The Chemical Age

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Notes and Comments

The Constructor in Industry

THE article on this subject which we publish to-day deserves the closest attention from all who direct the destinies of industry. We do not single out the chemical industry for especial mention in this instance, although our industry is equally concerned with others—the points put forward strike to the root of the whole of industry.

There are many to whom research is a second nature; they are to be found in Government departments or in universities, for the most part engaged upon pure research. Commercial men cannot permit research—, with certain exceptions upon which we have commented in past months—unless the financial balance sheet is likely to be improved thereby. The age of specialisation in which we live makes it almost inevitable that one man shall be content with one job. The man who so brilliantly operates a chemical plant in many instances could not build one, and, except in a general sense, certainly could not design one. Manufacturers of gas, electricity, steam, and chemicals, rely upon constructional firms to build plant and machinery for them. Constructors exist to do this service and cannot exist unless industry will allow them to charge sufficient for the plant to pay the necessary expenses. Our contributor's case is that whilst it may appear good business to pay as little as possible for plant and machinery, it may in fact be the very worst policy, because not only does it prevent the expenditure of money upon research by plant manufacturers but also it assists only those manufacturing firms who are content to build a standardised plant, without making any attempt to improve existing processes. At informal joint discussions last winter chemical manufacturers urged upon the plant manufacturers the desirability of maintaining research organisations; but many of those same chemical manufacturers when ordering plant will cheerfully go to the cheapest maker, irrespective of whether he is trying to improve his plant and processes or not.

Consultants and Specifications

OUR contributor also makes a valuable point in his reference to the cost of preparing estimates. We must disagree with his plea that too many estimates should not be asked for. We agree in principle, but in practice chemical plant manufacturers and others would prefer to be given the opportunity of quoting rather than to be left out in the cold. That, however, is not the end of the matter, for as our contributor rightly points out, the cost of estimating may be greatly diminished if purchasers would be sure of what they want before asking for estimates. One of the features of our times is the reliance placed upon constructional firms. Prospective buyers of plant, whether it be sulphuric acid chambers, burners, autoclaves or gas plant, bring to the constructor their general idea, that " they want a plant to deal with so much material, situated upon that site " and they leave the rest to the constructor to design and to build. Formerly that was the field of the consultant. The consultant's fee would be far less than the cost of preparing many estimates; the latest information would be made available without more than trifling cost to the plant maker. Let us bring back our consultants and rely upon them to issue specifications.

A Directory of Consultants

THE Association of British Chemical Plant Manufacturers is now preparing a list of those with specialised knowledge who could serve as consultants. We suggest that this aspect of the problem of costs might be discussed during the coming winter so that the panel of consultants shall be of some real use and that the consultant shall be again employed to design plant—not only at the expense of the plant maker. Possibly designs might be prepared by a central office and all makers could then quote to these designs. Our suggestion, amplified, is that when plant is required—excluding the little standard pieces of apparatus, tanks and so forth—a works, if affiliated to the Association of British Chemical Manufacturers, should immediately notify the secretary of that organisation who should give to certain consultants upon the panel the task of making the necessary designs. These designs will the form the specifications for the job and may be tendered for by any member of the Association of British Chemical Plant Manufacturers. A percentage upon the capital cost will be earmarked for the consultant's fee. There are many instances and many industries in which some such scheme might result in lower costs to the purchaser, in greater profits to the constructor, and finally in the allocation of more money for research into the improvement of plant. Overhead expenses, and the expense of maintaining adequate scientific staff provide some of the greatest problems of the plant constructor as our contributor shows; the ventilation of this aspect of industrial life is both timely and weighty.

Industrial Health

THE Industrial Health Research Board records in its annual report that it has difficulty in gaining an adequate collection of data because of the workers' dislike of medical examination. The importance of health to industrial efficiency has been stressed in these columns frequently, and we are convinced that when the workers have been made to realise the advantages that will accrue to them from periodic overhaul they will not only permit but demand adequate medical supervision. Nevertheless, we cannot avoid sympathising with the attitude of dislike, though probably for quite other reasons. There is the natural fear that examination is a prelude to a decision whether one is to continue in employment or be dismissed; each medical examination is faced with fear and with the feeling that an apparently secure job is thrown into the melting pot.

Examination is also too frequently connected with termination or reduction of compensation for injury, whilst the facts elicited by periodic examination might in the opinion of the examinee be used against his relatives in a compensation case. An examination by the Industrial Health Board comes under a different category from examination by the company's doctor; but the workers have no guarantee that that is so other than a promise to that effect. It is a difficult problem how to look after the health of the workers without directly, or even subconsciously allowing the facts elicited to react to the financial detriment of the employee who is found not to be quite fit. Probably the largest concerns are best able to devise suitable schemes, since they alone can afford to grade the type of employment of workers whose health is beginning to suffer without detrimentally affecting their earning capacity.

An Actual Experience

OBJECTION to medical examinations of the type undertaken by doctors, health boards and so forth, is based on personal experience and it is well that we should recount one example from that experience to press home our point. It happened to be a condition of employment in one post offered to one of our friends, whom we will call " Mr. A.," that examination by the company's doctor should be satisfactory. Accordingly he attended at the consulting rooms of an eminent and titled London physician to say ninety-nine and to be thumped. The physician refused to tell " Mr. A." what his condition was, but later in the day the secretary of the company informed him that his heart was in a " shocking state," that his chest was exceedingly malformed, that he might easily develop consumption . . . there was more but that is enough to be going on with. In the weeks that followed there ensued a triangular contest between the eminent doctor, " Mr. A.'s " family physician, and the company, in which the family physician won hands down and " Mr. A." was duly employed. The trouble had been that the eminent physician had mistaken a temporary condition developed as the result of removal of teeth for that normal condition. " Mr. A.," now over the age of 40, can still do 90 minutes strenuous exercise, and can walk 20 or 30 miles without discomfort. But if that had happened to a working man, possibly with no family physician to take up the case, what would have been the result? Our conclusion is that periodic medical examination is not desirable and is fraught with dangers, but what is desirable is a continuous medical supervision throughout the works by medical men known to and trusted by the men. In large concerns the works doctor might well be an employee (as he occasionally is) who moves among the men as one of them and in whom, in time, they will learn to confide as in a friend. By acting in liaison with the men and the management the maximum good will result.

