Press. We shall no longer be told that if we take tablets of chlorophyll we shall remain permanently youthful; at least, if we hug this belief we shall take it in the easy form of spinach or watercress. The great feat the modern chemist has to his credit is that of showing how the carrot leads mankind across the stage of life, not merely the well-known donkey of transpontine drama; he may hang up a bunch of vegetables at his house of call, as mark of his occupation.

No one of the present generation can well picture the bareness of the field of knowledge fifty years ago compared with its state to-day. The foundations then existing have been fully proved and found to be well and truly laid but we have to regret that they have not always been worthily built upon since—too much of the modern superstructure being shoddy and pretentious in character.

The Burden of Detail

We have most to deplore the vast burden of detail now laid upon the student, largely because of the false standards of the examiners. This is more and more leading to mere learning from dictation, to gross neglect of laboratory study and a consequent steady lowering of the practical skill of the average worker. The chief claim of chemistry to pre-eminence, that it is a practical discipline, is being lost. Faraday's example is not merely forgotten; it is unread of, unknown. The use of concrete in building, a muddled mixture of stones, sand, cement and water, in place of well-formed bricks and honest mortar truly laid, has its parallel in present-day methods of teaching. We sprawl, instead of walking with precision.

Fifty years ago, chemistry was entering upon a new epoch, beginning its wanderings in a desert of ionic mysticism. Fifty years before, the great but simple-minded Faraday had brought his exact electro-chemical inquiries, described in the third to the eighth series of his *Experimental Researches in Electricity*, to an end; the last communication of the series

The Three Musketeers of Physical Chemistry

was read to the Royal Society on June 5, 1834. These must serve as a model for all time to students of method; how many know of them or read them to-day? How many physicists look at them? The poor student is so pressed that he can only cram; untaught to read at school, he has no time to learn at college. He is trained as if he were a candidate for Holy Orders; no Fenton is in the field to develop a critical outlook—to present both sides of a question fully and fairly; then to leave the issue unproven, because of insufficient understanding.

Faraday's Foundation

Faraday laid complete foundations of electro-chemistry; he swept its floor clean. He established the doctrine of electro-chemical equivalents; he foreshadowed a definite unit charge of electricity, the atomic charge, now known as the electron; he divided compounds into two great classes, of electrolytes and non-electrolytes; with the aid of Whewell he devised a perfect nomenclature, unfortunately prostituted of late years, by mathematical physicists, to uses never contemplated by Faraday. Having developed a Jumping Frog doctrine, in explanation of spectroscopic phenomena, they have without warrant misapplied the term to their jumping electron. Faraday's ion was a material substance with its attendant electric charge, the two were thought of by him as interdependent. Some rectification of the frontiers of nomenclature should be made. *Ionize*, an unpleasant word added to Faraday's vocabulary, may mean so many things to-day that it is difficult to attach any definite meaning to the term; perhaps this is what the physicists desire; it should be reserved for solutions. A most winsome new baby to dangle, with powers of expansion equal to those of our Cat, the poor chemist is in despair at the antics ascribed to young master electron. Our great authority, Sir James Jeans, who must know everything on the subject, otherwise he could not speak with such certainty, assures his B.B.C. public that " ultra-violet light not only burns our skins but breaks up molecules of gas, tearing off electrons which can then move independently of the molecules of gas to which they originally belonged. When a gas is in this condition it is able to conduct electricity, since each detached electron can run about freely and transport its minute electric charge as it does so." Is this so? Has the electron such freedom? Would it not be well if a few electricians came down from pelting chimney pots and again worked quietly, in the basement, at the electric discharge, after the manner of one William Crookes? We have some recollection of his experiments and that there was evidence of gross material effects attending the attack nominally by electrons. Marked transfers of material are often seen to accompany the discharge and it has a strange way of declining to pass unless humoured by some material presence, of a right kind. There is so much " let it be granted " about the mathematical physicist that we somehow do not always feel safe in his company.

Vagaries of Substances in Solution

Chemists first began to plague themselves, though in no serious way, about the vagaries of substances in solution when Williamson (1850) drew attention to the matter, in connection with his celebrated observations on the formation of mixed ethers. Little notice had been taken of Gay Lussac's much earlier (1839) discussion of the instantaneous interaction of salts in solution or of the prehistoric (1805) Grotthus hypothesis. Williamson thought of compounds as constantly exchanging their radicles, though without supposing that these were free at any time. Clausius (1859), from a purely kinetic point of view, supposed that in the constant collisions of molecules, now and then, some were broken up; applying this view to electrolytes, he suggested that the separated radicles might be carriers of the current. Arrhenius in 1883,

measuring the electrical conductivity of a variety of electrolytes, was led to the conclusion that molecular conductivity increased with the dilution of the solution, because the number of conducting molecules was increased at the expense of the non-conducting molecules. He also concluded that the electrically-conducting molecules were the same as the chemically active molecules—Faraday's conclusion, in effect. His work was not made known until 1884 and then only in Swedish. At this time, Ostwald, from a study of the conductivities of a large number of acids at increasing dilutions, had been led to correlate conductivity with hydrolytic activity. He at once saw the bearing of the explanation brought forward by Arrhenius.

Electrolytic Phenomena

Special attention was directed to electrolytic phenomena at Aberdeen in 1885, in the presidential address to Section B and also in a voluminous special report prepared by (Sir) Oliver Lodge as opener of a discussion on the subject, so that English workers were to the fore in dealing with the problems of electrolysis. A special Committee of the B.A. was appointed in 1885, which presented several reports, culminating in a discussion, at which Ostwald was present, in Leeds in 1890.

One of the chief points made by Arrhenius was that ammonia only became an electrolyte (chemically active) when converted into the basic salt NH_4OH. He thought of the dissolution of hydrogen chloride as a completely analogous phenomenon—in fact, at this time, the idea of ionic dissociation as afterwards understood had no place in his mind.

Ostwald's electrochemical studies were fully discussed in March, 1886, in a paper presented to the Royal Society, by H. E. Armstrong, on *Electrolytic Conduction in relation to Molecular Composition, Valency and the Nature of Chemical Change; being an attempt to apply a theory of Residual Affinity.* Already in April, 1885, before the B.A. meeting, in the discussion at the Chemical Society, in a communication by H. B. Baker, on the effect of drying in limiting the combustion of phosphorus and charcoal, the same author put forward the view—adapted from Faraday—that chemical and electrolytic change were essentially interdependent phenomena, both expressible in terms of Ohm's Law,

$$C = \frac{E}{R}$$

where C is either Current or amount of Chemical Change, E the electromotive force or chemical intensity, R the electrical resistance in the circuit of change. The intervention of an electrolyte was postulated as essential to the occurrence of change. There and then the prediction was made that, ultimately, it would be found that hydrogen and oxygen did not interact, as neither was a conductor per se; moreover that water alone would not suffice to determine change, as it also was not a conductor—the presence of an impurity in the water was necessary to make it act as an electrolyte. The forecast was experimentally justified by Baker, who has shown in many cases that dry materials do not undergo change. Not a few others have made similar observations. Very few exceptions to the suggested rule are known and these will probably be removed on further study.

The Position in 1886

In the Royal Society 1886 paper referred to, in discussing the process of electrolysis, the statement was made "that there is no satisfactory evidence that the constituents of the electrolyte are either free prior to the action of the electromotive force or are primarily set free by the effect produced by the electromotive force upon either member separately of the composite electrolyte (water + dissolved salt) but that an additional influence comes into play, viz., that of one member of the composite electrolyte upon the other while both are under the influence of the electromotive force."

This explanation was advanced, with knowledge of the Clausius explanation of electrolysis, before Arrhenius had formulated his ionic dissociation hypothesis, with which it was to come in conflict.

Few will have read Arrhenius's first publication, as it appeared in Sweden. The possible implications of his generalisation were not clear, even to himself, until after van't Hoff (1886) had published his fascinating comparison of so-called Osmotic Pressure in dilute solutions with gaseous pressure and had shown the application of Avogadro's theorem to liquids—making possible the determination of molecular weights of substances in the dissolved state. Whilst, however, non-electrolytes gave normal values, those for salts were too high, nearly twice as great as they should be in the case of simple haloids such as KCl. The opportunity spurred Arrhenius to extend his views and to explain the anomaly by the assumption that salts were electrolytically dissociated into separate ions behaving as separate molecules—the noted hypothesis which has so long profoundly influenced, if not enslaved, the outlook of chemists.

Ostwald from the beginning had the genius to adopt Arrhenius, finding his own results so entirely in accordance with the views of the young Swede. He became his publicity agent; no greater master of the art of advertisement has yet appeared, though there have been indications of late that he may have successors. In 1887, he established his well-known journal, with which he carried the electrolytic dissociation hypothesis far and wide; dissociation by dilution became the faith of the world; belief in the ubiquity of ions, especially in dilute solutions, universal. Only in these last years has a new Daniel taken the field, proclaiming the opposite doctrine—that dissociation is practically complete in concentrated solutions. When doctors so differ, who shall decide? Probably both sides may safely be left to stew in their own solutions. The arguments upon which the existence of separate ions in solutions are based are of no cogency.

The Dissociationist Party

The dissociationist party has always cleverly avoided discussions of the real issues; the answers given to criticisms have been ridiculous. Where ignorance was bliss, 'twas folly to be wise. Some day, when heed is once more taken of the lessons of the laboratory, it will be possible to deal sanely with the situation—to see through the absurdities. In so far as solutions are concerned, chemists have ceased to be chemists—to have any feeling for substance; they are satisfied to live on hot air and take no notice of water unless it be "heavy." They are mere sign worshippers, never realising that one and the same mathematical expression may cover a multitude of different sins, both virtue and vice.

True readings of great movements can only be taken when they are more or less at an end, prejudice and partisanship no longer operative. The difficulty is to avoid falling to a faith: only the few can resist the temptation and retain open minds—be agnostics, in fact. We have to consider the influences at work—the character of the chief actors in the drama. The three main supporters of the ionic dissociation hypothesis, Arrhenius, Ostwald and van't Hoff, were all most remarkable and attractive personalities. Under their commanding influence, a new class of worker has been brought into chemistry—men who know not chemistry in any proper sense of the term. Perhaps no one of the three was a true chemist: all were too much afflicted with a mathematical afflatus to study facts sufficiently.

A Genius for Chemistry

Van't Hoff, the senior and by far the greatest mind of the three, had a definite genius for chemistry but no real working knowledge: he was easily carried away by analogies and apparent mathematical coincidences. In a sense, he was made popular by persecution—by Kolbe's criticisms. To understand Kolbe's severity, it is essential to remember that he belonged to a puritan type, long since lost to Germany. A pupil of Bunsen and Wöhler, both men whose memory is revered on account of their outstanding simplicity and steadfastness of purpose, he had an intense hatred of what he thought was shoddy, in any form. He had perhaps an acquired touch of Liebig pugnacity. So it came that his choler rose when the cynical young Byronist came along from the *Thierarznei Schule*, flaunting Tetrahedra in place of test tubes; in like manner, Kekulé's undoubted swagger roused his ire. Van't Hoff's essay savoured of the metaphysical to Kolbe, who indeed foresaw, in a measure, our modern outbreak of mysticism. The writer well recollects the appearance of the *Chimie dans l'Espace*. It created no particular sensation. In fact, van't Hoff only rose into favour when Wislicenus came forward and explained the chemical consequences of the tetrahedral hypothesis. Van't Hoff became

popular because he set the laboratory ball rolling: innumerable Ph.D.'s were fattened upon Optical Activity, in one form or another; the ionic hypothesis had a similar effect. He first gained general esteem when he applied Avogadro's theorem to solutions. He was a fascinating man to know.

Arrhenius came from the soil and looked the gentleman farmer; one of the most delightful and engaging of companions, especially at the Biertisch, he always remained the countryman. Well schooled in mathematics and physics, he sought to study chemistry under Cleve but apparently gained no more encouragement from him than had van't Hoff from Kekulé, so he returned to Physics. The excuse is only an excuse—chemistry was never in him. He was a born speculator, prepared at a moment's notice to manipulate any set of figures into a curve or a formula; a man of wide general outlook and fair intelligence but with little sense of artistry. He was a poor critic and only a passable literary worker. The writer remembers meeting him as he was leaving Ostwald to work with Kohlrausch and asking him—"Why?" "He supposed, to determine a fifth decimal—with what advantage he did not know." He seems to have learnt little from Kohlrausch: at all events, he never took note of his wonderful sulphuric acid conductivity curve. Simple and honest whilst in the first throes of his career, carried away by his friends in the movement he had instigated, he did little more than play a part in his later days.

Ostwald's Gifts

Ostwald was an entirely different character. Artistic in a high degree, painter, colourist and a good musician, an irrepressible talker, gifted with a facile pen, a master journalist without a shadow of modesty, a superman as an advertiser, he spoke always with the conscious certainty of the editorial *we*—and with some of the ignorance. He was never a true chemist and had little originalty of outlook. His chemical knowledge was superficial and he was no critic: in fact, most gullible. In manner, he was fascinating, supercharged with enthusiasm.

These three men came together, three Musketeers in Physical Chemistry, at a propitious time, when chemists were bent upon learning more of solutions. They found a willing public and established a school. Van't Hoff, the d'Artagnan, was the chief villain of the piece—he alone furnished real foundations. Arrhenius was a good foil and contributed a decoration or two to the van't Hoff structure. Ostwald was mainly Trumpet-blower and propagandist.

Apart from his innate genius, van't Hoff, although he knew it not, was influenced by an inspiring teacher, Kekulé, a man of imagination though no worker, from whom he carried away his first mount, the tetrahedral carbon atom. He had a free mind and a quick eye, so he added many mansions to our great house of chemistry. Arrhenius had studied under a man who was a steady, accurate and painstaking worker but without imagination: still, the starting point of his laboratory studies was the need impressed upon him by his teacher in his lectures of a method of determining molecular weights in solution. Compared with van't Hoff's brilliancy, Arrhenius had a woolly mind. Ostwald was mainly self-trained. The school they founded was a peculiar one, formed from a new type of recruits, with mathematical proclivities but lacking in practical instincts—a school with little knowledge of the laboratory arts, useful as book-keeper and accountant are in a business but not as productive workers or as understanding factory proceedings.

Present Treatment of Problems

Our present treatment of theoretical problems, other than those of structure, is both farcical and pretentious—entirely dishonest. The facts are not looked in the face—they are simply left unknown. The many publish but few read. What is published is in large part unreadable. If a competent critic could read through the long series of volumes of Ostwald's Journal, he would certainly condemn nine-tenths forthwith to the dust bin. We must find for some of our most promising students "dismal and desolate valleys" where they can work undisturbed and honestly seek to understand what is knowledge. Then some day a Fitzgerald may arise, able judicially to read probable if not certain meanings into the problems of electro-chemical interchange; who will see into the deeps of solution, unlock their secrets and understand their mysteries. Apprenticeship to the task will needs be long and intense. As said of the sea in Longfellow's poem:

> Only those who brave its dangers
> Understand its mystery.

One blank has to be filled in before all others. We go down to the sea in ships. We are an island people. We eat fish full of phosphorus. Yet our chemists take no special heed of Water, the magician, as solvent. Van't Hoff could only picture its molecules as kicked about; some day they will be sure revenged upon him, even laugh his views to scorn; they will claim to be masters in their house.