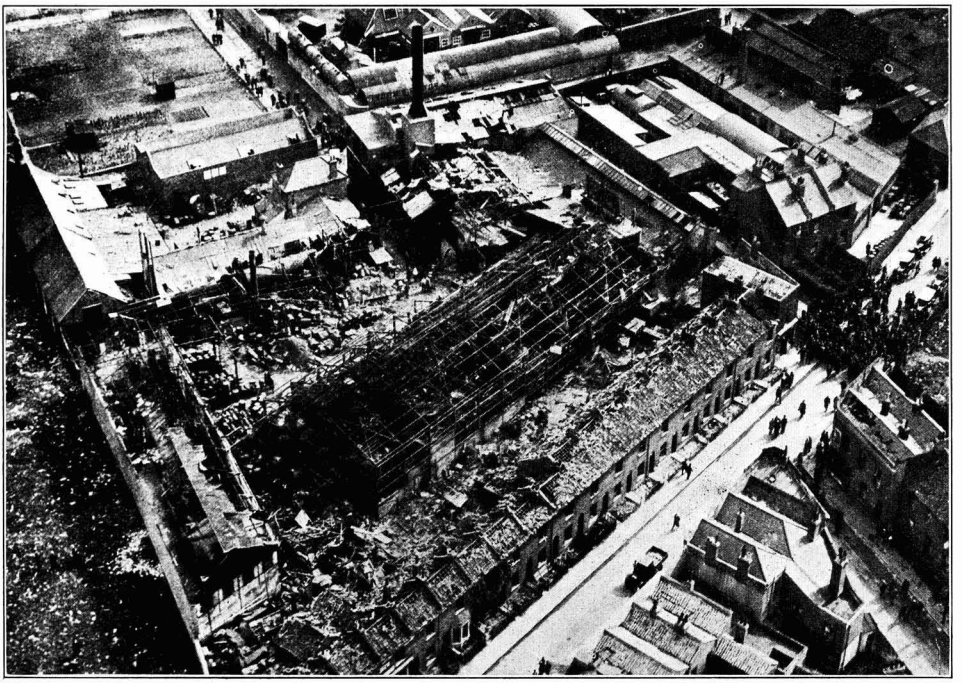
Imports of Dyestuffs

STATISTICS quoted by Sir Henry Sutcliffe Smith in his address to the recent annual meeting of the Colour Users' Association show an increase in both weight and value of dyestuffs and intermediates licensed for importation during the past year. In view of the difficulties that face the foreign makers by reason of adverse exchange rates and import regulations, Sir Henry considers that they are worthy of congratulation upon achieving such a result. It is only by progress in the methods of manufacture of dyestuffs and intermediates, the introduction of new dyes and speciality chemicals, and the continuance of their high standard of technical service that the German and Swiss manufacturers are able to keep a firm hold year by year on a valuable and not inconsiderable trade.

Under present economic conditions, exchange problems do not only impose difficulties on foreign manufacturers, they represent also a serious item for the colour users in this country, as their raw material costs are advanced accordingly. During the past twelve months a further depreciation in sterling has taken place and foreign dyestuff prices have been increased by $12\frac{1}{2}$ per cent. Whilst under these circumstances there is apparent justification for an increase in the price of foreign colours, there is a strong feeling that there is ample room for reductions in basic prices, and that an attempt to get down to an index figure more in conformiy with general commodity prices is long overdue.

Chemist and Works Manager

TO get the best out of the chemist it is necessary that he should be the works manager's good colleague rather than his subordinate. He should be responsible solely to his directors, because he alone understands his own work and he is a responsible person with specialised knowledge. He must also be independent, for occasions are numerous when he finds himself in the position of judging the work of others. There are works managers who only want the chemist to work out their own ideas, and otherwise would keep him confined to his laboratory. Experience shows that such works managers are often unaware just how and where the chemist can help them. The laboratory being a service department, the chemist is generally more than willing to help the works manager out of his difficulties. Where the chemist has invented a process in the laboratory, the idea should not be handed over to other non-technical members of the staff at that stage. They cannot see the full possibilities of the invention. It is in the interests of the business to let the chemist carry through the process on a large scale until it is shown to work in a profitable manner.



This explosion occurred at a chemical works near London during 1933. The extensive damage which was done to the actual works and to adjoining property emphasises the need for the rigid adoption of safety recommendations.

Hazards at Chemical Works

The Annual Report of the Chief Inspector of Factories Reveals some Outstanding Cases

THE year 1933 has been remarkable for the number of explosions and fires of a kind that are potentially disastrous, though the loss of life was luckily lighter than might have been anticipated. Such occurrences, unfortunately, are generally unforeseeable, and all that can be done is to devise means to prevent their repetition. This is one of the outstanding statements in the Annual Report of the Chief Inspector of Factories and Workshops for 1933 (H.M. Stationery Office, 2s. net).

Another very difficult task before the authorities has been the prevention of industrial diseases. An accident is an event; cause and effect can be quickly and certainly related, and the chief hindrance to the avoidance of accidents is not want of knowledge of the factors constituting danger, but want of appreciation on the part of those exposed to risk combined with indifference on the part of a small fraction of employers. A disease, on the other hand, is a condition, of which the symptoms may not be immediately apparent and the primary cause remain long unsuspected. The existence of asbestosis, for instance, was for many years unrealised, and the present cases of disablement through its agency are due to long past exposure to unfavourable conditions. It follows, therefore, that in our present state of knowledge, prevention must inevitably be preceded by the sacrifice of some health and even of life on the part of individual workers, and the main aim must be to reduce the number of such victims to the minimum.

A series of deaths due to the inhalation of vapour of diethylene dioxide (dioxan) at an artificial silk works was followed by an inquiry into the extent to which this substance is in industrial use. The result was negative and the present position as regards this particular substance is therefore reassuring in view of the public warning afforded. This occurrence, however, raises a question of wide importance. Subsequent research has clearly demonstrated not only the toxicity of this substance (dioxan) but also the insidious nature of its action, and unless suitable precautions are taken there is nothing to prevent a similar catastrophe arising from the use of other compounds, the properties of which are unknown. Having regard to the increasing use of new organic compounds as solvents, it would seem that a very valuable safeguard would be to arrange for each to be physiologically tested before it is placed on the market for general use. It is satisfactory, therefore, to report that in accordance with a decision reached more than a year ago Imperial Chemical Industries, Ltd., have now taken steps for this to be done.

At the end of the year reviewed there were 160,185 factories and 86,851 workshops on the registers of the Department, being an increase of 2,204 factories and a decrease of 4,008 workshops compared with the previous year. The number of premises of all kinds subject to inspection amounted to 285,284. The complaints received during the year numbered 3,559 of which 734 dealt with matters outside the Department's jurisdiction. Of the remaining 2,825, most of which related to conditions of employment, sanitation and temperature, about 60 per cent. were substantiated on inquiry.

The assistance of the Chemical Defence Research Department has been sought in several directions. Good progress has been made by them in the design of an effective type of dust respirator, and it is hoped that this may be made available to industries in course of the present year. Con-

currently, the efficiency of so-called canister respirators (*i.e.*, those provided with absorbent material) has been tested, in particular in regard to the range of toxic substances against which they may be accepted as protective. Research is being conducted (with financial aid from the Association of British Chemical Manufacturers) into methods of detecting and estimating small concentrations of toxic gases. Up to the present hydrogen sulphide, arsine, hydrocyanic acid, and certain halogen organic compounds have been studied. Investigation is similarly being made into the relative toxicities of carbon tetrachloride, methyl bromide and pentachlorethane when used in fire extinguishers. Finally, following the series of deaths due to the inhalation of dioxan the poisonous action of this substance is being investigated.

Accident Statistics

The total number of accidents reported for 1933 shows an increase from 106,164 to 113,260 and the fatalities have also increased from 602 to 688. Probably the rise in the number of accidents is not wholly due to more extensive employment, but also to other and altogether exceptional factors operating at the present time. Workers are returning to employment often after long periods of enforced unemployment. Many of them are suffering from lack of nourishment, and physically and mentally are less alert and more liable to mishap than in normal times. Again, there is evidence that on restarting work after a log spell of idleness some workers tend to over-exert their strength and energy, while others take some time to get accustomed to working conditions again.

The total number of accidents due to transmission machinery remains about the same as last year at 1,066, though the fatalities from the same cause have risen from 26 to 35. Of the 35 fatal accidents reported during the past year 18 occurred at revolving shafts while 17 were due to driving belts, ropes, pulleys and gearing. Of the non-fatal accidents recorded, 137 occurred at revolving shafts and 894 were due to driving belts, ropes, pulleys and gearing.

Dust Explosions

An explosion of coal dust occurred at a pulverising fuel plant at an electric power station resulting in injuries to six men and extensive damage to the plant. On this plant warm air entered the bottom of a Raymond grinding mill into which coal was fed from a hopper. The ground material from the mill was drawn by a fan and discharged into a small cyclone from which it dropped into a large hopper. Apparently on the previous day there had been a fire in the large hopper and it was necessary to empty it. After restarting, an explosion occurred in the hopper, the top being blown off. Ignition most likely was due to overheating of a pocket of coal dust in one of the pipes and consequent ignition of the dust cloud in the almost empty hopper by a portion of incandescent material blown over with the air current. There was a safety vent on the cylone above the hopper but this was not sufficient to relieve the explosion which occurred in the hopper and steps were taken to provide a vent on the hopper itself. The firm were also advised to provide a safety vent on the mill.

A dust explosion occurred on a plant for grinding cattle food. The ignition apparently started in a disintegrator, and some flame passed up the feed chute and burned two men who were feeding material into it. As previous explosions had occurred on this plant, the firm were about to replace the disintegrator by a nutting machine, the final grinding being carried out by a special disintegrator and explosion vent pipes being fitted to the various hoppers, together with choke tubes at the bottom of hoppers in which a dust explosion might occur. An explosion also occurred in another mill of the same company whilst the mill was standing for the purpose of carrying out alterations. A workman was cutting an opening in the casing of an elevator by means of an oxy-acetylene flame. In knocking out the plate some dust was disturbed and formed a cloud which was ignited by the cutting flame. This case shows the need for precautions being taken to prevent any dislodgment of dust when work of this kind is in progress.

In another explosion which occurred in a sugar-grinding plant, a dust balloon burst through ignition of the dust, some of the glass skylights being broken. No one was injured but the occurrence indicates the need for care as to the position in which such dust balloons are placed so as to avoid risk to workers passing.

A serious explosion and fire occurred in March at a works for the preparation of synthetic chemicals. Extensive damage was done to the works and to adjacent houses. One boy was killed and several persons suffered from shock and minor injuries. The accident was no doubt primarily due to an escape of boiling methylated spirit, caused by the breakage of one of the bolts securing the blank flange at the back of a still used for distilling methylated spirits. The vapour evolved appears to have passed through one of the buildings and then over a low wall towards a row of cottages behind the works where it was most likely ignited by the gas flame of a domestic cooker. A full report* on the accident (prepared by Mr. L. C. McNair annd Dr. J. H. Coste, chief chemist to the London County Council) has been issued. Certain precautions were suggested which are at present under discussion with the Association of British Chemical Manufacturers with a view to the issue of a memorandum containing recommendations for safety.

Precautions During Repair Work

A gas cooler, consisting of a rectangular tower fitted with a number of cross water tubes, was being overhauled in a by-product works and for this purpose the gas connection had been cut off by simply closing the valve. Repair work proceeded for three weeks when an explosion occurred while men were working on platforms at the side of the cooler. Six men were thrown a distance of 20 ft. to the ground, one man being injured fatally. The explosion was apparently due to an escape of gas into the tower from a slight leak in the valve, an air-gas mixture being formed which was probably ignited by a spark struck from a hammer. The firm now propose to provide a definite air break between the gas main and the plant before any repair is undertaken in future.

Another explosion occurred at a tar still but the cause of ignition was not clearly ascertained. It may have been due to iron sulphide or to some part of the crown of the still being hot enough to ignite residual vapour.

There were again several explosions when repairing or cutting up for scrap metal drums or other vessels which had contained petrol or similar inflammable liquids. One would expect that the danger of applying a flame to such drums unless they had been first thoroughly cleaned out, was now well known, but accidents still happen. The only safe way to clean a petrol drum or tank is to use steam or hot water and then thoroughly ventilate and dry the inside by blowing compressed air through it. Acetylene generating plant has also contributed to the number of explosions and there was one explosion of an oxygen cylinder, the latter being probably due to oxygen coming into contact with oil on some part of the valve.

Dangers from Inflammable Materials

A serious fire occurred in a chemical works, which caused considerable damage to the plant, to two neighbouring factories and to a cottage in the street leading to the works. At the works there was a plant for refining anthracene, but this was not in operation at the time. In a large store shed there was stored a considerable quantity of waste war-time "smoke-screen" material containing nitre, sulphur, borax, pitch and glass, the nitre from which was being gradually recovered. The roof of this shed was of corrugated iron, covered with roofing felt, and the corrugated iron rested on a wooden plate on top of the wall. At the back of the shed, but separated from the smoke-screen material by an asbestos partition, there was a store of crude anthracene contained in bags. Two workmen employed by an outside contractor were cutting up pieces of scrap metal in the yard of the works. It seems probable that the acetylene flame used in cutting the scrap metal had passed through the space between the corrugated roof and the wooden plate on the brickwork so igniting the smoke-screen material inside the shed. The fire rapidly spread to the anthracene in the shed and then to another store containing purified anthracene on the opposite side of the yard and finally to adjoining property.

* A Report on an Explosion at the Synthetic Chemical Works of Messrs. W. J. Bush & Co., Mitcham. (Published by H.M. Stationery Office.)

All the workers were able to escape, although one man was slightly burned. This fire shows that exceptional care must be taken in the neighbourhood of all stores of inflammable material so as to avoid any risk of ignition.