Recent Progress in Fertiliser Technology

By C. H. KUNSMAN

(Bureau of Chemistry and Soils, United States Department of Agriculture)

THE results of some of the more important developments in fertiliser technology having their origin in the laboratories of the Bureau of Chemistry and Soils, United States Department of Agriculture, were discussed at the annual convention of the National Fertiliser Association on June 12. A new nitrogen carrier, ammoniated peat, has been prepared by treating peat with anhydrous ammonia at elevated temperatures and pressures. By varying the moisture content of the peat, the pressure and the temperature, products containing from 7 to 22 per cent. nitrogen were obtained. Although small amounts of nitrogen are fixed in this process at atmospheric pressure, increased pressures up to 100 atmospheres are necessary to obtain the products containing the larger amounts of nitrogen.

One of the pieces of apparatus in use at the Bureau of Chemistry and Soils is a two-gallon autoclave, electrically heated with an agitator and drive, designed to operate to 300 atmospheres pressure and up to 300° C. This autoclave is used for the preparation of ammoniated peat where agitation will bring about a more uniform heating and furnishes a means for laboratory study of conditions affecting the product. By removing the ammonia during agitation a granulated product of increased density may be obtained. The capacity of this system is about 3 lb. of product. A larger reactor or autoclave has been constructed capable of producing 50 lb. of product. This consists of a 12 in. cylinder closed with flanged ends, electrically heated, water cooled and equipped with an agitator. It can be operated at 60 atmospheres pressure and a temperature up to 300° C.

The products obtained in this process are promising, containing a large amount of water soluble nitrogen immediately available to the plant, and some slowly available nitrogen. Several experiment stations are carrying out vegetative pot tests on this product in order to ascertain its exact fertiliser value. The results obtained to date would indicate that the nitrogen in the ammoniated product is somewhat less available than that contained in cottonseed meal or dried blood. Collateral studies are being carried on with regard to the chemical constitution of the nitrogen compounds formed. It has been definitely determined that urea is one of the compounds formed in the reaction, constituting from 13 to 15 per cent. of the product.

When carbon dioxide is added to the ammonia-peat mixture an added amount of fixation takes place in the form of the synthesis of urea. In this way products containing 65 per cent. urea, or 38 per cent. nitrogen are formed. The physical properties of all of these mixtures makes them a very desirable ingredient in mixed fertilisers, and they should be considered from the points of view of nitrogen-carriers, fertiliser conditioners and as substitutes for organic ammoniates.

Until quite recently relatively little change has taken place in phosphates for fertilisers. Superphosphate prepared by the sulphuric acid batch process was and still is the main source of phosphoric acid. The electric and blast furnaces permit of the production of phosphorus and concentrated phosphoric acid.

In the five-ton pilot blast furnace plant, operated by the Bureau of Chemistry and Soils, for the production of phosphorus, phosphate rock, silica and coke are fed into the top of the furnace by means of a skip hoist. A hot blast of air is fed through a tuyere into the base of the furnace at a pressure of from 3 to 5 pounds. Two stoves are essential in preheating the air or hot blast. These stoves are alternately heated and in blast. Relatively clean carbon monoxide from the furnace is burned in one of these brick-lined stoves, containing pebbles, until the temperature of the pebble bed is about 900 to 1,000° C. Air is then forced into the stove where it is heated by coming in contact with the hot pebbles and then led through a tuyere into the base of the furnace.

Strong Phosphoric Acid

At about 1,400° C. phosphorus begins to vaporise and goes to the top of the furnace with carbon monoxide and a certain amount of dust from the furnace burden. These hot gases are then cooled to 50° C. and below, by means of water sprays and a series of pipes surrounded by tap water acting as heat interchangers. The phosphorus, together with the dust, is collected by the water scrubbers and Cottrell electrical precipitator. About once an hour the slag is withdrawn at the base of the furnace. The phosphorus can then be either distilled and collected as elementary phosphorous, or allowed to oxidise to P_2O_5 and collected as strong phosphoric acid. This strong phosphoric acid can now be used to treat phosphate rock for the production of double superphosphate, containing an average of about 45 per cent. P_2O_5:—

$$Ca_3(PO_4)_2 + 4H_3PO_4 = 3Ca(H_2PO_4)_2$$

Another development is the calcination of phosphate rock. When phosphate rock is heated in the presence of water vapour at 1,400° C. for a short time ($\frac{1}{2}$ hour) in a laboratory tube type furnace, a product very low in fluorine and containing 30 to 35 per cent. available phosphoric acid is obtained. No increase in the citrate solubility of the phosphate occurs until more than about 60 per cent. of the total fluorine is volatilised. Furthermore, the data obtained show that no significant increase in solubility occurs until all the fluorine in excess of that corresponding to one atom of fluorine in the fluorapatite $[Ca_{10}F_2(PO_4)_6]$ equivalent of the total phosphoric acid is volatilised; from that point, however, the increase in citrate solubility is more or less directly proportional to the percentage of the remaining fluorine volatilised. The presence of both silica and water vapour is essential to the removal of fluorine and the formation of citrate-soluble phosphate; the available evidence indicates, however, that the commercial grades and varieties of domestic phosphate rock usually contain sufficient silica for the reaction.

Use of Rotary Kilns

The present information indicates that the process can be carried out in rotary kilns with practices and costs comparable to those in the manufacture of Portland cement. The product is obtained in the form of a sintered or semi-fused clinker which needs only to be ground for use as fertiliser. Pot tests indicate that the plant food value of calcined phosphate is as high as that of superphosphate and other well-known phosphatic fertilisers. The product is free from diluents other than those naturally present in the phosphate rock, contains no free acid or acid salts, has excellent physical properties, and improves the physical properties of other fertiliser materials with which it is mixed. An improved product containing very little or no fluorine can be made and may be used as a substitute for bone meal in mineral supplements for livestock feeding.

In view of the recent increase in supplies of potash throughout the world and the United States in particular, the Bureau of Chemistry and Soils is concentrating its efforts on increased potash utilisation as illustrated by this country's potentialities for potassium sulphate, potassium phosphate, potassium nitrate and potassium carbonate. The American farmer paid, on the average, nearly $3,000,000 annually for the last ten years for one of these products alone—imported potassium sulphate.

The increased use of ammonia and its salts in the past ten years has been due largely to the establishment of a synthetic ammonia industry. The increased use of ammonium salts in place of the organic ammoniates and nitrates has led to an increase in the acid-forming influence of fertilisers. Dolomite, limestone and other basic materials are now being used in fertiliser mixtures in order to reduce their acid-forming influence on the soil. These basic materials often supply calcium, magnesium, and other elements now known to be necessary as plant foods for some crops grown on soils deficient in these elements. The trend for the last ten years is toward a marked increase in plant food content. It would seem that ammoniated peat, the basic materials dolomite, limestone, etc., might replace much of the so-called filler.

Concentrated Superphosphate

Superphosphate and double superphosphate are examples of fertiliser materials that differ only in their content of one inert component. The first having a plant food content of 16-20 per cent. is classed as an ordinary or low analysis material, while the second having a plant food content of 40-48 per cent. is a concentrated or high analysis product.

Double superphosphate as prepared by present methods must necessarily cost more per unit of P_2O_5 than the ordinary superphosphate. It is possible, however, that improvements in the smelting methods of treating phosphate rock may change the situation. The phosphoric acid recovered by these methods is only suited for direct use as a fertiliser after being neutralised by some basic material such as phosphate rock, limestone or ammonia. The product obtained in each case is a high analysis material. The volatilisation methods of treating phosphate rock thus provide a means for producing high analysis phosphates having 2 to 4 times the plant food content of ordinary superphosphate. The accompanying table gives the fertiliser formulae of two fertiliser mixtures:—

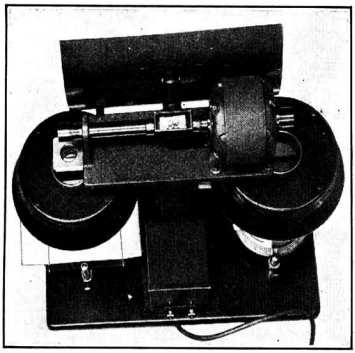
Materials.	Av. mixed fertiliser for 1932 3-10-5 lbs.	High analysis fertiliser 6-20-10 lbs.
Superphosphate, 18% P_2O_5	1,100	
NH_3: 3 % of superphosphate	33	
$7\frac{1}{2}$% of double superphosphate	—	66
Double superphosphate, 45% P_2O_5	—	880
Potassium chloride, 50% K_2O	200	400
Organic ammoniates	100	200
Ammonium sulphate	100	200
Sodium nitrate	33	66
Dolomite	94	188
Filler (sand, etc.)	340	
	2,000	2,000

Average Mixed Fertiliser

The first of these formulae, chosen from many which might be used, represents the average mixed fertiliser in use at the present time. The other is a high analysis mixture containing twice the plant food content. The second, or high analysis formula differs from the first only in that double superphosphate is used in place of superphosphate and filler is omitted. Mixtures prepared according to these formulae will contain the same fertiliser components in approximately the same proportions. Both mixtures must therefore be very much alike in their chemical, physical and physiological properties. If double superphosphate should come into general use it will mean that the filler used in the average mixed fertiliser must be increased to about 50 per cent. of the mixture if its analysis formula is to remain the same as before. It would seem that a more logical procedure would be to increase the analysis formula by the elimination of filler. Methods are now available for the application of the higher analysis fertilisers in quantities which duplicate present-day plant food applications. It is evident, therefore, that the successful production of of phosphoric acid for use in double superphosphates by furnace methods may play a very important rôle in the fertiliser industry.

With the increasing supply of higher analysis nitrogen compounds, phosphates and potash salts, comes the trend to make higher analysis fertilisers, so that the fertiliser industry and consumers are confronted with either the manufacture, distribution and use of higher analysis products, or a marked increase in the use of filler which adds appreciably to the cost of manufacture and transportation of fertilisers.

A Simplified Method of Colour Analysis



Top view of Bausch & Lomb H-S-B Colour Analyser with cover of prism box removed.

A NEW colour analyser introduced by the Bausch and Lomb Optical Co., Ltd., analyses colour according to its psychological attributes of hue, saturation, and brilliance. This instrument is not a spectrophotometer. It is designed for use with the standard Munsell colour discs, based on the well-known Munsell system of colour nomenclature. The Munsell system, moreover, has been examined by the United States Bureau of Standards, and the discs are credited as being satisfactorily permanent.

The Munsell Colour System

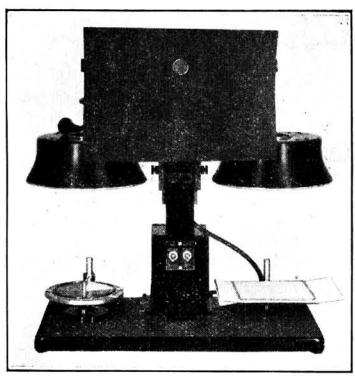
According to the Munsell system, the primary dimensions or properties of colour are hue, value or saturation, and chroma or brilliance. Each of these three colour dimensions or properties can be considered and measured separately, regardless of the other two. "Hue" is the name of a colour; it is the property by which any colour of the spectrum is distinguished from the other colours and it is the first characteristic of a colour that the eye detects. "Value" is the lightness or darkness of a colour; it is the property which bears a relation to the amount of light reflected from the surface of any colour. "Chroma" is the strength or weakness of a colour; it is the property which governs the intensity or purity of a colour. Numerical scales have been established for all three properties so that it is possible, by using the standard colour discs, to reconstruct any given colour from numerical specifications. The former method of producing a required colour was to clamp a number of discs to a shaft, rotate the shaft at a speed sufficient to cause the different colours of the discs to merge, and view the resulting colour by means of a suitable optical system. The angular measurement of the exposure of each disc then furnished the numbers for the necessary colour equation.

This new instrument comprises a prism system with the proper lenses to give a circular photometric field divided vertically. Light for one-half of the field comes from the surface of the Munsell discs, and that for the other half comes from the surface of the sample to be measured. The optical system is so diaphragmed that only light that is reflected from the two surfaces reaches the eye. Illumination for sample and discs is provided by means of specially designed lamp houses directly over each. Each lamp house carries four frosted auto headlight bulbs, the lamps being operated in parallel from an integrally mounted transformer. The lamps are mounted in the form of a square, the reflected beam passing upward through the centre of the square to the photometer. The viewing direction is approximately perpendicular to the sample surface. The lamps are symmetrically positioned and slightly off the vertical axis, so that specular reflection from the illuminated surfaces cannot enter the optical system of the photometer. Each group of four lamps is adjustable in a vertical direction for the purpose of balancing the illuminations on the sample plane and the disc plane, or the two groups can be adjusted as a single unit.

The system has been so designed optically that the actual rotation of the discs for integration of the colours is avoided. In the left-hand light path there is placed a prism, the rotation of which causes a circle to be scanned upon the disc surfaces. The prism is mounted in the hollow shaft of an especially designed A.C. induction motor of the shaded pole type. This motor is mounted directly in the optical path and the light beam passes along its axis of rotation. The system provides for a quietness of operation which is not attainable by any geared or belted type of motor. It operates at a speed sufficient to eliminate flicker, due to the alternation of brilliance and colour.

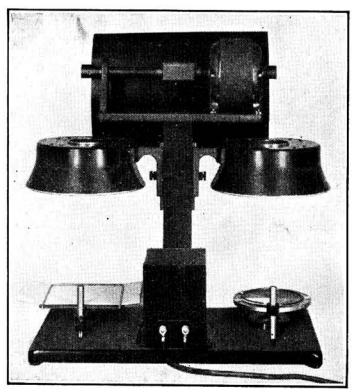
An Easier Method of Observation

In older systems where this type of disc was used, the interleaved discs were clamped directly to the shaft of the motor and spun. It was therefore necessary, if the match were not correct, to stop the motor, make a tentative adjustment of the discs and again try the match. This process had to be repeated over and over until the correct values were found. With the new system of scanning the stationary discs, the complete adjustment is made in a very short time, since one simply views the photometric field and alters the sectors of the four stationary discs until a satisfactory match is



Front view showing eyepiece, light shield, colour disc, holder and sample mount.

Back view showing illuminating units, transformer and special motor.



secured. The percentage values of the sectors are then read on the graduated circle upon which the discs rest and are used in the formulæ previously given. A central and a peripheral clamp hold the discs loosely upon the table.

The sample table is square and carries a spring clamp which holds the specimen in a smooth horizontal position. When liquid materials are being measured, they may be placed in a shallow Petri dish and set centrally upon the sample table, inside the spring clamp. In the optical system on the sample side there is a negative lens mounted in a slide so that it may be introduced into the light path at will. The purpose of this lens is to provide for a larger field of view where a sample is of uneven colour. With the negative lens out of the system, the specimen field covered is approximately one inch.

Nine Special Features

The particular features of this new colour analyser are ninefold. The instrument measures colour in terms of three primary attributes—hue, brilliance and saturation. It measures colour in terms of what the eye sees. The illuminants for sample and standard are integrally mounted and individually adjustable. The instrument is arranged for convenient usage and for two sizes of sample field. The hollow shaft motor with its scanning prism obviates the necessity of stopping the motor to adjust discs. The hollow shaft motor reduces noise to a minimum. The dividing edge between the two halves of the photometric field is practically invisible. Light shields protect the eyes from glare and stray light which reduce the sensitivity of setting. A daylight filter in the eyepiece serves to set up conditions which closely approximate north skylight.