One fire occurred in a waste film stripping factory. It was probably caused by a flame from an unauthorised open brazier used for burning scrap pieces of film. The means of escape was ample and the fourteen workers escaped, although houses 150 feet away were scorched. The firm were prosecuted and fined £25 for having an open fire, and also for having unauthorised storage bins in workroom. The danger of this process can be appreciated when it is stated that fifteen tons of films were completely destroyed and the fire was practically all over in fifteen minutes. Another fire, due to ignition of acetone vapour by static charges on celluloid occurred in a factory manufacturing cinematograph films.

Safety Organisations

The works which are now without safety organisations are mostly small places with low accident risk or works where the number of workers employed has been greatly reduced or which are temporarily shut down owing to slack trade, many shipbuilding yards and marine engineering works being included in this number. The reports received show that while many of the safety committees are doing excellent work, yet there are also many others doing little or nothing really worth while in improving the fencing of the machinery or the works plant, and the problem of educating the workers in safety first principles is overlooked entirely or at best tackled in a very luke warm manner. Inspectors endeavour to give new vigour and activity to the work of these committees on every available opportunity, but the scope of an inspector's activities in this direction is inevitably limited and the success obtained is often far from satisfactory. It would seem, in many cases, that firms are content to observe the requirements by setting up a committee without taking any further trouble to make it a real live help in solving the accident problem.

It has also been noted in many works that there is a growing tendency for safety committees to be replaced by a full time Safety Officer and the change has been a decided improvement in some cases. On the other hand, there is an increasing number of committees on which workers now serve. These workers are appointed either by selection on the part of the firm or by election by the workers employed.

In one large oil refinery it is reported that a most efficient safety committee is working and with excellent results. Members of the safety committee, including workers' representatives, are relieved from their normal duties and act in turn for a period of one week as Safety Inspectors, going over as much of the plant as possible and making a report to the committee of all matters which in their opinion require improvement or alteration in the interests of safety. Arrangements are also being made for all members of the safety committee in turn to visit the Home Office Industrial Museum in order to pick up fresh ideas on safety and welfare methods.

In an important dye works it is reported that 34 distinct items were brought to notice by the safety committee and remedied during 1933. These included drainage of floors, uneven floors, faulty ladders, unfenced machinery, need for protective clothing, etc.

Arsenic and Aniline Poisoning

The continued reduction in the number of cases of lead poisoning notified is satisfactory, and with the exception of one case in the manufacture of lead arsenate no fresh source of poisoning has arisen. It was previously thought that the predominant symptoms of arsenical poisoning would appear before those of lead in workers exposed to dust of lead arsenate, but this case exhibited definite lead symptoms without any signs of being affected by arsenic. In another worker, however, arsenical poisoning developed without any symptoms of lead poisoning.

In spite of the high temperature prevailing during the summer the number of cases of "*anilism*" notified has been satisfactorily small. This is undoubtedly due to the greater recognition of the dangers inherent from exposure to the fume and dust of aniline and the comparable chemical substances giving rise to this form of intoxication. The twelve cases reported occurred in the following processes:—Making intermediates (D.N.B., D.N.T., T.N.T.), 4; making or use of aniline, 2; aniline black dyeing, 2; paratoluidine, 2; paranitraniline, 1; dinitrochlorbenzene, 1.

The two cases of chronic benzene poisoning—one of which proved fatal in 1934—occurred in processes not under regulations and where adequate ventilation was not maintained. Both cases occurred in females, one employed in mixing cellulose lacquers—the fatal case—and the other in cleaning lenses. The typical clinical features of this form of poisoning were present in both cases. Effective exhaust ventilation in the first case and the substitution of a non-toxic solvent in the second, were the measures adopted to prevent further intoxication. Two cases due to the use of tetrachlorethane in wool scouring were reported.

The slight increase of 10 cases of chrome ulceration reported is attributable to the extended use of the process of chromium plating. The regulations for this industry, if carried out effectively, are adequate to prevent the occurrence of this condition.

Cancer at Dyestuff Works

New growths in the bladder occurring among workers exposed to certain chemicals—aniline and allied intermediate dyestuffs—have been referred to in many previous reports. In order to obtain some concrete view of the subject, an extensive inquiry has been carried out in Huddersfield, where large works manufacturing intermediate dyestuffs are situated. The earliest recorded case of death from a new growth in the bladder amongst Huddersfield chemical workers, occurred in 1900, and since that date to the end of 1932, 31 further deaths among chemical workers have been registered from this cause. During the same period 71 cases were registerd among workers outside the chemical industry. The average age at death among chemical workers, from this disease, is considerably lower than among non-chemical workers—53.2 years as compared with 63.6 years. The trade of chemical labourer was the only one giving a number of fatal cases. Other trade groups yielded individually no more than one case except that of cotton dyers, where two cases were recorded over the 33-year period. The nature of the chemicals which these men handle in the course of their work is very varied and it is impossible to identify one particular chemical as the cause, though contact with certain of them appears to predominate in the history of the cases inquired into—in particular, aniline, benzidine, alpha- and beta-naphthylamine and their derivatives.

Diethylene Dioxide ("Dioxan")

In July, 1932, a firm manufacturing artificial silk installed an experimental plant for treating cellulose acetate silk yarn with diethylene dioxide ("dioxan"). Operations on the plant commenced on July 14, 1932, and nothing of note appears to have occurred for nearly 16 months, when, between November 5 and 19, 1933, five men aged from 26 to 33 years, left their work on account of illness. All died between November 11 and 25. The first two died at home, being attended by different practitioners. The other three were admitted to hospital. Suspicions were then aroused owing to the similarity of the unusual form of the illness and the fact that the work upon which they were employed was identical in every case. After death, an examination revealed in all three cases enlargement of the liver and a haemorrhagic condition of the kidney.

Although certain other processes were being carried on in the same room as the experimental plant, by a process of elimination it was possible to say with a degree of certainty that the experimental plant was the source of poisoning. The strongest piece of evidence was that between September 14 and September 18 the vessel containing the solution was enclosed, but without exhaust ventilation, the concentration of the vapour of "dioxan" thereby becoming higher in the air above the liquid. When, therefore, the enclosure was opened, as it frequently was, for manipulating the yarn, the men doing this work were exposed to this higher concentration of vapour. The firm were naturally concerned that there should be no question as to the correctness of this view of the toxicity of "dioxan" and guaranteed the expenses of any experiments that could be undertaken. These were accordingly arranged for and while incomplete at the time of writing they are sufficiently advanced to demonstrate the toxic nature of "dioxan" in the directions found in the fatal cases.