There is provided with the instrument a basic series of discs. This series is intended for the experimental work necessary to make a choice of the particular discs which will be most advantageous for measurement of a given group of colours. It includes only those discs of maximum saturation and greatest brilliance in each of the ten hues of the system, together with a selected set of neutrals. With these, the operator will be able to match any colour with fair success. In the case of weak colours, however, the sectors of the coloured discs will be so small that the greatest accuracy will not be possible. When the colours involved in a particular series of determinations have been matched with the standard set of discs, it is a comparatively simple matter to determine what further discs will be necessary. The price of the instrument is about one-third that of a good spectrophotometer.

Specialised Technical Information

An Enterprise by the Leeds Public Libraries

EVIDENCE of the practical application of printed knowledge to business is reflected in the extended use of the Commercial and Technical Library which has been established by the City of Leeds Public Libraries. Many firms in the city who have investigated and tested the possibilities of the application of specific information to their particular needs. The Commercial and Technical Library is a business reference department organised to provide local industry with essential information. It provides commercial books covering every aspect of business technique; technical books on all branches of technology, particularly local industries; periodicals and trade journals, both commercial and technical; a card index to Leeds trades, forming an exhaustive index of the products produced in the city, and their manufacturers; British Standards Institution specifications and reports; Government publications, including reports of Royal Commissions, Committees, and State Departments, so far as they are concerned with commerce and technology; trade reports and statistical returns; trade catalogues descriptive of the products of the principal firms of Great Britain; files of current data, classified for instant accessibility, containing information extracted from periodicals; a register of local translators; and English, United States and German patent specifications. The library also publishes a bulletin giving bibliographies of subjects of immediate interest. The October issue is devoted to "Protective Materials."

Chemical Notes from South Africa

From a Special Correspondent

OVER a period of six months in the present year, 2,500 tons of arsenic was landed at Durban. Nearly 700,000 gallons have been concentrated in liquid spray and 50 tons of dusting powder have been supplied to the Government. In addition to this, arsenic is being used in the manufacture of many commodities, including cattle dips.

The annual production of South African salt, about 100,000 tons, is valued at some £137,000. Although this salt is stated to be suitable for table use, especially as it is free of magnesium and calcium chlorides, yet even when it is well screened it has so far failed to compete with the imported. Some of the samples that have lately been brought to public attention have been remarkably dry even in moist atmospheres, when they have not become lumpy. Grading and refining in South Africa has now attained to a higher standard than was usual a few years ago, and especially in the high-grade salts for the dairy industry. This increased efficiency is due to oversea competition. The presence of calcium and magnesium as well as some four per cent. or more of anhydrous sodium carbonate gave these salts a somewhat doubtful value for curing purposes, but this complaint is now heard less frequently.

In some lines British chemical business in South Africa still remains unsatisfactory. Great Britain, however, remains the largest exporter of chemical goods to South Africa, and, with forceful advertising and improved representation, they could capture more of this trade. At present, British sales of chemicals for manufacturing purposes and druggists' supplies are worth about £600,000 a year.

Ammonia, Glycerine and Cyanide

Large quantities of ammonia for industrial purposes are now being produced at the factory in Modderfontein, where a synthetic process is employed. Previously, this concern used annually some 18,000 tons of Chilean nitrate and 7,000 tons of sulphur for manufacturing explosives. A quantity of Chilean nitrate is still being imported by South Africa, particularly for the manufacture of fertilisers, but this trade is not so large as it was several years ago. Large quantities of liquid ammonia and gaseous ammonia are produced annually in this Transvaal factory, which sends much of its by-products to Somerset West, where they are converted into fertilisers and many other chemical manufactures.

Glycerine for various manufacturing purposes is used widely in the Union, but the bulk of this trade is in French hands, sales reaching an annual value of almost £120,000. Holland also makes extensive sales of glycerine to South Africa, the annual value of this trade being about £20,000.

Sodium cyanide needs are being largely supplied by Canada, which is making rapid progress in this branch of the chemical industry. At one time these sales were negligible, but they have reached an annual value of £96,000, with every possibility of increasing. Cyanide from Germany sold well in South Africa before the war, but this country has never recovered its old position in the Union market. The pre-war trade in this line was worth over £219,000 a year, but to-day it rarely reaches a value of £200 a year. The demand for nitrates for commercial and agricultural purposes is supplied by Chile, but such sales in this market have dropped from the £227,602 of 1929 to a little over £50,000 a year.

Salad and Cooking Oils

South Africa is now producing salad and cooking oils of high grade which are being used for all ordinary cooking and for commercial baking, although they have not driven British brands of such oils off the market. These oils are prepared from maize, and in taste and odour no complaints can be made about them. These oils are of full fat value, and as there is no marked discrimination between oils for cooking and baking purposes and for salad uses, these high-grade vegetable oils serve all purposes. As these oils are produced in the country they have a strong advantage over those which have to be imported. None the less, there is still a strong demand for pure olive oil for salad and other uses.

Chemistry in Canadian Industries

The Trend of Recent Developments

WITH the value of its products averaging more than one hundred million dollars a year, the Canadian chemical industry constitutes an excellent example of the advanced development of Canadian manufacturing. The period since the war has been peculiarly notable because of the tremendous gains of industrial chemistry in many countries. The desire to create a home chemical industry which would render the country relatively independent of foreign resources in the contingency of war, led a number of countries to grant special assistance for the creation or expansion of this industry. Further, as economic nationalism became more and more the mode in international affairs and as each nation strove to limit imports, the newly-developing chemical industries were among the first to receive special consideration when tariffs of all kinds were being raised to excessive levels.

Rapid Spread of the Use of Cellophane

There are few articles in common use which have not been materially affected in their composition as the result of recent chemical discoveries. On the one hand, as in the case of aluminium, a new metal has become the material out of which many products are manufactured; on the other hand, wood pulp in the form of rayon and celanese constitutes a new competitive factor in the textile field. In each of these instances, Canada has large, new manufacturing plants which supply the requirements of the home market and are able to manufacture on a sufficiently efficient basis so that they export to other countries on a substantial scale. Although aluminium, a product of the electro-chemical industry, is no longer counted among Canadian chemical products, it should not be forgotten that the aluminium industry of Canada is one of the largest in the world. Chemical discoveries as to the effects of mixing a certain proportion of nickel with steel, have accounted for the recent rapid increase in the consumption of nickel in the steel industry.

There has been no more startling development in the pulp and paper industry than the rapid spread in the use of cellophane, another chemical transformation of cellulose. New chemical discoveries presage further developments in the pulp and paper industry. At the present time, well-developed experiments are under way in the direction of producing a new transparent grease-resisting wrapping paper and a paper milk bottle so cheap that it may be destroyed after once being used. Tough paper bags are now being used for the shipment of cement and the time may not be far off when this type of bag will have superseded jute bags in other important industries.

Expansion of Canadian Industries, Ltd.

The chemical industry of Canada ranks well among the chemical industries of the world. Canadian Industries, Ltd., developed from Canadian Explosives, Ltd., have expanded and diversified production until to-day they are the largest Canadian manufacturers of acids, alkalies, chlorines and fertilisers, and have also become an important factor in the paint industry. In addition, they are the principal manufacturers of artificial leathers and the only manufacturers of cellophane in Canada. Among their most interesting products are those derived from cellulose. Cellulose was first used chemically as a base for gun cotton. At the present time the chemist transforms it into cellophane, fabrikoids or lacquers such a Duco, and in combination with resins, it is used in the manufacture of many other products.

In practice, chemical companies tend to produce a continually increasing variety of products from the same set of raw materials with which they have manufactured their first or primary product. When one considers the widely varying forms into which cellulose may be transformed, it is not surprising that a chemical company usually makes use of comparatively few raw materials. Many chemical products are used almost entirely for the production of further chemical products. Thus, from an industrial point of view, there are few chemicals of greater importance than sulphuric acid. At Copperclift, Ontario, the smoke from the smelter of the International Nickel Co. contains a large proportion of sulphur. This smoke is now used by Canadian Industries, Ltd., for the manufacture of sulphuric acid at the rate of about one hundred and fifty tons per day.

Operations at Shawinigan Falls

At Shawinigan Falls, Quebec, a chemical industry is established which is essentially Canadian in character. It was developed by Canadian chemists and has utilised Canadian resources. It has found a world-wide market for its products and Shawinigan Chemicals, Ltd., is one of the largest power consumers in the country. Even before the war this plant produced calcium carbide on a large scale; the calcium carbide, in turn, is used to produce acetylene gas which is of importance in modern welding. In 1915 these processes became of great importance in the production of acetone for cordite and acetic acid. To-day the plant has been much enlarged and its production greatly diversified. By the application of hydro-electric energy to lime and coke, carbide is made, and from carbide a series of synthetic organic compounds. It is a peculiar fact that the physical properties of the different members of this group of organic chemicals, some of which are used in explosives, may be controlled in such a manner as to produce the resilient resins necessary for a chewing gum (now on the market), or transformed into a hard, transparent resin which may eventually prove satisfactory as a substitute for shatter-proof glass. In the meantime, other forms and colourings of this same group are being used for new and attractive sets of brushes and combs, cups and various decorative containers. It has the advantage over the celluloid group of products in that it is relatively non-inflammable. Perhaps the largest source of sulphuric acid in Canada is the plant of the Consolidated Mining and Smelting Co., at Trail, British Columbia.

CANADIAN CHEMICAL PRODUCTION.

Principal Divisions.	1933.*	1929.	1926.	1920.
Coal tar distillation	$1,671,697	3,818,050	2,967,281	1,817,831
Acids, alkalis and salts ..	12,681,866	28,021,972	18,526,247	16,736,068
Compressed gases	2,490,215	3,967,416	2,422,486	1,993,141
Explosives, ammunition and fireworks	7,378,732	10,828,778	7,930,276	10,004,718
Paints, pigments and varnishes	14,695,335	27,103,465	22,279,382	27,042,096
Soaps, washing compounds, etc.	14,268,394	19,218,726	14,847,018	17,727,002
Medicinal and pharmaceutical preparations	16,739,530	19,038,894	15,382,475	15,728,224
Toilet preparations	5,614,505	4,451,588	4,225,510	2,077,813
Fertilizers	4,231,598	2,258,780	1,449,589	3,288,027
Wood distillation	669,119	1,689,332	1,712,169	4,899,704
Inks	2,094,570	3,038,049	2,436,057	2,527,825
Adhesives	1,076,148	1,830,644	1,710,095	2,202,059
Polishes and dressings ..	1,862,770	1,356,223	1,406,581	2,005,970
Miscellaneous	6,612,752	11,942,304	9,483,271	7,066,664
Total	92,087,231	138,555,221	106,778,437	115,617,142

* Preliminary figures.

Use of Fertilisers

Because of the great fertility of the Prairies, Canadian farmers have not felt that it was worth while to make much use of fertilisers. Plant growth, however, is a chemical process and since the plant foods found in the soil have been reduced in quantity, replacement has become necessary. Smelters have co-operated with model farms in the west to show that with comparatively small expenditure for fertilisers, crop yield and quality could be greatly improved. The results were sufficiently striking so that a beginning has been made in the use of fertilisers in the west.

Formerly, the nitrate deposits of Chile were the world's chief source of nitrogen for fertiliser. With the acute need for nitrogen during the war, methods for securing it from the air were perfected and developed. The Cyanamid Co., at Niagara Falls, one of the largest fertiliser companies in Canada, takes nitrogen from the air and by the use of electrical energy converts it into cyanamide. Another important product manufactured by this company is that essential chemical for gold extraction—sodium cyanide.

Canadian Industries, Ltd., built their cellophane plant at Shawinigan Falls in 1931-32 and they are at present erecting

a plant for the electrolytic production of caustic soda and chlorine at Cornwall, Ontario. Courtaulds, Ltd., have recently made a large outlay of capital to increase their capacity at Cornwall. The fertiliser plant of the Consolidated Mining and Smelting Co. also was built since the onset of the depression.

The Dominion Bureau of Statistics records the value of Canadian chemical production as shown in an accompanying table. It will be noted that the peak value was reached in 1929 when the total exceeded $138 million. While it fell as low as $92 million in 1933, this was a much smaller decline than that in many manufacturing industries, and judging by the reports received to date, the recovery shown in 1934 will prove to have been substantial.

With the rapid changes constantly being made in chemical processes and products, the question has been raised as to whether the chemical industry is a safe place for the investment of capital. Chemical engineers reply that it is far less dangerous to invest in chemical companies, which are making every possible effort to keep abreast of new developments, than in many older industries, particularly those which have failed to take cognisance of new chemical achievements. Many large industrial companies have added a competent chemical engineer to their board. Electrical and chemical industries are spending the largest amounts upon research, and the return from this investment may be estimated in terms of the rapid transformations which such research has made in all types of industry.

The British Standards Institution

Activities of the Chemical Division

The British Standards Institution has issued its half-yearly handbook which includes the report presented at the last annual general meeting, as well as the indexed list of current standard specifications. The report on the activities of the three divisions—Engineering, Building and Chemical—provides interesting reading and shows the large amount of valuable work voluntarily carried out by the Institution's 663 technical committees.

The work of the chemical division in regard to the standardisation of cresylic acid and phenol has been brought to a completion in the past year by the issue of the specifications covering phenol and the whole range of the more generally used cresylic and carbolic acids. Certain of the specifications will be of interest to pharmacists, and to the manufacturers of pharmaceutical chemicals derived from phenol or cresol. Makers of synthetic resins, disinfectants, explosives, soap, synthetic perfumery, leather, photographic chemicals, dyestuffs, paint, and the brewing industry will find use for most of these specifications.

The work on scientific glassware which was taken over from the joint committee formerly under the ægis of the Institute of Chemistry, has six sub-committees dealing with the preparation of British Standard Specifications for volumetric glassware, thermometers, hydrometers, distillation apparatus, laboratory porcelain, and qualities of glassware. So far as volumetric glassware is concerned, specifications have been completed for interchangeable conical ground-glass joints, distillation flasks and graduated measuring cylinders, and the committee has in the course of preparation specifications for Crow receivers, Nessler cylinders, centrifuge tubes, petri dishes, test tubes and other tubes and flasks. A panel is also dealing with the setting up of a standard Dean and Stark apparatus.

Testing of Disinfectants

A British Standard Technique for determining the Rideal-Walker coefficient has been issued and must be regarded as an event of first importance to manufacturers of disinfectants. The Rideal-Walker method of comparing disinfectants was first published in 1903 in this country, in certain of the Dominions and in America. A sub-committee is now at work examining the alternative Chick-Martin test with a view to its issue also as a British Standard. Consideration has also been given to the possible standardisation of methods for determining fungal restraint. After consideration and examination of existing methods it has been agreed that the time is not yet ripe for the proposed standardisation.

At the request of the Imperial Agricultural Bureaux, a technical committee has been appointed to take over and continue the work of the Dairy Research Committee of the Empire Marketing Board, and to deal with any further standardisation work which may be shown to be desirable in the interest of the dairy industry. Four sub-committees are dealing with volumetric glassware, freezing point of milk, chemical analysis, and bacteriological technique.

A conference is to be convened to consider the question of the preparation of British Standards for silver deposits.

Specifications for methods of sampling vegetable oils and fats both in packages and in bulk are in course of preparation. The question of preparing standard methods for sampling coal tar products has been under consideration and a draft specification has been prepared based on the existing proposals drafted by the Standardisation of Tar Products Tests Committee. These have now been circulated for general comment and criticism. Two important specifications have been issued in connection with the work of the preparation of British Standard Methods for the sampling and analysis of coal and coke.

Gross and Net Calorific Value

Arising out of the resolution made at the London Fuel Conference in 1928, consideration is now being given by the International Standards Association to the setting up of international standards dealing with the definition of gross and net calorific values of solid, liquid and gaseous fuels. The British Standards Institution accepted the invitation of the World Power Conference to undertake to present the British viewpoint as to what was the practice in Great Britain in regard to the definitions of the terms "Gross" and "Net" calorific value and the way in which they were used. The recommendations on this subject have been issued as B.S. Specification No. 526. There are now 19 technical committees, and 49 sub-committees and panels in the Chemical Division.

In the Chemical Engineering Division the dimensional standardisation which is being undertaken in regard to chemical stoneware is at present confined to pipes. It has been decided to prepare standard methods for mechanical and physical tests and a limited range of chemical tests. The committee is of the opinion that it would be difficult at the present time to attempt to set up standard limits for the various grades of stoneware that are being used in this country.

Arising out of a request received from the Home Office a committee is investigating the question of the preparation of a B.S. Specification for hydro-extractors as a guide to makers and users, and a small exploratory sub-committee is at present considering the accidents which have arisen through failures of hydro-extractors, with a view to reporting to the technical committee the possibilities of standardisation and the direction which it should take. There are now 11 technical committees and 12 sub-committees under the chemical engineering industry committee.

The section of the handbook devoted to current lists of British Standard Specifications includes a numerical list, the new specifications in course of preparation, and a complete subject index. This index should be in the hands of all drawing offices and purchasing departments of public authorities and firms throughout the building, chemical, engineering and allied industries who have found the British Standards of such assistance in the preparation of contracts and tenders. Copies of this publication (Reference C.D. 3900) are available from the British Standards Institution (Publications Department), 28 Victoria Street, London, S.W.1, price 1s. 2d. post free.

A Synthetic Wax with Wide Industrial Uses

Flameproofing and Waterproofing Qualities

WAXES play an important and versatile part in modern industry and there are few manufacturing processes in which they are not used either directly or indirectly. They are particularly exploited because of their impregnating, water-resisting, electrical and polish-forming properties. Natural waxes, which may be of mineral, animal or vegetable origin, are all of a combustible nature, and are capable of burning if subjected to a sufficiently high temperature.

In some directions the property of combustibility is a desirable feature which enables natural waxes to find special and particular applications in industry. For many purposes, however, it can readily be understood that a non-inflammable wax must possess definite advantages, and particularly is this the case in the manufacture of electrical equipment, where fire hazards must be reduced to a minimum. Another feature which natural waxes have in common is that of fairly low melting point. It is exceptional to find a wax of this class with a melting point higher than 90° C., and this obviously restricts the range of utility of natural waxes.

A range of synthetic waxes which embodies the good qualities and eliminates these disadvantages of natural waxes is now being produced by Imperial Chemical Industries, Ltd. These waxes, known as "Seekay" wax, are made by the controlled chlorination of naphthalene. They resemble natural waxes in appearance and also in so far as their water-resisting, inertness to chemicals and good electrical insulation properties are concerned, but in addition they are non-inflammable and can be obtained with melting point as high as 125° C. Seekay wax also possesses definite insecticidal and fungicidal properties. It is not merely a competitor of the natural waxes, but is a new product opening up new possibilities to wax users.

Difference Between Grades

Seekay wax is supplied in two qualities, *viz.*, "A" quality (dark brown to black in colour) and "R" quality (produced by refining "A" quality and pale yellow in colour). Each quality is available in several grades. The main difference in the grades lies in melting point, and the advantages which accrue when a choice over the wide range of 68° to 123° C. is possible will be appreciated. The different grades are made by slight adjustments in the manufacturing process, and differ a little in such physical properties as specific gravity, hardness and solubility. They are, nevertheless, fundamentally the same in general properties. The values given below are those for grade R93, but except for melting point they can be taken as representing fairly broadly the other grades of both A and R qualities :—

Melting point	90° to 95° C. (194° to 203° F.)
Boiling range at 1 mm. mercury pressure	143° to 190° C. (290° to 375° F.)
Specific gravity $d_4^{15^\circ}$	1.55
Specific heat : At 18° C.	0.202
At 110° to 120° C.	0.278
Latent heat of fusion	19.6 Cals /kg. (35.3 B.Th.U./lb.)

SOLUBILITY OF SEEKAY WAX R93 AT 16° C. (61° F.).

Gm. per 100 ml. of solution.	Solvent.
50 to 60	Trichlorethylene.
	Dichlorethylene.
40 „ 50	Benzene.
	o-Dichlorbenzene.
30 „ 40	Ethyl ether.
	Petrol.
	Creosote.
20 „ 30	Acetone.
	White spirit (b.r. 140° to 180° C.)
10 „ 20	Petroleum ether (b.r. 60° to 80°C.)
Up to 10	Amyl alcohol.
	Methylated spirit.
Nil	Water.

The results of the caustic soda and corrosion tests show that the chlorine in Seekay wax is fixed and is not liberated either as such or as acid on prolonged heating. Since it is resistant to alkalies and acids, the wax can be used for coating or impregnating such perishable materials as wood, textiles, etc., to render them resistant to attack.

Seekay wax is non-inflammable and can replace combustible paraffin wax in the electrical cable industry, bitumen in the roof felting industry, and can be incorporated in rubber to produce a flame-resisting material. Alternatively, it can be mixed with inflammable waxes or bitumens in order to reduce their inflammability. Further, it can be used on cellulosic materials for waterproofing, and at the same time it increases their flame-resistance.

High Melting Point

Paraffin waxes, etc., usually melt below 60° C. and are, therefore, unreliable when used in equipment destined for tropical climates. Seekay wax has a high melting point and will withstand *any* climatic condition and is of particular interest in connection with electrical equipment for tropical countries. It melts sharply to a mobile liquid of low viscosity and excellent penetrating powers, and its penetration into porous materials is markedly superior to that of most waxes or bitumens.

Seekay wax is insoluble in water and can be used in exactly the same way as other waxes for waterproofing textiles, paper, board, concrete and any porous material. It increases rather than decreases the flame-resistance of the material treated. It can be applied to wood, textiles, etc., in the molten state, or it can be sprayed on as a solution in a suitable solvent.

The wax is toxic to white ants and death watch beetles, and to certain fungi. Such materials as wood, millboard, leather, textiles, etc., are therefore rendered resistant to attack from these pests by impregnating (or in some cases, spraying) with the wax or its solutions. Being substantially odourless, non-poisonous and permanent, the wax is superior in many cases to arsenical or tar acid products for combating insect pests. It has already been used for insect- and fungus-proofing electrical cables and timber.

Other Properties

Miscibility with bitumens and other waxes is another exceptional property of Seekay wax. At the same time, it increases the resistance of the bitumen to weathering and avoids all trace of greasiness in the product. It is therefore valuable in the production of high-grade bituminous mixtures. It mixes with most natural waxes and can be used by admixture to modify the properties of these with respect to melting point, density, inflammability, etc. If necessary, the wax can be brightly coloured by the addition of suitable mineral pigments or soluble dyestuffs, both of which are obtainable from Imperial Chemical Industries, Ltd.

Any grade of Seekay wax can be emulsified but the standard emulsions are limited to two. Both emulsions are stable and can be diluted with warm water. They merit a trial for any problem connected with waterproofing, flameproofing, electrical insulation, insect pests, fungus, or wax or bitumen blending.

UNITED STATES production of flavours and perfume materials of coal-tar origin increased in 1933 to 3,159,000 lb. compared with 2,307,000 lb. in 1932, according to a report recently released by the United States Tariff Commission. Production and sales data for principal products in 1933 were as follows :—

	Total. lb.	Sales. lb.	Sales. $
Coumarin (synthetic) ...	140,512	124,054	300,819
Ethylsalicylate ...	401	320	290
Methyl salicylate ...	1,115,154	1,146,064	354,191
Vanillin	195,811	191,939	775,239
Total flavours ...	1,738,815	1,739,509	1,796,663
Acetophenone ...	—	3,738	3,717
Amyl cinnamic aldehyde ...	32,150	30,370	62,985
Cinnamic aldehyde ...	6,374	4,288	6,729
Total perfume materials	1,420,501	1,225,929	687,141

Unloading Tank Cars

Need for Safety Precautions

THE hazards of unloading tank cars which contain everything from helium gas to bulk cement, and from maple syrup and ice cream to aniline oil, were described before the Chemical Section at the 23rd annual Safety Congress and Exposition held at Cleveland, Ohio, during the first week of October.

Mr. A. C. White, Technical Sales Division, The Dow Chemical Co., said the increase in the use of tank cars for the transport of many products never before handled in this way has called for the establishment of new practices in loading and unloading such equipment. It should be remembered, even with so-called "harmless" loads, that " no tank car is ever empty," and it offers the same potential danger from its possible contents of explosive and suffocating gases that any other closed tank has. Only electric hand lanterns or flash lights should be used to inspect tank cars, either when empty or full, and if it is necessary to remove the manhole cover the opening should be covered with wet burlap or wet canvas to prevent possible ignition from sparks. No one should be permitted to enter a tank car, even after it has been thoroughly cleaned, unless wearing a fresh air hood or a hose and blower type of mask. The person entering the car should always wear a life belt provided with a strong life line and at least one helper should be stationed at the manhole as long as anyone is inside the car.

In general, continued Mr. White, it is always good practice to "ground" a tank car which is being loaded or unloaded. but in case of flammable solvents and such materials as gasoline, naphtha, benzol, etc., it is highly important that this be made part of the standard practice. He emphasised the need for extreme caution in thawing the contents of tank cars, a procedure often necessary because of freezing en route. He also urged that a shower bath, provided with a deluge head and operated by a quick opening valve, be installed on the ground level close to the unloading platform for emergency use from flames or acid burns.

Additions to the Free Lists

Nickel Powder, Flake and Hydroxide

THE Treasury, on the recommendation of the Import Duties Advisory Committee, has issued Import Duties (Exemptions) (No. 12) Order, 1934, adding to the Free List, as from October 24, nickel powder, nickel flake and nickel hydroxide.

Nickel in other forms than powder is already on the Free List. Manufacture of the metal in powder form has recently been established on the Continent, and the committee consider that it should be equally exempt from any duty. Nickel flake and nickel hydroxide are imported for use as the active ingredients of the positive plates of certain types of nickel alkaline storage batteries. There is no home production of the former material, while the small quantity of the latter made in this country is insufficient to meet requirements. The committee state that the cost of nickel flake and nickel hydroxide represents a substantial proportion of the total cost of manufacture of such batteries and that the existing duty handicaps manufacturers in competing with foreign-made batteries both in the home and export markets.

The Treasury Order (Cmd. 4719) is published by H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2, together with the recommendations of the advisory committee.

MEXICO ranks sixth among the world's largest producers of zinc, and therefore has ample supplies of metal for the production of zinc oxide. There are three concerns in the country manufacturing the pigment, and, according to a recent report, another firm will shortly begin the production of zinc oxide in the State of Nuevo Leon. Statistics covering imports of this pigment into Mexico are not obtainable, but domestic manufacturers supply the greater part of the demand. Shipments of zinc oxide to Mexico from the United States in 1933 totalled 145,628 lb. valued at $10,692.

Canadian Tariff Changes

Sizing Cream and Enamel Sizing

APPLICATION has been made to the Canadian Tariff Board by the Canada Starch Co., Ltd., of Montreal, to be heard on November 21 unless interested United Kingdom firms are desirous of opposing the application and request an adjournment, for the removal of the words " sizing cream and enamel sizing " from Item 255 of the Canadian Customs Tariff which covers " British gum, and dextrine, dry; sizing cream and enamel sizing," and for an increase in duty on dextrine. The Board has been instructed by the Minister of Finance to report on the Tariff status of the commodities covered by Item 255, and also to consider an application made in March, 1933, by a Montreal firm for revised rates of duty on ultra-dextrine. United Kingdom firms interested should communicate with the Department of Overseas Trade, 35 Old Queen Street, London, S.W.1 (Ref. No. 21369/61/33), as soon as possible.

Cereal or Starch Products

On November 21 the Canadian Tariff Board will hear an application by a Canadian maker of glues and pastes for the inclusion of the words " cereal or starch products which when ground only make an adhesive in cold water " in Item 232d of the Canadian Tariff, which at present imposes duties on " mucilage, casein and adhesive pastes," unless United Kingdom firms desire to oppose the application and request an adjournment.

The effect of the application, if granted, would be to alter the import duties on the products in question from 15 per cent. *ad valorem* to 17½ per cent. *ad valorem* and 2 cents per lb. under the British Preferential Tariff, from 25 per cent. *ad valorem* to 25 per cent. *ad valorem* and 2½ cents per lb. under the Intermediate Tariff, and from 25 per cent. *ad valorem* to 27½ per cent. *ad valorem* and 3 cents per lb. under the General Tariff.

Firms desiring to oppose the applications should communicate with the Department of Overseas Trade, 35 Old Queen Street, London, S.W.1 (Ref. No. 21369/60/33), as soon as possible.

Michael Faraday

A Biography

MICHAEL FARADAY was apprenticed to a bookbinder, but later developed a leaning towards science, and in 1813 he was engaged at the Royal Institution, which he continued to serve until he died at Hampton Court in 1867. Mr. Thomas Martin is to be congratulated for having succeeded in compressing a subject about which so much could be written, into so small a compass, and for presenting it in such readable form as that of " Faraday: A Biography " (Duckworth and Co., Ltd., pp. 143. 2s.). The layman will find it extremely interesting to observe the man Faraday through the medium of Mr. Martin's prose, the great intellect that could come from the laboratory after making a discovery which was to perhaps revolutionise electrical research, to join in the games and amusements of the younger generation, and the scientifically inclined will derive great interest from following the discoveries and aspirations of one of the greatest pioneers of scientific research.

TOTAL imports of lacquers into Japan for the first half of 1934 advanced to 1,414,200 kin (kin = 1.3 lb.) valued at 1,530,672 yen, from 1,246,900 kin valued at 1,428,783 yen for the first half of 1933. Varnish imports for the comparative months were, respectively, 34,744 kin valued at 26,660 yen and 39,687 kin valued at 33,610 yen.

THE total value of fertiliser imports into Kenya, Uganda and the Tanganyika Territory in 1933 was £17,630, a decline from the average of £25,000 for the two previous years. The decreased importation was due in part to the local manufacture and use of bone meal. A shipment of Japanese superphosphate was imported at about 30 per cent. below European prices.

Notes and Reports from the Societies

Society of Dyers and Colourists

Manchester Section : Kier Boiling Efficiency

THE inaugural meeting of the Manchester Section of the Society of Dyers and Colourists for the Session 1934-35 was held on October 19 in the Lecture Hall of the Manchester Literary and Philosophical Society, when Mr. L. G. Lawrie, A.I.C., presided.

Some observations on kier boiling efficiency, prepared jointly by Mr. F. Scholefield, M.Sc., F.I.C., and Dr. D. Ward, B.Sc., Ph.D., formed the subject of a paper presented by Dr. Ward. It was pointed out that the bleaching of cotton piece goods constituted the largest branch of the bleaching industry, and, briefly, comprised preparation of the grey cloth for the subsequent processes of dyeing, printing or finishing. The system of bleaching woven cotton goods ordinarily consisted of three operations: (1) The removal of the greater part of the starch introduced during the sizing operation—desizing. (2) The removal of fatty, waxy and other materials such as protein, pectins, etc.—kier boiling. (3) The removal of natural colouring materials present in the cotton—chemicking or bleaching proper.