Indian Institute of Science

Progress of Research

THE annual report of the Indian Institute of Science, Bangalore, for the year 1933-34 shows that a considerable amount of research work was done in the various departments of the Institute during the year. One of the first things Sir C. V. Raman did, as soon as he took over the directorship of the Institute last year, was to inaugurate a department for research work in physics under his direct control, and a laboratory has already been equipped where work will be carried out in all branches of physics especially in radio-activity and nuclear physics which had not hitherto received adequate attention in India.

In general chemistry, valuable results have been obtained in spray drying of sugar syrups. It is found that in India, about 80 per cent. of the cane crop is lost by the wasteful methods employed in the manufacture of gur, etc., but by a process of spray drying the solid constituents in cane juice can be obtained in the form of white powder and preliminary experiments have shown that such a scheme is feasible. Certain difficulties are still being investigated.

Work in connection with the hydrogenation of oils has proved that the process can be commercially successful and would give a daily output of one ton of the finished product. Experiments on the properties of sandal-seed oil with a view to using it for the preparation of varnishes are now in progress. New methods for the extraction and isolation of tannin present in myrobolams in the form of powder are under investigation. In organic chemistry, the santolals which form the bulk of the sandal wood oil have been isolated. A satisfactory process has also been devised for the large-scale distillation of the leaves of *Spheranthus indica* and an oil from *Ocinum canum*.

A new process for manufactures of vegetable casein and water paints has been devised. Research has also been made in the effects of cooking and storage of foods in tinned and brass vessels. Banana and mango have been successfully dehydrated and experiments with citrus fruits are in progress.

The Chemical Club

Annual General Meeting

THE annual general meeting of the Chemical Club has been fixed for Monday, October 29, at 8 p.m.

The present membership of the executive committee is as follows:—President of the Club, Lord Leverhulme; chairman of the executive committee, Mr. F. A. Greene; hon. treasurer, Mr. T. H. Fairbrother; hon. secretary, Mr. J. Davidson Pratt; ordinary members, Messrs. J. A. Blair, W. H. Coleman, R. L. Collett, J. C. Drummond, W. P. Joshua, H. Langwell, H. J. Pooley, S. R. Price, J. F. Ronca, H. Talbot and A. J. V. Underwood.

All the officers retire at the annual general meeting and are eligible for re-election. Three ordinary members retire, *viz.*, Messrs. W. H. Coleman, R. L. Collett and H. Talbot, of whom the last two are not eligible for re-election. Nomination for candidates to fill the two vacancies among the ordinary members are invited. These must reach the hon. secretary not later than the first post on September 30. Each nomination must be signed by two members of the Club who have ascertained that their candidate is willing to serve if elected.

Iron and Steel Institute

Autumn Meeting in Belgium and Luxemburg

THE autumn meeting of the Iron and Steel Institute will be held in Belgium and Luxemburg, by the kind invitation of Messieurs Léon Greiner and Aloyse Meyer with the support and co-operation of the industrialists of those countries. The arrangements for the meeting have been carried out by influential reception committees, the hon. secretaries of which are Monsieur Auguste Greiner (Belgium) and Monsieur A. Kipgen (Luxemburg).

The sessions will take place at the Palais des Académies, Brussels, on Monday and Tuesday, September 10 and 11, and at the Hotel de l'Arbed, Luxemburg, on Thursday, September 13. The subsequent arrangements include visits and excursions to the principal iron and steel manufacturing and engineering establishments in Belgium and Luxemburg.

Papers to be presented at the meeting include:—"The Influence of Vanadium on Carbon Steel and on Steels containing Nickel and Chromium" (H. H. Abram); "Belgian Research Committee on the Behaviour of Metals at Elevated Temperatures" (H. Dustin); "Some Aspects of the Fatigue Properties of Patented Steel Wire" (E. T. Gill and R. Goodacre); "The Blistering of Iron Oxide Scales and the Conditions for the Formation of a Non-Adherent Scale" (R. Griffiths); "The Decomposition of Martensite" (Gunnar Hägg); "Accelerated Cracking of Mild Steel (Boiler Plate) under Repeated Bending. Part II—Further Tests" (C. H. M. Jenkins and W. J. West); "The Influence of Diffusing Elements upon the Alpha-Gamma Inversion of Iron" (W. D. Jones), "The Constitution of Iron-Rich Fe-Al-C Alloys" (F. R. Morral); "Contribution to the study of the Resistance to Chemical Attack of Various Special Steels" (A. Portevin, E. Prétet and H. Jolivet); "The Properties of Non-Hardenable Alpha-Iron Steels" (S. H. Rees); "Flexibility as a Factor in the Economic Exploitation of Rolling-Mills and some Technical Means for its Realisation" (G. A. V. Russell); "The Physical Properties of Iron-Aluminium Alloys" (C. Sykes and J. W. Bampfylde), and "The Influence of Silicon and Aluminium on the Resistance of Cast Iron to High Temperatures" (H. Thyssen).

Industrial Alcohol in Ireland

Five Factories to be Established

CONSIDERABLE surprise was created in Dublin last week by the Government's endeavour to rush the Industrial Alcohol Bill through its final stages in the Dail, and protests were made against the attitude of the Minister for Industry and Commerce for not providing adequate time for discussion.

During discussion on the Bill, the Minister for Industry and Commerce (Mr. Sean Lemass) stated that the original plan had been somewhat modified as it was now proposed to establish five factories, spread over the counties of Louth, Monaghan and Donegal with a central refinery in Dublin, instead of concentrating the factories and refinery in the north-eastern corner of the Free State. He also stated that while the legal authority and responsibility for the production of industrial alcohol would remain with him and actual working of the undertaking is to be carried out by a board of officials from his department, the Department of Agriculture and outside technical experts. A considerable amount of work in the preparing of plans and examining sites for the factories had already been carried out.

Opposing the Bill Mr. P. McGilligan, who was Minister for Industry and Commerce in Mr. Cosgrave's Government, quoted details to show that it was not possible to manufacture industrial alcohol at the present time at a price less than three shillings per gallon.

Replying to other criticism the Minister said that the yield of potatoes in the districts in which the factories would be established ranged between 10 and 10.3 tons per acre and there was no reason to anticipate difficulty in obtaining supplies.

The Bill then passed its final stages in the Dail and now awaits the consideration of the Senate.

Iron Oxides Industry in Canada

ACCORDING to a report by the Dominion Bureau of Statistics, four establishments produced a total of 4,357 tons of iron oxides valued at $53,450 for 1933, as compared with 5,240 tons worth $46,161 in 1932. Production of the pigments was confined to the provinces of Quebec and British Columbia with the former province contributing 96 per cent. of the total. The industry employed a capital of $156,551 and the number of employees totalled 22, with salaries and wages amounting to $15,631.

Is Your Laboratory Mill Adjustable

for Large and Small Quantities of Material?