Two Systems of Kier Boiling

Two systems of kier boiling were in general use. The older, known as the lime boil, was relatively elaborate. More recently, especially in the case of yarn and some cotton piece goods, this has been largely replaced by the caustic soda boil. It might be said, without reservation, that efficient kier boiling was the foundation of successful bleaching. It consisted briefly in boiling the goods with an alkaline solution, the operation being carried out in kiers, which might either be "open," in which the boil was carried out at atmospheric pressure, or closed, in which case the temperature corresponded to the steam pressure produced.

Apparently, during kier boiling, the natural oils, fats and waxes were in part saponified and in part emulsified, and their products removed from the cloth. These actions of saponification and emulsification further liberated mechanically entangled dirt. Dressing and sizing material left over by incomplete desizing were generally soluble in hot alkaline solution. No effort should be spared to make the boil complete. Badly boiled cloth was not only a source of trouble to the bleacher, but might frequently be the prime cause of fault in finished goods. Dealing with the desirable properties to be looked for in efficiently kier-boiled cloth, it was stated that the cloth should be of good appearance, and obviously should be free from the motes and seeds which were present in the grey cloth. If fats and waxes were left in at this stage, they subsequently protected the fibres from the action of chemick during bleaching. This made it necessary to use stronger bleaching solutions with the accompanying danger of over-bleaching and tendering.

Producing a Brilliant White

For the white trade, a bright permanent white possessing brilliance of tone was required. The cloth should be rendered uniform in its capacity for absorbing moisture, the presence of which in correct proportion had a most important bearing on the effect produced by many finishing processes. It should also be readily absorbent, so that stiffening and weighting ingredients used during finishing might be readily and uniformly applied. For certain finishes a content of fats and waxes of a low order was requisite. In general, it might be said that efficiently kier-boiled cloth should be as free from fatty and waxy matter as possible; possess as high an absorbency as possible, and be capable of producing a brilliant white on bleaching.

The object of the experiments described in this paper was primarily to assess the value of one of the new textile auxiliary products as an assistant for use during the caustic soda kier-boiling of grey cotton piece goods. For this purpose the product chosen was Lissapol A. Paste (Imperial Chemical Industries, Ltd.). The line of attack adopted in the first place was, briefly, to attempt to follow the actual progress of purification of the cloth by analysis of samples of the kier liquors taken from time to time during kier-boiling, and so to assess the value of Lissapol A. in terms of accelerating this process. The kier liquors might be analysed for oxidisable matter, for example, by potassium permanganate. It has been assumed by other workers, notably Viktoroff ("Melliand Textilberichte," 1931, *12*, 638) that when the degree of oxidisability becomes constant, the boiling process was virtually complete. Experiments carried out, using potassium dichromate as oxidising agent pointed strongly to the view, however, that this assumption was untenable, and this technique did not therefore afford a method of following the progress of boiling. Recourse had then to be made to examination of the kier boiled cloth. It was found that Lissapol A. exerted a distinctly favourable influence on a representative range of properties, improving the whiteness, ensuring low fat and wax content and increasing the wettability of the cloth.

The best practical concentration of Lissapol A. Paste for addition to the liquors was found to be approximately 0.2 per cent. calculated on the volume of solution used, although improved whites were found with as low a concentration as 0.05 per cent. The work described points the way to the commercial possibility of cutting out the chemicking and souring processes when the cloth was used for certain dyed shades, and of doing away with the necessity for a double boil in some cases where this had been customary in order to improve the whiteness and reduce the fat and wax content.

Royal Society of Arts

Cantor Lectures

DR. HERBERT DINGLE, D.Sc., A.R.C.S., D.I.C., assistant professor of astrophysics, Imperial College of Science and Technology, will deliver the Cantor Lectures, on November 19, 26, and December 3, each evening at 8 p.m., his subject being "Modern Spectroscopy." The first lecture will be dealt with The Spectra of Atoms (Fundamental principles. Brief historical survey. The rise of atomic theory. Relation of spectra to atomic structure. Extension into the extreme ultra-violet region. The Zeeman effect. Recent developments of atomic spectroscopy, showing the close interaction between theory and experiment. Hyperfine structure of spectrum lines. Brief non-technical outline of quantum mechanical interpretation of spectra); second lecture, The Spectra of Molecules (Description of band spectra. Early attempts at interpretation—Deslandres's work. Application of quantum theory to band spectra. Rotation, vibration and electronic changes in molecules, and their spectroscopic effects. Band spectra and isotopes. The Raman effect. Chemical aspect of the spectroscopy of molecules. Fluorescence and absorption spectra); third lecture, Applications of Spectroscopy Astronomical applications. Determination of chemical composition, radial velocities and temperatures of stars on empirical grounds. Applications of spectrum theory to problems of stellar atmospheres. Metrological applications of spectroscopy—the fundamental unit of length. Various industrial and other applications of spectroscopy).

Institution of Chemical Engineers

Texture and Chemical Resistance

A PUBLIC lecture on "Texture and Chemical Resistance" was delivered by Professor Cecil H. Desch, F.R.S., before the Institution of Chemical Engineers, on Friday, October 26, at the Institution of Civil Engineers, Westminster.

The resistance of materials of construction to attack by chemical agents, said Professor Desch, depends on their composition, both ultimate and proximate, and also on their texture. This is illustrated by the differences between the behaviour of wrought iron and mild steel, the attack of sulphates on limestone, and the action of hard and soft waters on concrete dams. On a finer scale, the resistance of metals and alloys to chemical attack is affected by the grain size,

the presence of cold-worked regions, the smoothness of the surface, and the directional effects of rolling and drawing. In steels, the distribution of the carbides and the size of their particles influences the rate of attack by acids, and similar instances are drawn from other alloys. The texture of the resisting or "stainless" steels to steam at high temperatures depends on the distribution of the compounds precipitated from the solid during heating.

Oxidising agents produce a thin skin on the surface of many metals, and this protects against further action or fails to protect, according to the texture of the oxide so formed. On a yet finer scale, certain classes of solids containing "giant molecules" have their chemical properties determined by the shape of those molecules, whether forming thin sheets, fibres, or a loose network; examples include graphite and other forms of carbon, textile fibres, and the zeolites. The study of texture, usually by means of the microscope, but also making use of many physical methods, is therefore an essential part of the study of chemically-resistant materials.

The Institute of Chemistry

September Examination Results

THE Institute of Chemistry has issued the following pass list relating to the September examinations:

Examination in General Chemistry for the Associateship: R. W. Ancrum, Rutherford Technical College, Newcastle-upon-Tyne; A. Aspa, A.M.C.T., College of Technology, Manchester; G. T. Baldwin, Sir John Cass Technical Institute, London; H. J. Bowcott, Central Technical College, Birmingham; H. Burman, A.M.I.Chem.E., The University, and Royal Technical College, Glasgow; G. R. Campbell, Royal Technical College, Glasgow; A. G. Fishburn, Ph.C., Technical College, Cardiff; H. R. Fleck, Sir John Cass Technical Institute, London; W. A. L. Fleming, Royal Technical College, Glasgow; A. H. O. Johnson, B.Sc. (Lond.), West Ham Municipal College, and Birkbeck College, London; W. Lee, College of Technology, Leeds, and Technical College, Bradford; J. H. McGill, Royal Technical College, Glasgow; A. F. Millidge, B.Sc. (Lond.), University College, Southampton; R. G. Minor, Ph.C., Technical College, Cardiff; A. Silvester, B.Sc., College of Technology, Manchester, and Northern Polytechnic, London; R. S. Watson, Royal Technical College, Glasgow, and Technical College, Paisley; W. Watson, Royal Technical College, Glasgow; W. R. Weigham, Central Technical College, Birmingham.

Examinations for the Fellowship: In Branch E: The Chemistry, including Microscopy, of Food and Drugs, and of Water: G. E. Boizot, B.Sc. (Lond.); A. E. Fletcher; H. McGowan, M.Sc. (Lond.), A.R.C.S.; P. H. Smith, B.Sc. (Lond.).

Society of Public Analysts

Discussion on Quantitative Spectroscopy

A MEETING of the Society of Public Analysts will be held on Wednesday, November 7, at the Chemical Society's Rooms, Burlington House, Piccadilly, W.1, at 8 p.m., for a discussion on "Quantitative Spectroscopy and its Analytical Applications." The discussion will be opened by Dr. J. J. Fox, who will be followed by Mr. F. Twyman (speaking on apparatus), Dr. S. Judd Lewis (on methods of spectroscopy), and Mr. D. M. Smith (on the application of spectroscopic methods to metals).

Joint Meeting with Food Group

A joint meeting with the food group of the Society of Chemical Industry will be held on Wednesday, November 14, at the Chemical Society's Rooms, Burlington House, Piccadilly, W.1, at 8 p.m., when the following papers will be read: "The Identification of Common Edible Sea Fish," by C. H. Hattersley (Chief Inspector, Fishmongers Company); "Fish Oils and their Vitamins," by Norman Evers, B.Sc., F.I.C.; "The Composition of Fish Pastes," by H. E. Cox, D.Sc., F.I.C.; "Notes on Fish Pastes," by H. E. Manley, M.A., F.I.C.; "Some Observations on the Amounts of Amines and Free Ammonia in Fish Products," by D. H. F. Clayson, B.Sc., F.I.C., and L. H. Lampitt, D.Sc., F.I.C.; "Some Observations on Methods of Estimating the Degree of Preservation of White Fish," by G. A. Reay, Ph.D. (Torry Research Station).

Chemical Engineering Group

Modern Cast Irons

A MEETING of the Chemical Engineering Group will be held in the rooms of the Chemical Society, Burlington House, Piccadilly, London, W.1, on Friday, November 9, at 8 p.m., when a paper on "Modern Cast Irons for Chemical Engineering Plant" will be read by Mr. J. G. Pearce, M.Sc., director of the British Cast Iron Research Association. Much progress has recently been made in the development of cast irons specially suited to the needs of chemical industry. The subject matter of this paper should therefore prove of the greatest interest to chemical engineers and provoke a lively and informative discussion. The chairman of the Group, Dr. W. R. Ormandy, will preside.

Cleanliness in the Brewery

An I.C.I. Exhibit at the Brewers' Exhibition

DETERGENT and sterilising agents for the brewing trade will be exhibited by Imperial Chemical Industries, Ltd., showing on Stand No. 40 and 47 at the International Brewers' and Allied Trades' Exhibition, to be held at the Royal Agricultural Hall, London, November 3-9.

The new detergent, "Lustros," combines three main functions. The first is the cleansing of bottles which have contained beer, cider, wine, aerated mineral waters or soft drinks. Several alkaline detergents are included in Lustros, each with a specific operation, the amount of caustic soda being so well calculated that whilst ample for cleansing purposes it avoids the "bloom" on the glass produced by larger quantities. Bottles to be shown on the stand will testify to the cleansing power of Lustros by their brilliant sparkle and freedom from all trace of "bloom," which not only spoils their appearance but tends to make their contents flat, tasteless and clouded. Its second function is germicidal, for Lustros will kill "wild yeast" spores and bacteria normally present in bottles and will prevent the formation of sediment, cloud and mould growths. A sterile bottle is essential in particular for the new pasteurised beers and the keep properties of these and practically all other bottled beverages are actually enhanced by the use of Lustros sterilised bottles. The third function of Lustros is that of a water-softener. No preliminary water-softening is necessary with this detergent and it can be used successfully with any water supply, from the softest to the hardest.

Results are equally satisfactory with any type of machine, whether the hand-operated "soaker" type or the mechanically-operated "spray" or "hydro" type. Lustros will be shown to be non-corrosive towards the metal parts normally employed in the construction of bottle-washing machines. There will also be exhibited paper labels removed from bottles by the use of Lustros in the modern "spray" type of machine without pulping, and a testing set used by bottlers to ensure that the detergent solutions in their machines are kept up to the requisite strength.

A second product to be exhibited is "Chloros," a sterilising agent for general use. Chloros is used for the cleansing and sterilising of fermenting vessels, yeast backs and squares, refrigerators, wort mains and rubber piping and carbonating plant; for bleaching and sterilising filter pulp; and for cleansing metal mash tuns and hop backs as well as bottles and plant of every description. A powerful deodorant, it is also useful for deodorising the water in pasteurising tanks and for treating screw bottle stoppers. It attacks organic matter and is effective in removing the accumulation of mould on malt house floors. Walls, floors and partitions when washed down with Chloros are freed from dirt, mould and dead yeast, while the same process prevents the growth of mould or fungus between joints. Chloros, moreover, is non-poisonous, and if used according to the makers' instructions will leave no smell after its work is done.

Continental Chemical Notes

Sweden

RADIUM DEPOSITS HAVE BEEN DISCOVERED in the Swedish province of Halland and are asserted to be comparable to Congo ores.

Norway

NORSK HYDRO ARE PLANNING to produce 500 grams of heavy water daily for sale at 10 Norwegian kronen per gram, a considerable reduction over the current American price.

NORWEGIAN INTERESTS have selected Notodden for the erection of a rayon factory, mainly owing to the availability of cheap electric power. Production is expected to commence about the middle or end of next year.

Russia

ATTEMPTS TO GASIFY PETROLEUM in some of the Russian oilfields have given promising results according to a report in "Metallbörse." Various methods of igniting the oil-bearing layers were tried out and a gas with high calorific value was obtained from which benzine and ligroin could be extracted. The investigations are being continued in a specially established department of the Russian petroleum industry.

Germany

THE RUHRGAS A.G., in 1933, produced 6,671 tons of sulphur from used gas-purifying masses. The annual German production of sulphur from this source is estimated at 10,000 to 12,000 tons, as compared with a total consumption of 40,000 to 50,000 tons.

CALCIUM CYANAMIDE can be used as a starting point for the manufacture of guanidine salts by a method recently described by H. Göckel ("Angew. Chem.," 1934, p. 555). In admixture with ammonium nitrate, the cyanamide is heated on a water bath for about 2 hours, the reaction mixture being then extracted with water and guanidine separated from calcium nitrate by fractional crystallisation

AN IMPROVED METHOD FOR RAPID DETERMINATION of the water vapour content of gases is described by Dr. H. Kahle in the "Chemische Fabrik," October 17. It is based upon condensation of the water vapour from a measured quantity of the gas in a tube cooled to a very low temperature, the separated water being estimated by measurement of its volume after evaporation. When suitably modified, the method is also applicable to the determination of traces of hydrogen and oxygen and of easily condensed gases like carbon dioxide and acetylene.

News from the Allied Industries

Rubber

THERE WAS A LARGE INCREASE in United Kingdom crude rubber stocks last week. The addition amounted to 3,722 tons, bringing the total up to 118,457 tons, which is the highest since May, 1932. This compares with 91,957 tons at the corresponding date last year.

Artificial Silk

THE ACCOUNTS OF NORTH BRITISH RAYON, LTD., for the year to June 30 last show a very small improvement in both trading and net profits, the latter figure being equivalent to 5 per cent. on the capital after meeting interest and providing £2,500 for stock reserve. This sum is more than sufficient to cover a loss arising from a reduction of 6d. per lb. in Excise during the current financial year. The directors attribute the continuance of small earnings to a lightning strike and to the unexpected reduction in selling prices at a time when demand was increasing. The directors say that the cut has led to disorganisation among consumers and that confidence has not yet been restored. It is also to be noted that the company has increased its plant by a net amount of £50,000 after deducting depreciation reserve, and advanced an additional £23,000 to a subsidiary.