THE rapid development of research in industry has created a demand for a small and simple type of universal grinder for laboratory use. The C & N mills, which are made by Christy and Norris, Ltd., and are obtainable from Baird and Tatlock, Ltd., incorporate many novel features.

The C & N junior mill has a collecting system designed to ensure the minimum loss of material; with reasonable care losses on this mill should not exceed about two per cent. on quantities of two or three grams, to less than one per cent. on larger amounts. It is carried at the top of a cast iron pedestal. The grinding chamber, 5 inches diameter, is machined inside, and provides the front cover of the machine. It is fixed to the body by two thumbscrews, and can be removed in a few seconds, thus exposing the whole of the working parts. Accessibility and cleanliness are therefore fully provided.

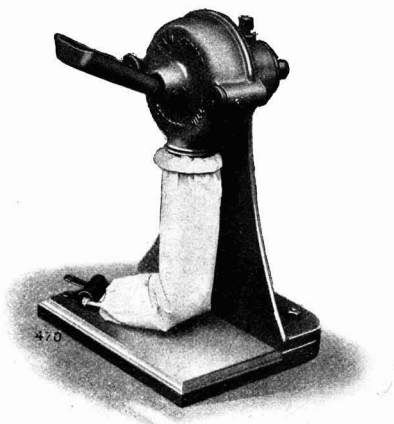


Fig. 1. C & N Junior Laboratory Mill, showing feed tray and sleeve delivery.

In normal operation a current of air passes through the machine and a free flow for this air adds much to the efficiency. For this reason the bag and sleeve types of collector, having large filtering area, are usually preferable. For quantities above 50 grams, the cloth sleeve (Fig. 1) is advised; it clips on to the outlet of the mill, and having an open end, it allows the ground material to be withdrawn at intervals during operation if desired. For smaller quantities, down to a few grams, cellulose "extraction thimbles" are provided; the material of which they are made being porous enough to allow sufficient air to escape. For minute quantities a thick rubber ring may be fitted to the outlet, and a glass beaker of suitable size used as a collector, but as no air can then escape, more time must be allowed for the mill to clear itself. For dry free-running material a conical fitting with rubber tube to thimble or other receptacle may be used, allowing of very clean collection, as the product is blown along the tube by air, leaving no residue adhering to mill or connections.

The feed hole being at the centre of the mill ensures cleanliness and a regular flow of air. A small feed tray is provided and pieces up to about $\frac{3}{8}$ inch cube can be passed into

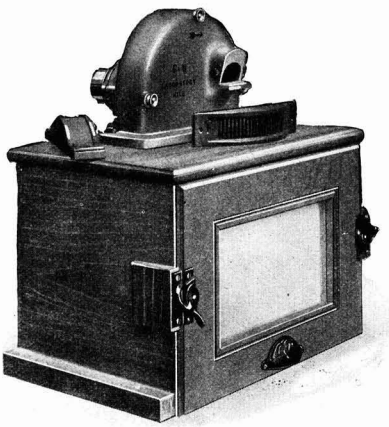


Fig. 2. C & N 8 inch Laboratory Mill mounted on stand with filter panel front.

the mill. The screens are plain discs of stout perforated steel plate, and can be of practically any mesh, but the usual range includes from 0.4 mm. holes as the minimum to 2 mm. holes as the maximum. The drive can be by belt from an electric motor, or any other source of power giving the speed required; a very flexible belt, 1 inch wide, should be used. A small adjustable ball bearing countershaft to gain the necessary speed can be supplied when required.

The C & N 8 inch laboratory mill (Fig. 2) has been on the market for a number of years, and is particularly well suited for the general grinding requirements of a laboratory. Its corrugated grinding chamber and the large screening area

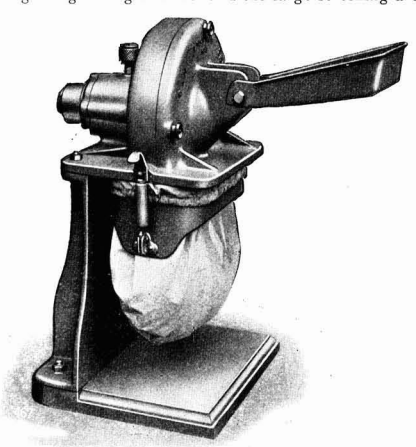


Fig. 3. C & N 8 inch Laboratory Mill mounted on pedestal, showing central feed, feed tray and bag delivery.

ensures rapid operation, while its sturdy construction allows heavy and hard materials to be handled with safety. Quantities from a few ounces up to 5 cwt. can be conveniently handled. The mill can be supplied with side or central feed and with several types of collecting system. The bottom is machined to allow of fixing to top of collecting chamber or to pedestal. The front portion of the body forms the grind-

ing chamber to which a front cover plate with inlet is fixed by thumbscrews. The grinding member as with the C & N Junior mill consists of a four armed beater-cross which revolves at a high speed and shatters or tears anything passed into the feed hole.

Delivery of the ground product is through a screen, which forms the bottom section of the grinding chamber, into the collecting chamber below. For the coarse grinding of hard materials and for handling large quantities a stand with drawer (Fig. 2) is recommended, a small, easily cleaned dust bag being connected to the top to provide for air escape. A cloth front to the drawer as illustrated may be used as an alternative, where small quantities only are to be ground but a bag is preferable. When fixed on a pedestal (Fig. 3) a metal frame with detachable bag of ¾ gallon capacity is clipped to the underside of the mill, this bag serving the double purpose of collector and air vent. This system allows of greater accessibility to all parts and greater cleanliness.

By using a special screen frame, to take the circular screen plates, this 8 inch mill can be adapted for grinding small quantities into sleeve or thimble as with the Junior mill, although the larger machine is not quite so well adapted for such methods. The screens frames are held in place by studs and thumb nuts. They can have steel bars cast in for hard and heavy work or be made to take renewable, perforated steel plates for general grinding. Fine or coarse meshes can be supplied in either type as required. The feed inlet can be central or to one side as may be preferred. The central position, as shown in Fig. 3, is cleaner and ensures a better draught; it is advised for cereals and pieces not exceeding ¾ inch cube. For pieces 1 inch cube, or for materials liable to clog the screens, the side inlet is preferred, or two cover plates with alternative positions of feed can be fitted. The drive is obtained by belt from either motor or shafting giving the required speed, and a flexible belt 1 inch wide is necessary.

Removal of Oil and Grease from Metal Parts

A Review of Non-Inflammable Solvents

THE treatment of metal parts for the removal of oil, grease or swarf is an operation which enters into many branches of industry to-day, and ranges from the cleaning of motor car parts and dirty machinery generally before repair, to the preparation of a chemically clean surface prior to plating or rust-proofing processes. The metal cleaning and degreasing agents in common use are of two kinds: those which rely on emulsification and peptisation for their effect and which include alkalies such as caustic soda or sodium carbonate solutions, as well as numerous proprietary brands, mostly containing soap; and those which are actual grease-dissolving liquids, such as benzine, white spirit, paraffin, and the chlorinated ethane and ethylene group of non-inflammable solvents, such as are produced at the Runcorn factory of the Castner-Kellner Alkali Co., now a subsidiary of Imperial Chemical Industries, Ltd.