Noe-Ferrous Metals

AUTHORITATIVE SOURCES IN BRUSSELS state that the difficulties of renewing the international agreement between the zinc producers are numerous. The principal difficulty lies in the fact that the cartel only fixes production, but has no power to fix prices, and certain producers are in a position to sell more than their quotas and to pay the penalties involved, owing to their lower costs.

THE CHIEF POINT OF INTEREST discussed at the meeting of the International Tin Committee at Brussels on October 22, was the possibility of admittance to the committee, in a consultative capacity, of representatives of consumer countries. England and the United States were given seats on the committee under this heading, although the French delegates submitted that certain restrictions should be enforced on this point. It was stated that consumption would shortly approximate output, but the question of reduction of quotas was postponed until the meeting in Paris on November 29.

Mineral Oil and Petrol

A FIRST DIVIDEND of 9s. 6d. in the pound will be paid in connection with the affairs of Blue Bird Petrol, Ltd., according to the current issue of the "London Gazette."

THE DIRECTORS OF THE MEXICAN EAGLE OIL CO. have decided to postpone consideration of the payment of the dividend on the first preference shares for the half-year ended April 30 last. The Canadian Eagle Oil Co. has similarly postponed consideration of the payment of dividends on its first preference shares for the same period. Payments are to be held up pending the hearing, by the Supreme Court of Mexico, of the Mexican company's appeal against the Tribunal Superior in the Amatlan case. The company was condemned by the Third Civil Court to pay approximately £1,000,000 to the Compania Petrolera Commercial in respect of oil extracted from Lot 113 Amatlan, to which must be added a substantial amount in respect of interest accruing since the date of the claim. The matter is now to be taken to the Supreme and final court, the appeal being based on the irregularities and violations of judicial procedure which the company alleges have taken place in the lower court.

Iron and Steel

EVIDENCE OF THE STEADY IMPROVEMENT in the steel and kindred trades of Great Britain is furnished in the announcement that the directors of Thomas Firth and John Brown, Ltd., of Sheffield, have decided to pay the arrears of dividend on the 600,000 (£1) 5 per cent. tax-free cumulative preference shares up to June 30, 1934. Payment will be made on November 12. This preference dividend was in arrear from December 31, 1930. Payment was made in June last of three years' arrears of dividend on the 6 per cent. cumulative preference shares up to December 31, 1933.

THE DIRECTORS OF INDUSTRIAL STEELS, LTD., have filed a formal declaration of solvency (*i.e.*, a declaration that, after full inquiry, they have formed the opinion that the company will be able to pay debts in full within twelve months from the commencement of winding-up). The authorised capital is £700,000 in £1 shares, of which, to April 12, 1934, 275,000 shares had been issued and fully paid up in cash. The company is controlled by the English Steel Corporation, a member of the Vickers group.

Weekly Prices of British Chemical Products

Review of Current Market Conditions

UNLESS otherwise stated the prices below cover fair quantities net and naked at sellers' works. There are no price changes to report in the markets for general heavy chemicals, rubber chemicals, wood distillation products, pharmaceutical and photographic chemicals, perfumery chemicals, essential oils and intermediates. The price of pyridine 90/140 has been reduced from 7s. 6d.—9s. to 7s.—8s. 6d. per gal.

LONDON.—There are no changes to report in the London chemical market, prices continuing firm. Prices of coal tar products are unchanged except for pitch which is quoted at about 52s. 6d. per ton f.o.b. East Coast port.

MANCHESTER.—Although actual forward buying on the Manchester chemical market during the past week has not been of substantial proportions by any means, a number of users are displaying a readier disposition to look ahead, and this has been reflected in the number of market "feelers." The general outlook seems to be for a continuation of steady to firm market conditions, and in very few market quarters indeed is the view entertained of any important price modifications in respect of the leading chemical products for delivery over the early part of next year. Meanwhile, old commitments are being drawn against by consumers in Lancashire fairly steadily, although there has been no pronounced improvement in conditions among textile users. In a number of other directions, however, the expansion of recent months has been maintained and a reasonably hopeful view is being taken.

SCOTLAND.—Business remains fairly steady in the Scottish heavy chemical market.

General Chemicals

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

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

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

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

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

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, 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. 0½d.

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 : 4¼d. to 5d.

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

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

CHROMETAN.—Crystals, 3½d. per lb.; liquor, £19 10s. per ton d/d.

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

CREAM OF TARTAR.—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. to 8s. 4d. per lb.

LAMPBLACK.—£45 to £48 per ton.

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

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 to £17 10s. per ton.

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

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

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

NICKEL SULPHATE.—£49 per ton d/d.

PHENOL.—8½d. to 8¾d. 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 : 99⅔/100%, powder, £37. MANCHESTER : £38.

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

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

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

POTASSIUM PERMANGANATE.—LONDON : 9¾d. per lb. SCOTLAND : B.P. crystals, 9d. MANCHESTER : B.P., 10d.

POTASSIUM PRUSSIATE.—LONDON : 8½d. to 8¾d. per lb. SCOTLAND : Yellow spot, 8½d. ex store. MANCHESTER : Yellow, 8½d.

SALAMMONIAC.—First lump spot, £41 17s. 6d. per ton d/d in barrels.

SODA ASH.—58% spot, £5 15s. per ton f.o.r. in bags.

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

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

SODIUM ACETATE.—£22 per ton. LONDON : £23.

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

SODIUM BICHROMATE.—Crystals cake and powder 4d. per lb. net d/d U.K. discount according to quantity. Anhydrous, 5d. per lb. LONDON: 4d. per lb. net for spot lots and 4d. per lb. with discounts for contract quantities. SCOTLAND: 4d. delivered buyer's premises with concession for contracts.

SODIUM BISULPHITE POWDER.—60/62%, £18 10s. per ton d/d 1-cwt. iron drums for home trade.

SODIUM CARBONATE (SODA CRYSTALS).—SCOTLAND: £5 to £5 5s. per ton ex quay or station. Powdered or pea quality 7s. 6d. per ton extra. Light Soda Ash £7 ex quay, min. 4-ton lots with reductions for contracts.

SODIUM CHLORATE.—£32 per ton.

SODIUM CHROMATE.—4d. per lb. d/d U.K.

SODIUM HYPOSULPHITE.—SCOTLAND: Large crystals English manufacture, £9 5s. per ton ex stations, min. 4-ton lots. Pea crystals, £14 10s. ex station, 4-ton lots. MANCHESTER: Commercial, £10 5s.; photographic, £15.

SODIUM META SILICATE.—£16 per ton, d/d U.K. in cwt. bags.

SODIUM IODIDE.—B.P., 6s. per lb.

SODIUM NITRITE.—LONDON. Spot, £18 to £20 per ton d/d station in drums.

SODIUM PERBORATE.—LONDON: 10d. per lb.

SODIUM PHOSPHATE.—£13 per ton.

SODIUM PRUSSIATE.—LONDON: 5d. to 5¼d. per lb. SCOTLAND: 5s. to 5¾d. ex store. MANCHESTER: 4¾d. to 5½d.

SULPHUR.—£9 15s. to £10 per ton. SCOTLAND: £8 to £9.

SODIUM SILICATE.—140° Tw. Spot £8 per ton. SCOTLAND: £8 10s.

SODIUM SULPHATE (GLAUBER SALTS).—£4 2s. 6d. per ton d/d SCOTLAND: English material £3 15s.

SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 15s. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER. £3 5s.

SODIUM SULPHIDE.—Solid 60/62% Spot, £10 15s. per ton d/d in drums; crystals 30/32%, £8 per ton d/d in casks. SCOTLAND: For home consumption, Solid 60/62%, £10 5s.; broken 60/62%, £11 5s.; crystals, 30/32%, £8 2s. 6d., d/d buyer's works on contract, min. 4-ton lots. Spot solid 5s. per ton extra. Crystals, 2s. 6d. per ton extra. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8 2s. 6d.

SODIUM SULPHITE.—Pea crystals spot, £13 10s. per ton d/d station in kegs. Commercial spot, £9 10s. d/d station in bags.

SULPHATE OF COPPER.—MANCHESTER: £14 to £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, 8 1/16d. to 8⅔d. per lb.; crude, 60's, to 2s. 2½d. per gal. MANCHESTER: Crystals, 7½d. per lb.; crude, 1s. 10d. to 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. 6½d.

CREOSOTE.—B.S.I. Specification standard, 4d. to 4½d. per gal. f.o.r. Home, 3⅜d. d/d. LONDON: 3½d. f.o.r. North; 4d. London. MANCHESTER: 3d. to 4d. SCOTLAND: Specification oils, 4d.; washed oil, 4¼d. to 4⅜d.; light, 4½d.; heavy, 4¼d. to 4½d.

NAPHTHA.—Solvent, 90/160%, 1s. 6d. to 1s. 7d. per gal.; 95/160%, 1s. 7d.; 99%, 11d. to 1s. 1d. LONDON: Solvent, 1s. 3½d. to 1s. 4d.; heavy, 11d. to 1s. 0½d. f.o.r. SCOTLAND: 90/160% 1s. 3d. to 1s. 3½d.; 90/190%, 11d. to 1s. 2d.

NAPHTHALENE.—Purified crystals, £10 per ton in bags. LONDON: Fire lighter quality, £3 to £3 10s.; 74/76 quality, £4 to £4 10s.; 76/78 quality, £5 10s. to £6. SCOTLAND: 40s. to 50s.; whizzed, 70s. to 75s.

PITCH.—LONDON: 52s. 6d. per ton f.o.b. East Coast port.

PYRIDINE.—90/140, 7s. to 8s. 6d. per gal.; 90/180, 2s. 3d.

TOLUOL.—90%, 1s. 10d. to 1s. 11d. per gal.; pure, 2s. 2d. to 2s. 3d.

XYLOL.—Commercial, 1s. 11d. to 2s. per gal.; pure, 2s. 1d. to 2s. 2d.

Intermediates and Dyes

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

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

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

ACID NAPHTHIONIC.—1s. 8d. per lb.

ACID, NEVILLE AND WINTHER.—Spot, 3s. per lb. 100%.

ACID, SULPHANILIC.—Spot, 8d. per lb. 100% d/d buyer's works.

ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.

ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.

BENZALDEHYDE.—Spot, 1s. 8d. per lb., packages extra.

BENZIDINE BASE.—Spot, 2s. 5d. per lb., 100% d/d buyer's works.

BENZIDINE HCL.—2s. 5d. per lb.

p CRESOL 34-5° C.—2s. per lb. in ton lots.

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

DICHLORANILINE.—1s. 11½d. to 2s. 3d. per lb.

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

DINITROBENZENE.—8d. per lb.

DINITROTOLUENE.—48/50° C., 9d. per lb.; 66/68° C., 01½d.

DINITROCHLORBENZENE, SOLID.—£72 per ton.

DIPHENYLAMINE.—Spot, 2s. per lb., d/d buyer's works.

α-NAPHTHOL.—Spot, 2s. 4d. per lb., d/d buyer's works.

β-NAPHTHOL.—Spot, £78 15s. per ton in paper bags.

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

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

o-NITRANILINE.—3ss. 11d. per lb.

m-NITRANILINE.—Spot, 2s. 7d. per lb., d/d buyer's works.

p-NITRANILINE.—Spot, 1s. 8d. per lb., d/d buyer's works.

NITROBENZENE.—Spot, 4½d. to 5d. per lb.; 5-cwt. lots, drums extra.

NITRONAPHTHALENE.—9d. per lb.; P.G., 1s. 0½d. per lb.

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

o-TOLUIDINE.—9½d. to 11d. per lb.

p-TOLUIDINE.—1s. 11d. per lb.

Nitrogen Fertilisers

SULPHATE OF AMMONIA.—Oct., £6 17s. 6d.; Nov., £6 19s.; Dec., £7; Jan., 1935, £7 2s.; Feb., £7 3s. 6d.; Mar./June, £7 5s.

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.

NITRATE OF SODA.—£7 12s. 6d. per ton for delivery to June, 1935.

NITRO-CHALK.—£7 5s. per ton to June, 1935.

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.

Latest Oil Prices

LONDON, Oct. 24.—LINSEED OIL was barely steady. Spot, £19 10s. (small quantities 30s. extra); Dec., £18 2s. 6d.; Jan.-April, £18 7s. 6d.; May-Aug., £18 12s. 6d., naked. SOYA BEAN OIL was quiet. Oriental (bulk), Oct.-Nov. shipment, £14 per ton. RAPE OIL was slow. Crude extracted, £27; technical, refined, £28 10s., naked, ex wharf. COTTON OIL was firm. Egyptian crude, £15; refined common edible, £17 15s.; deodorised, £19 5s., naked, ex mill (small lots 30s. extra). TURPENTINE was steadier. American, spot, 45s. 3d. per cwt.

HULL.—LINSEED OIL, spot, quoted £18 15s. per ton; Oct. and Nov.-Dec., £18 5s.; Jan.-April, £18 7s. 6d.; May-Aug., £18 12s. 6d., naked. COTTON OIL, Egyptian, crude, spot, £15 15s.; edible, refined, spot, £17 10s.; technical, spot, £17 10s.; deodorised, £19 10s., naked. PALM KERNEL OIL, crude, f.m.q., spot, £15, naked. GROUNDNUT OIL, extracted, spot, £23 10s.; deodorised, £27 10s. RAPE OIL, extracted, spot, £26; refined, £27 10s. SOYA OIL, extracted, spot, £15 10s.; deodorised, £18 10s. per ton. COD OIL (industrial), 25s. per cwt. CASTOR OIL, pharmaceutical, 36s.; first, 31s.; second, 28s. per cwt. TURPENTINE, American, spot, 47s. 3d. per cwt.

Books Received

Einfuhrung in die Lehre von den Kolloiden. By Prof. Dr. H. Bechhold. Dresden and Leipzig: Theodor Steinkopff. Pp. 160. RM 10.

Annuario Statistico dei Prodotti Chimici per l'Agricoltura. Anno 1933. XI. Vo. IV. (Statistical Yearbook of Chemicals for Agriculture). Roma: Federazione Nazionale Fascista Dell'Industria dei Prodotti Chimici per l'Agricoltura. Pp. 234.

"Gas!" The Story of the Special Brigade. By Major-General C. H. Foulkes. London: William Blackwood & Sons, Ltd. Pp. 361. 30s.

The Principles of Motor Fuel Preparation and Application. By Alfred W. Nash and Donald A. Howes. Vol. I. London: Chapman & Hall, Ltd. Pp. 538. 30s.

Institute of Chemistry. Register of Fellows, Associates and Students, 1934. London: Institute of Chemistry. Pp. 414.

Official Publications

Work of the Government Laboratory for the Year Ending March, 31, 1934. The Report of the Government Chemist. London: H.M. Stationery Office. Pp. 48. 9d.

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.

Aromatic Amines

DISCOLOURATION is prevented or retarded in liquid aromatic amines by the removal of dissolved oxygen therefrom by the replacement of the dissolved oxygen by an inert gas, *e.g.*, nitrogen (preferred), hydrogen or carbon dioxide. The displacement of the dissolved oxygen is preferably effected by bubbling the inert gas through the liquid amine, but any other convenient method may be employed to assist in the removal of the oxygen, *e.g.*, the amine may be heated or subjected to reduced pressure or both, prior to or during treatment with the inert gas. The process is applicable to the ertatment of aniline, ethylaniline, *o*-toluidine, *vic.*-*o*-xylidine, *p*-xylidine, dimethylaniline, *o*-anisidine, and *p*-phenetidine. (See specification 411,433 of Imperial Chemical Industries, Ltd.)

Extracting Paraffin Wax

PARAFFIN wax is separated from oils by diluting with liquefied hydrocarbons which are gaseous at atmospheric temperatures, and passing the mixture through pipes at a speed of at least 0.5 metre per sec. while cooling sufficiently to precipitate the wax. For example, 1.6 tons of cylinder oil which has been purified by liquid propane is diluted with 4.8 tons of liquid propane, and the mixture is led through a spiral pipe of 4 cm. diameter and 170 meters length at a mean speed of 2.5 meters per sec.; cooling from 20 to —10 deg. C. is effected in the first 95 meters by countercurrent exchange with the cold wax-free oil, and from —10 to —40 deg. C. in the last 75 meters by refrigeration. The cold mixture, now at practically atmospheric pressure, is centrifuged, filtered, or allowed to stand to separate the wax, and the cold oil used to cool fresh oil. (See Specification 411,866 of J. Y. Johnson).

Tanning Agents

PRODUCTS useful as tanning agents are prepared by condensing a sulphonated phenol with formaldehyde in the presense of a free ammoniacal base and in the presence or absence of a fixed alkaline substance. The phenolic component may be a sulphonated phenol or phenol homologue, a sulphosalicylic acid, a sulphonated naphthol, or a sulphonated condensation product of the type of *p*-dioxydiphenylmethane or *p*-dioxydiphenyldimethylmethane, or halogen derivatives thereof. The ammoniacal base may be ammonia, methylamine and its immediate homologues or the corresponding secondary amines, or amines containing one or more higher radicles such as cyclohexyl, dodecyl, or cetyl. The fixed alkaline substance may be caustic potash or soda, calcium hydroxide, potassium or sodium carbonate, or sodium acetate. (See specification 411,390 of J. Y. Johnson.)

Piperitone

PIPERITONE is isolated from essential oils containing it by forming its addition compound with orthophosphoric acid and decomposing the compound into its components. The addition compound contains one molecule of piperitone for each molecule of phosphoric acid; it is sparingly soluble or insoluble in the terpene constituents of essential oils, but is readily soluble in orthophosphoric acid. Racemisation of the piperitone may be avoided by operating at a low temperature, *e.g.*, 0-10° C., employing an excess of the phosphoric acid and keeping the time of contact of the reactants as short as possible. A solvent, such as a liquid hydrocarbon, may be present. The addition compound, or its solution in phosphoric acid, is decomposed by water into piperitone and a diluted acid which can be concentrated for re-use. (See Specification 410,813 of Howards and Sons, Ltd., J. W. Blagden and W. E. Huggett.)

Azo Dyes

INSOLUBLE dis- or poly-azodyestuffs are prepared by coupling diazo compounds and such coupling components as have two or more positions capable of coupling under the same conditions in the presence of an organic base of the pyridine series. The diazo compounds and the coupling components are free from groups which would impart solubility to the finished dyestuff. The dyes may be prepared on a substratum or on a fibre of vegetable origin such as cotton or regenerated cellulose or of animal origin such as silk or wool. In examples (1) cotton impregnated with a solution of di(*p*-creosotinic acid)-benzidide containing caustic soda, sodium chloride and turkey red oil is treated with a neutralised solution of diazotised 4-chloro-2-aminodiphenylether containing pyridine to yield a brown tint; (2) cotton impregnated with an alkaline liquor containing di-(2 : 3-oxynaphthoyl)-dianisidide is treated with a solution of diazotised *o*-aminoazotoluene to yield a bordeaux tint. (See Specification 410,669 of Societe of Chemical Industry in Basle.)

Foam Producing Agents

ALDOL condensation products, suitable for use inter alia as foam or froth producing agents, are obtained by treating an aldol, in presence of water, with an amount of an alkali only sufficient to maintain the mixture just alkaline to phenolphthalein during the reaction. The water is preferably, wholly or in part, the waste water from a previous condensation. The duration of the reaction is controlled by regulation of the temperature and/or of the concentration of the alkali solution added. In an example, 6-8 litres of commercial acetaldol (which is acid to phenolphthalein) is diluted with 3-4 litres of water, 35-40 grams of caustic soda in the form of a 30 per cent. aqueous solution are added and the mixture is warmed to 45° C. to start the condensation, whereafter further rise of temperature is prevented; the mixture is then allowed to stand, the top aqueous layer is drawn off for use in further reactions, and the orange resinous liquid lower layer is the required product of an average molecular complexity C_{12}. (See specification 411,483 of Distillers Co., Ltd., J. V. Eyre and H. Langwell).

Complete Specifications Open to Public Inspection

RUBBER VULCANISATION.—Rubber Service Laboratories Co. April 11, 1933. 6643/34.

COPPER-ZINCONIUM ALLOYS.—Dr. W. Guertler. April 13, 1933. 8621/34.

LACTONES OF 3-KETO-ACIDS of the sugar series, manufacture.—T. Reichstein. April 10, 1933. 9266/34.

ALKYLOLAMINE SOAPS and related products, treatment.—W. J. Hund and L. Rovenstein. April 11, 1933. 9457/34.

AZO DYESTUFFS, manufacture.—I. G. Farbenindustrie. April 15, 1933. 10798/34.

PRODUCTS CONTAINING CHLORINATED RUBBER, manufacture.—I. G. Farbenindustrie. April 11, 1933. 10823/34.

POLYNUCLEAR COMPOUNDS, manufacture.—E. I. du Pont de Nemours and Co. April 10, 1933. 10841/34.

HYDROGENATED HETEROCYCLIC NITROGEN COMPOUNDS, manufacture.—E. I. du Pont de Nemours and Co. April 11, 1933. 10988/34

NAPHTHYLAMINESULPHONIC ACIDS, manufacture.—E. I. du Pont de Nemours and Co. April 11, 1933. 10989/34.

DYEING ANIMAL FIBRES.—Soc. of Chemical Industry in Basle. April 12, 1933. 11064/34.

COATING OF ARTICLES with rubber.—I. G. Farbenindustrie. April 13, 1933. 11070/34.

HYDROGENATION PRODUCTS of the follicle hormone, method for the production.—Schering-Kahlbaum A.-G. April 13, 1933. 11071/34.

LACTIC ACID AND ITS SALTS, purification.—Grasselli Chemical Co. April 13, 1933. 11173/34.

FLOTATION OF ORES.—Imperial Chemical Industries, Ltd. April 13, 1933. 11175/34.

QUATERNARY AMMONIUM COMPOUNDS and preserving and disinfecting media containing the same, manufacture.—I. G. Farbenindustrie. April 13, 1933. 11237/34.

SUBSTANTIVE DYESTUFFS, manufacture.—I. G. Farbenindustrie. April 13, 1933. 11240/34.

ORGANIC CONDENSATION PRODUCTS and their manufacture.— E. I. du Pont de Nemours and Co. April 14, 1933. 11427/34.

CUPRAMMONIUM ARTIFICIAL SILK, manufacture.—British Bemberg, Ltd. April 15, 1933. 11457-8/34.

MERCERISATION PROCESSES.—I. G. Farbenindustrie. April 15, 1933. 11463/34.

REACTION PRODUCTS, manufacture.—I. G. Farbenindustrie. March 2, 1932. 28945/34.

REACTION PRODUCTS, manufacture.—I. G. Farbenindustrie. March 2, 1932. 29058/34.

GOLD AND SILVER ZIRCONIUM ALLOYS.—Dr. W. Guertler. April 13, 1933. 29257/34.

Specifications Accepted with Dates of Application

PHARMACEUTICAL PREPARATIONS, manufacture and production.—J. Y. Johnson (I. G. Farbenindustrie). Dec. 29, 1932. 417,715.

DISTILLATION OF TAR.—E. A. Davies. March 7, 1934. 417,652.

SPONGY INDIARUBBER and other substances, manufacture.—Hilton, Waliace and Co., Ltd., and A. Whitehead. April 5, 1933. 417,857.

CONDENSATION AND POLYMERISATION PRODUCTS of hydrocarbons, manufacture and production.—J. Y. Johnson (I. G. Farbenindustrie). April 5, 1933. 417,659.

NAPHTHALENE DERIVATIVES.—Imperial Chemical Industries, Ltd., M. Wyler and R. W. Kersey. April 7, 1933. 417,861.

SEPARATION OF CARBONIC ACID from gases containing the same.—I. G. Farbenindustrie. April 12, 1932. 417,669.

ANHYDROUS ALKALI SULPHIDES, process for the manufacture.—I. G. Farbenindustrie and Dr. H. Wolff. April 10, 1933. 417,670.

INDIGO DERIVATIVES.—Imperial Chemical Industries, Ltd., A. Davidson and C. H. Lumsden. April 10, 1933. 417,862.

CARBAZOLE COMPOUNDS, process for the manufacture.—I. G. Farbenindustrie. April 13, 1932. 417,794.

CELLULOSIC COMPOSITIONS.—British Celanese, Ltd. April 16, 1932. 417,871-2.

DYESTUFFS OF THE GALLOCYANINE SERIES, manufacture.—I. G. Farbenindustrie. April 14, 1932. 417,875.

MODIFIED POLYHYDRIC ALCOHOL-POLYBASIC ACID RESINS and coating and moulding compositions manufactured therefrom, manufacture.—E. I. du Pont de Nemours and Co. April 16, 1932. 417,877.

TITANIUM PIGMENTS, production.—Titan Co., Inc. Oct. 28, 1932. 417,699.

ABSOLUTE ALCOHOL, production.—J. McGlashan. Feb. 3, 1934. 417,755.

DESTRUCTIVE HYDROGENATION of carbonaceous materials and the recovery of oils from the residues of said treatments.—International Hydrogenation Patents Co., Ltd. April 29, 1933. 417,757.

CONVERTING CARBON MONOXIDE with steam, process.—Oesterreichisch Amerikanische Magnesit A.-G. March 24, 1933. 417,829.

CRYSTALLINE SUGAR from wood sugar solutions, process for making.—Holzhydrolyse A.-G. April 7, 1933. 417,834.

Applications for Patents

(October 11 to 17 inclusive.)

DIACETONE ALCOHOL, production.—British Industrial Solvents, Ltd., and E. C. Craven. 29591.

AZO DYESTUFFS, manufacture.—A. Carpmael (I. G. Farbenindustrie). 29640.

BUTYL ALCOHOL by fermentation, production.—Commercial Solvents Corporation. (United States, March 8.) 29131.

CALCINING DIATOMACEOUS EARTH.—Dicalite Co. (United States, March 29.) 29470, 29471.

ORGANIC CHEMICAL SUBSTANCES, manufacture.—H. Dreyfus. 29119.

SEPARATION OF GASEOUS MIXTURES, etc., by rectification.—M. Fränkl. (Germany, Oct. 14, '33.) 29499.

ACID WOOL DYESTUFFS, manufacture.—W. W. Groves (I. G. Farbenindustrie). 29582.

CONDENSATION PRODUCTS containing nitrogen and sulphur, manufacture.—W. W. Groves (I. G. Farbenindustrie). 29708.

HETEROCYCLIC HYDROXY COMPOUNDS, manufacture.—I. G. Farbenindustrie. (Germany, Oct. 12, '33.) 29310.

PIGMENTS, manufacture.—I. G. Farbenindustrie. (Germany, Oct. 14, '33.) 29363, 29364.

PYRIDINE DYESTUFFS, manufacture.—I. G. Farbenindustrie. (Germany, Oct. 18, '33.) 29709.

DELUSTRING TEXTILE MATERIALS, ETC.—Imperial Chemical Industries, Ltd. 29237.

SOLIDIFICATION OF MOLTEN SULPHUR.—Imperial Chemical Industries, Ltd., and W. Russell. 29238.

RECOVERY OF SULPHUR DIOXIDE from gas mixtures.—Imperial Chemical Industries, Ltd., A. M. Clark and D. Tyrer. 29632, 29633.

DYESTUFFS, manufacture.—J. Y. Johnson (I. G. Farbenindustrie). (May 29, '33.) 29275.

OLEFINES from gaseous hydrocarbons, manufacture.—J. Y. Johnson (I. G. Farbenindustrie). 29454.

RECOVERY OF PHENOLS from aqueous solutions.—J. Y. Johnson (I. G. Farbenindustrie). 29455.

AZO DYESTUFFS, manufacture.—J. Y. Johnson (I. G. Farbenindustrie). 29457.

CONDENSATION PRODUCTS FROM UREA, etc., manufacture.—W. Kraus. (Nov. 25, '33.) 29318.

PIGMENTS.—Krebs Pigment and Color Corporation. (United States, Oct. 16, '33.) 29520.

MAKING EMULSIONS.—Lancaster Processes, Inc. (United States, Oct. 12, '33.) 29284.

PECTOUS MATERIAL, manufacture.—Mutual Citrus Products Co., Inc. (United States, Oct. 16, '33.) 29304, 29305.

COLD SOLUBLE STARCH PRODUCTS, preparation.—Naamlooze Vennootschap Chemische Fabriek Servo and M. D. Rozenbrock. (Holland, Oct. 23, '33.) 29749.

CONTROLLING VISCOSITY of liquids.—Peabody, Ltd. (Peabody Engineering Corporation). 29371.

POWDERED METALS, production.—R. W. Rees. 29255.

2-KETO-LAEVO-GULONIC ACID, manufacture.—T. Reichstein. (Switzerland, Oct. 25, '33.) 29513.

LAEVO-ASCORBIC ACID, manufacture.—T. Reichstein. Switzerland, Oct. 25, '33.) 29514.

LAEVO-ASCORBIC ACID, manufacture.—T. Reichstein. (Switzerland, Dec. 9, '33.) 29515.

LIME ALUMINATES, treatment.—J. C. Seailles. (Luxembourg, Nov. 29, '33.) 29483.

MIXED POLYVINYL RESINS.—Shawinigan Chemicals, Ltd. (Canada, Nov. 25, '33.) 29107.

INTERMEDIATE PRODUCTS, manufacture.—Soc. of Chemical Industry in Basle. (Switzerland, Oct. 17, '33.) 29151.

CELLULOSE ACETATE soluble in acetone, production.—A. H. Stevens (Berl). (Dec. 5, '33). 29130.

CHLORINATION PRODUCTS OF CAOUTCHOUC, producing.—Thurn and Beschke Komm-Ges. (Czecho-Slovakia, Nov. 9, '33.) 29170.

Forthcoming Events

Oct. 29.—Chemical Club. 26th annual general meeting. 8 p.m. 2 Whitehall Court, London, S.W.1.

Oct. 29.—Society of Chemical Industry (Yorkshire Section and Road and Building Materials Group). "Asphaltic Bitumen Emulsions for Road Purposes." Dr. F. H. Garner. 7.15 p.m. Chemistry Lecture Theatre, University, Leeds.

Oct. 30.—Society of Dyers and Colourists (Bradford Junior Branch). "Carbonising and Dyeing of Woollens." Dr. L. L. Lloyd.

Oct. 30.—Institute of Chemistry (Edinburgh Section). "Headquarters." R. L. Collett. 7.30 p.m. North British Station Hotel, Princes Street, Edinburgh.