Caustic soda, apart from involving the possibility of burns to the operator, is not very satisfactory for the removal of mineral oils which cannot be saponified, and its action on many metals naturally restricts its use as a degreasing agent. Of the grease solvents proper, benzine and white spirit can be dismissed on account of their inflammability, and benzine is also toxic. Although carbon tetrachloride is quite satisfactory as a degreasing agent, it tends to corrode some common metals.

The Best Degreasing Agent

Trichlorethylene, apart from being the cheapest and most generally stable of the non-inflammable chlorhydrocarbons, also possesses many other advantages which make it perhaps the best degreasing agent known. Almost all waxes, greases, oils and tarry matter are completely miscible or fairly soluble in the liquid, and while it has certain narcotic properties it is quite safe to use with adequate and correct ventilation. Solvent losses are low with correct usage in a properly designed plant, and since there is no residuum to be removed from the degreased metal, and the boiling-point and maximum operating temperature of the solvent are low, the whole degreasing operation is seen to be very rapid, being a matter of minutes or even seconds.

Degreasing plants for use with trichlorethylene have been designed to deal with articles of all shapes and sizes, and proof of the great progress made in this sphere of trichlorethylene application was afforded by the wide range of new I.C.I. models at the British Industries Fair this year. All these plants involve two main principles, or a combination of them: one providing for liquid solvent washing for removal of grease, as well as non-greasy dirt or polishing compound; and the other based on the condensation of solvent vapour on the article to be degreased. By this last method, the metal surface is washed continually by clean solvent liquor at the boiling-point, at which temperature solvent power and rate of solution are generally at their maximum. Vapour condenses on the whole of the surface, however intricate, including places which could only be reached with difficulty, if at all, in a hand-cleaning process.

The non-inflammability of trichlorethylene in both liquid and vapour states readily explains the fact that it is replacing both benzene and petroleum benzene for dry-cleaning.

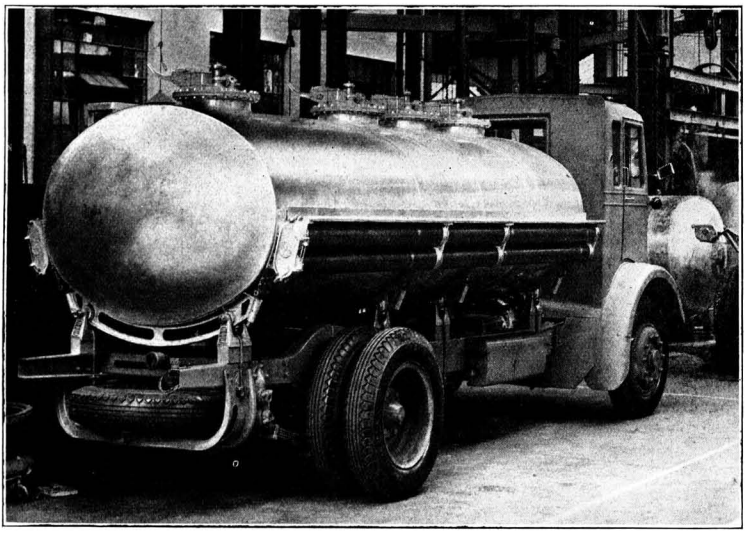
Dry Cleaning and Textile Scouring

Trichlorethylene, moreover, is capable of dissolving many substances other than those of a greasy nature. The risk of fire when white spirit is used must enter at least during the drying-out phase, whereas the chlorhydrocarbons could actually act as fire-extinguishers. Further, careful measurements before and after cleaning have confirmed that normal garments do not shrink, nor is the tensile strength of natural and artificial textiles (including acetate silks) impaired, by dry-cleaning with trichlorethylene. The high volatility of this solvent, combined with its purity as at present manufactured, ensures its complete and ready removal from articles after cleaning, and the absence of any after-smell. Dry-cleaning plants are now obtainable which are specially designed for use with trichlorethylene.

It is well known that the detergent action of soaps is enhanced by using solvents in conjunction with them, and in recent times soaps in which trichlorethylene is incorporated have achieved a considerable importance as solvent scourers. These solvent scourers are of two types, one (including that bearing the trade name of "Westropol") being water-soluble, and the other (of which "Westoran" is an example) forming stable emulsions with water. Both types contain neutral soaps, and are used in laundry work for the scouring of textiles of all kinds. In textile scouring processes in which hard water is used, these solvent detergents dissolve and emulsify the lime and magnesium soaps, which are frequently found to cause staining.

Perchlorethylene

Perchlorethylene is beginning to find favour as a dry-cleaning solvent, and is considered to be equally as powerful, extensive and rapid in its solvent action as trichlorethylene. The claim in respect of its exceptional cleaning effect on white goods should be of interest to dry cleaners, and its use in certain proprietary spirit soaps is well known. It has no action on cellulose acetate, but being less volatile than trichlorethylene, the time necessary for the complete removal of odour from cleaned work at ordinary temperatures would be proportionately longer. In general, it is quite likely that the chlor-hydrocarbons, so far as dry-cleaning is concerned, will come to be recognised as the ideal agents for use with silk goods and light coloured articles.



This four-compartment petrol tanker was made of aluminium by the Aluminium Plant and Vessel Co., Ltd. Its capacity is 1,300 gallons, and when empty, complete with all tank fittings, bearers, hose carriers and walkways, it weighs 12½ cwt.

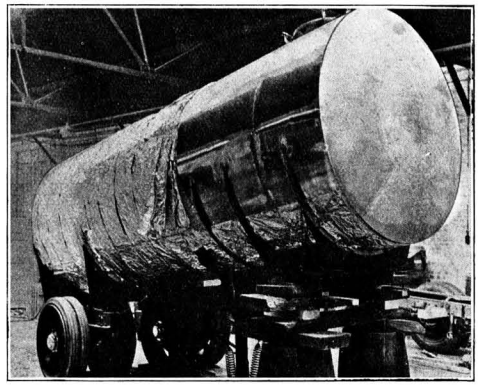
Works Equipment News

Aluminium for Road Transport Tanks

For the transport of liquids, aluminium has a number of very definite advantages. For use with foodstuff and various chemical liquids, the corrosion and hygienic qualities of the metal are advantageous, in addition to the weight reduction which is obtained. Thus for many years aluminium has been associated with the bulk transport of milk, but, as in other cases, the application of aluminium has developed gradually. In the earliest milk tankers aluminium was used as a lining to a steel tank, but even so weight reduction was of sufficient magnitude as to increase the capacity substantially. In one instance of which particulars are available a chassis originally carrying a 2,100 gal. glass-lined steel tank was able to accommodate with equal facility a 2,600 gal. aluminium-lined tank. In many present-day tankers the whole double-walled tank is of aluminium or of aluminium alloy, thus obtaining the maximum possible weight saving and the maximum possible carrying capacity. Similarly, aluminium tankers are now widely used for petrol and oil, and, incidentally, this is proof of their efficiency, since with highly inflammable materials the dangers arising from leakage or from damage to the tank by collision are serious.