Oct. 30.—Hull Chemical and Engineering Society. "Thixotropy in Paints and Enamels." J. Pryce Jones. 7.45 p.m. Room 51, Municipal Technical College, Park Street, Hull.

Oct. 30.—Institute of Chemistry (Leeds Area Section). Joint meeting with the Leeds University Chemical Society. "Production of Monel Metal," and "Fabrication of Acid-resisting Steel Plant" (Films). 5.30 p.m. "Recent Developments in the Application of Petroleum Gases," Dr. A. E. Dunstan. 7 p.m. Chemistry Lecture Theatre, University, Leeds.

Nov. 1.—Royal Society. The John Murray Expedition. Opening address by Lieut.-Colonel R. B. Sewell, F.R.S. 4.30 p.m.

Nov. 1.—Society of Dyers and Colourists (Huddersfield Section). Joint meeting with Huddersfield Technical College Jubilee Celebrations. "Fifty Years of Dyeing." Sir Joseph Turner.

Nov. 1.—Society of Chemical Industry (Bristol Section). "Spectrum Analysis." Dr. S. Judd Lewis. Joint meeting with the Chemical Society. 7.30 p.m. University, Woodland Road, Bristol.

Nov. 1.—The Chemical Society. Ordinary Scientific Meeting. 8 p.m. Burlington House, Piccadilly, London.

Nov. 1.—Institution of the Rubber Industry (Preston and District Section). "The Artificial Ageing of Rubber." H. Jackson. Victoria and Station Hotel, Preston.

Nov. 1.—Society of Chemical Industry (Plastics Group and Glasgow Section) and Institute of Chemistry (Glasgow Section). "Impregnation." W. Bain. 7.30 p.m. Royal Technical College, Glasgow.

Nov. 2.—Society of Dyers and Colourists (London Section). "Colour Measurement." Tintometer, Ltd.

Nov. 2.—Royal Institution. "Elements and Isotopes." F. W. Aston. 9 p.m. 21 Albemarle Street, London.

Nov. 2.—Manchester Chemical Societies. "Heavy Water." Professor M. Polanyi. Geographical Society's Rooms, The Textile Institute, St. Mary's Parsonage, Manchester.

Nov. 2.—British Association of Chemists (Scottish Section). "Photosynthesis of Carbohydrates." Professor E. C. C. Baly. 7.30 p.m. Royal Technical College, Glasgow.

Nov. 3.—The Chemical Society. Joint meeting with the Science Masters' Association. "The Teaching of Chemistry." Discussion, opened by S. V. Brown. 3 p.m. Chemistry Lecture Theatre, University, Liverpool.

From Week to Week

AN INCREASE IN SHIPMENTS OF CHINA CLAY from the port of Fowey during the last few weeks has resulted in a degree of activity unknown for some time. Included in the shipments was one for Bombay.

MR. JOHN ARTHUR CLEMENTS, F.I.C., at one time chief chemist to the Sheepbridge Coal and Iron Co., Ltd., has died at Chesterfield, aged 45. Since the war he has been engaged at the Brown-Firth Research Laboratory in Sheffield, where he had taken an important part in the development of corrosion-resisting steels.

THE AGRICULTURAL DEPARTMENT OF THE BOMBAY GOVERNMENT has published results of experiments which have been carried out with artificial manures. Sulphate of ammonia has proved to be of the greatest value for rice and sugar cane. Nitrate of soda has been of considerable advantage and calcium cyanamide has given fairly good results. Sulphate of potash and rock phosphate are also being used with moderate success.

A PARTY OF FUEL EXPERTS was granted the privilege of visiting the Cannock plant of the National Coke and Oil Co., on October 18. The Cannock process makes use of cheap slack and dust. The dust is reduced to powder and mixed with coal oil. The mixture is fed into a tubular retort heated to a temperature that makes it give off light vapours. The residue is a smokeless fuel, claimed to be suitable for many industrial purposes. When the vapours are collected, they are condensed and the liquid is then treated very much as raw crude oil. The products are a light motor spirit, said to be comparable to benzol, and a heavier oil.

WITH REFERENCE TO THE IMPOSITION of restrictions on the import of certain fertilisers into France and certain French colonies, the French "Journal Officiel" has announced that licences for these goods will be issued to cover the period May 1 to the following April 30, and importers will be granted quotas in respect of this period equal to the following percentages of their imports during the period April 1, 1933, to March 31, 1934, viz.:—Superphosphates —36 per cent. Basic phosphates and precipitated phosphates—60 per cent. Carbonate of potash and caustic potash—80 per cent. Other phosphatic and potassic products—40 per cent. In addition, an annual quota of 5,000 metric tons of superphosphates is put at the disposal of the Ministry of Agriculture for allocation.

BY MEANS OF SOLID CARBON DIOXIDE it is easy to lower the temperature of a piece of metal to 100 deg. below zero on the Fahrenheit scale. At this temperature, the metal contracts considerably and so the workman can obtain a good "shrink fit." Mr. W. H. Swanger of the United States Bureau of Standards, who has been conducting experiments with solid carbon dioxide, reports that machine shop practice may come to accept this new method of shrinking metals. When a metal band has to be slipped round a shaft it is necessary to heat it, and as it cools it contracts to a tight fit. Instead of doing this it should be possible to refrigerate the shaft, causing it to contract and thus enabling the band to be slipped in place; when the shaft warms to room temperature a tight fit will then be secured.

THE COUNCIL of the Finsbury Technical College Old Students' Association, this year, is as follows: President, Dr. J. Vargas Eyre; immediate past president, Mr. H. D. Symons; ordinary members of council, Messrs. H. W. Gregory, E. W. Moss and R. W. L. Clarke; secretary, Mr. F. R. C. Rouse; treasurer, Mr. W. B. Thompson. The annual dinner will take place at the Trocadero, on March 9, 1935. The Association holds informal dinners during the winter months, usually at Stone's restaurant, on the third Wednesday in each month. Notices of these informal dinners are sent only to members who ask for them. Recently, arrangements have been made by which old students of Finsbury College may join up with the Old Centralians, the sister City and Guilds College. Further information can be obtained from the hon. secretary, Mr. F. R. C. Rouse, 15 Clifton Gardens, Golders Green, London, N.W.11.

RESULTS OF TESTS EXTENDING OVER FIVE YEARS to find the best means of preserving the bright steel parts of stored machinery from rust, are described in a report issued by the Department of Scientific and Industrial Research (Stationery Office, price 6d.). These tests, which were supervised by the National Physical Laboratory, showed that the most satisfactory and economical method is to coat the metal parts with partially refined lanolin, which is prepared from wool grease and is a waste product of the wool-combing industry. Crude lanolin, sufficiently refined for the purpose, can be obtained at about £15 per ton. The method of use recommended is to dissolve the lanolin in white spirit or solvent naphtha —7.8 lb. of lanolin dissolved in a gallon of white spirit, or 8.3 lb. dissolved in a gallon of solvent naphtha. This quantity, applied to the metal with a soft brush, will cover about 1,200 square feet of surface. Under ordinary storage conditions, the recommended coatings are a sufficient protection against rusting over a period of five years, even when the coated pieces are frequently handled. During storage in a badly corroding atmosphere, as, for example, in an ammonium nitrate shed, satisfactory protection is given for three years, the probable loss being less than 3 per cent. if the pieces are not handled during storage.

MR. T. GREENSMITH, of Eckington, late managing director of J. and G. Wells, Eckington Collieries, near Sheffield, director of the British Tar Products, and the Kallamarsh Gas Light and Coke Co., left £43,484 (net personalty £38,187).

DR. C. HERBERT THOMPSON, consulting industrial chemist, of Severn Grange, Worcester, died on October 18. He had considerable business interests in the production of colours, enamels and perfumes, but recently his principal connection was with the firm of Thompson, L'Hospied and Co., of Stourbridge and Worcester.

PARTICULARS OF THE QUANTITY OF MOTOR SPIRIT entered for home consumption are given in this week's "Board of Trade Journal." They show an aggregate figure of 879.6 million gallons for the first nine months of 1934, an increase of around 54,000,000 gallons on the comparable 1933 total.

PRODUCTION OF RAYON YARN and waste for the month of September amounts to 7,550,000 lb., compared with 5,700,000 lb. in August, and 8,100,000 lb. in September, 1933. Given as a percentage of 1924 production, the September production works out at 338. The average of the July-September quarter of this year is, for seasonal reasons, below the averages of the two previous quarters.

A MEMORIAL TO CARL DANIEL EKMAN, the originator of the sulphite pulp process of paper manufacture, who died in 1904, has been unveiled in Northfleet Cemetery by Consul T. Lundgren, the managing director of the Swedish Cellulose Association. The sulphite pulp industry has now developed into one of the world's greatest industries, with an annual output of about six million tons, valued at approximately £50,000,000.

SIR ERIC HAMBRO'S PROVISION OF £100,000 and Mussolini's desire for a low temperature carbonisation process to adapt English coal on the Italian State Railways were discussed before Mr. Justice Branson in the King's Bench Court, on October 8, when Salerni Carbonisation Process, Ltd., claimed from the British Coal Refining Process, Ltd., £999 advanced to the defendant company. There was a counter-claim in respect of £2,500, which the defendants said was advanced to the plaintiff company.

THE GERMAN POTASH SYNDICATE has decided to reduce domestic prices by 11 to 38 per cent., according to grade, in an endeavour to stimulate domestic consumption. This reduction is the first since the one imposed in December, 1931, which brought domestic prices to a level of about 15 per cent. below the 1929 level. At the same time the large number of grades of potash fertilisers has been reduced to only five, while uniform freight rates to be paid by domestic consumers have been established. Unsatisfactory export results are clearly shown by the fact that German exports of potash during the first eight months of 1934 declined to Rm.12,351,000, compared with Rm.13,066,000 during the corresponding period a year ago.

New Companies Registered

Nemlin Chemicals, Ltd., Nemlin Distillery, Bradley Fold, Bolton. Registered October 10. Nominal capital £2,500. Chemists, druggists, drysalters, and oil and colour men, manufacturers of and dealers in chemicals and other preparations and articles, tar pitch, manures, oils, paints, pigments and varnishes, paint and colour grinders, dye and gas makers, etc. Directors: Harold Yates, Christopher Lord.

Robert Bowran and Co. (1934), Ltd., 4 St. Nicholas Buildings, Newcastle-upon-Tyne.—Registered October 1. Nominal capital £30,000. To acquire the undertaking, assets and liabilities of Robert Bowran and Co., Ltd., and to carry on the business of manufacturers of and dealers in paints and varnishes, formerly carried on by the said company, and that of manufacturers of and dealers in enamel, polish, lacquer, oils, turpentine, turpentine substitutes, colours, waxes, brushes, hollow-ware, and similar goods, painters, decorators, etc. Directors: James Bowran, John W. Craggs, John J. R. Eynon, John R. McEune, David S. Bowran.

Titan Soap (Dublin), Ltd.—Registered in Dublin on October 8. Capital £100. To carry on the business of dealers in and brokers, manufacturers and refiners of oils, tallows, greases, lard and its compounds, etc. Directors: John J. Hannan, 9 Pembroke Road, Dublin; Peter McCarthy, "Rosheen," 35 Orwell Park, Rathgar, Dublin.

United Ebonite Manufacturers, Ltd.—Registered as a "private" company on October 11. Nominal capital £50,000. To carry on the business of manufacturers of and dealers in ebonite and all substances and materials containing or capable of producing the same, chemists, mine owners, electrical and mechanical engineers, manufacturers and distributors of electricity, manufacturers of and dealers in natural and artificial rubber, cork, leather, vulcanite, mica and celluloid and like substances. A subscriber: Frederick A. Jones, 28 Ryde Vale Road, S.W.12.

Company News

Cross Bone Manure and Lime.—The report for the year ended June 30, 1934, shows a net profit of £2,658, adding £1,078 brought forward to make £3,736. The directors recommend £500 be written off formation expenses, £500 written off goodwill, £500 transferred to general reserve, and £2,236 carried forward.

Irish Sugar Co.—The trading profit for the period ended April 30, after charging all manufacturing and selling expenses, including directors' remuneration and taxation, is £131,551; deducting depreciation written off Carlow factory £55,781, reserve for improvement and repairs £10,000, preliminary and formation expenses £10,982, and debenture issue expenses £10,527, there remains a balance of £14,260, which the directors recommend be carried forward.

North British Rayon.—The report for the year to June 30, 1934, shows a net profit of £9,747 (£9,658); adding balance forward, £12,482, this gives £22,229. It is proposed to appropriate £2,500 to stock reserve, carrying forward a balance of £19,729. Development of plant and extension of buildings at Jedburgh have continued during the year with corresponding increase of capacity, benefits of which may be expected to be realised during the new financial year. Meeting, Incorporated Accountants' Hall, London, W.C.2, November 1, at 12 noon.

Electrolytic Zinc Co. of Australia.—The cabled summary of the report for the year ended June 30 refers to the further improvement of trade in Australia, which is resulting in an increased demand for zinc. After transferring the usual amount of £145,000 to depreciation reserve, the gross profit for the year is returned at £285,732, which is approximately the same as for the previous year. Two years' accumulated fixed dividends on the 8 per cent. participating preference capital are charged against the year's net profit, leaving £73,081 to be carried forward.

Explosives and Chemical Products.—The net profit to June 30 is £15,001 (£11,916), plus £22,204 brought in; dividend on ordinary shares, 16⅔ per cent., tax free (same); deferred shares 5.9124d. per share, tax free (6.0717d.); carrying forward £27,074. Dividends were payable October 25.

British Match Corporation.—An interim dividend of 2 per cent., tax free, has been declared. The corporation owns all the ordinary shares of Bryant and May and all the issued shares of Bryant and May (Brazil) and J. John Masters and Co., and has other match interests. The distribution is the same as that made a year ago, which was followed by a final dividend of 4 per cent., tax free, making a total of 6 per cent., tax free.

Chemical Trade Inquiries

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

Argentina.—The Commercial Counsellor to H.M. Embassy at Buenos Aires reports that the Argentine State Oilfields is calling for tenders (Tender No. 2725), to be presented in Argentina by November 20, 1934, for the supply of 12,000 kgs. of prepared, bituminous, anti-corrosive paint and 3,000 sq. metres of tarred paper (rag felt) for protecting pipes in nitrous earth areas. (Ref. B.Y.7916.)

Argentina.—The Commercial Counsellor to H.M. Embassy at Buenos Aires reports that the Argentine State Railways Administration is calling for tenders, to be presented in Buenos Aires by November 19, 1934, for the supply of aluminium, antimony, tin, iron, lead, phosphor-copper and zinc ingots. (Ref. G.Y. 14412.)

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PATENTS obtained, trade marks and designs registered, at home and abroad.—GEE AND CO. (Patent and Trade Mark advisers to THE CHEMICAL AGE), 51-52 Chancery Lane, London. W.C.2. Telephone: Holborn 1525. Established 1905.

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THE Proprietor of British Patents Nos. 276,190, dated October 25, 1926, and 277,537, dated January 10, 1927, relating to "A Method of Making Sound Silicon Iron," and "A Method of Producing High Grade Silicon Iron," respectively, is desirous of entering into arrangements by way of a licence or otherwise on reasonable terms for the purpose of exploiting the above patents and ensuring their practical working in Great Britain. Enquiries to B. Singer, Steger Building, Chicago, Illinois.