The metal used for the tank construction is either pure aluminium or an aluminium-manganese alloy. In this country pure metal is chiefly used, but the alloy has a large following in the United States and France, permitting a small decrease in metal thickness on account of its higher strength.

Many tankers, and other vehicles as well, are provided with heat insulation, and in spite of the fact that aluminium is one of the best heat-conducting metals, it is used largely for this heat insulating. The insulation consists of a number of layers of crumpled aluminium foil, which are applied between the inner tank and the outer protective aluminium sheet. The effectiveness of aluminium for this purpose is due to the bright surface of the foil, which is so excellent a reflector of heat that a number of layers of the foil provide an almost impenetrable barrier to the passage of radiation. The insulating value of this type of insulation, which is known as "Alfol," is, in fact, about equal to that of an equal thickness of cork, but its weight is very considerably less. Cork weighs more than 70 times as much as "Alfol" for an equal insulating power. In the case of a 2,000 gal. milk tank the use of "Alfol" instead of cork will provide a total weight reduction of some 750 lb. The extreme value of this type of heat insulation for transport vehicles cannot, therefore, be exaggerated



Aluminium foil, supplied by Alfol Insulation, Ltd., is being used to provide heat insulation for this milk transport tank, which has a capacity of 2,000 gallons.

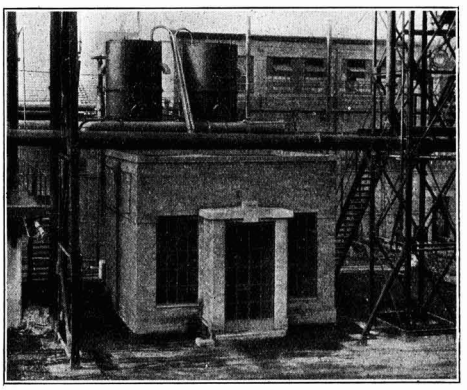
Blast Furnace Gas Cleaning

At the new iron and steel works of Stewarts and Lloyds, Ltd., at Corby, near Kettering, a Lodge-Cottrell electrostatic precipitation plant has been installed for cleaning the blast furnace gas. This is an extension of the equipment which was supplied to the existing works by Lodge-Cottrell, Ltd., about six years ago, for the rough cleaning of the blast furnace gas, under then existing conditions.

At the new works the whole of the gas is to be used not only in modern blast furnace stoves, with close fireclay packing, but also for heating the by-product coke ovens in place of coke oven gas, as well as for mixing with the latter for use in the steelworks. Consequently a thorough cleaning of the blast furnace gas is necessary, and for this reason the existing electrostatic equipment has been supplemented to form a 2-stage installation on the latest scientific principles. The total capacity of the complete plant at Corby is 5,500,000

cubic feet of gas per hour (measured at normal temperature and pressure), and this gas will be cleaned down to the guaranteed figure of 0.0088 grains of dust per cubic foot. The original rough cleaner will bring down the bulk of the dust—well over 90 per cent.—in the dry stage, and the gases will then pass on to conditioning and cooling towers before receiving the second electrical treatment. This will eliminate the remainder of the dust and all water mist, so that the gas will pass on in a clean, cool, and dry condition.

The basic principle of the electrostatic process, primarily the invention of Sir Oliver Lodge (Great Britain) with subsequent developments by Dr. F. G. Cottrell (United States) and Dr. Erwin Moller (Germany), consists in the use of concrete chambers or towers through which the dust or fume-laden gases are passed. These towers are provided with a



A typical installation of the Lodge-Cottrell electrostatic process for gas cleaning.

series of vertical metal plates or pipes, forming collector electrodes, which are connected to earth. In the narrow spaces between these plates, or in the pipes, there are wires or rods with numerous points constituting discharge electrodes, which are coupled to a high tension direct-current supply so that brush discharge takes place, giving a glow of light or corona, and creating a powerful electrostatic field. As the gases pass through the electrostatic field all the solid and liquid particles are electrified and repelled against the earthed collector electrodes (pipes or plates). Here they give up their charge and fall to the bottom of the tower or partly adhere to the collector plates, from which they are detached by means of motor-driven rapping hammers.

Automatic Control of Boiler Plant

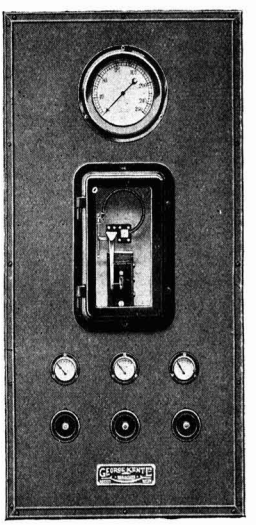
THE difficulties of complete automatic control for steam boiler plant in the average chemical works, as distinct from power stations and water tube boilers generally, included the devising of equipment which is simple enough to be understood by the ordinary boiler house staff, sufficiently robust to be immune from breakdown, and not excessive in price. These problems have the attention of George Kent, Ltd., who have introduced a new design of automatic control equipment for "Lancashire" and industrial boilers of all types, which incorporates most of the features of the firm's equipment for large water tube boilers.

In general, the "Kent" industrial boiler plant control system consists of two separate units, the master controller (which regulates the draught for all the boilers) and a fuel/air ratio controller on each boiler (which regulates the fuel supply). The master controller measures the pressure in the steam main and as this rises and falls adjusts the draught within fine limits. Regulation may be effected by means of the dampers or the speed of the induced draught fan motors, or by a combination of both methods. Where balanced draught is used there is a furnace pressure controller on each boiler, regulating the mechanical forced draught, whilst in the case of forced draught by steam jets a small diaphragm valve is fixed in the steam supply pipe so as to control the amount passing. With natural draught the flue dampers are operated by powerful hydraulic units which are operated by the master controller.

The fuel/air ratio controller on each boiler measures the amount of air being supplied for the combustion, and in the case of mechanical stoking, for example, alters the rate of the fuel feed until the correct ratio of fuel to air obtains.

A panel of boiler control instruments (George Kent, Ltd.)

Thus, when the demand on the boilers increases the steam pressure commences to fall, and the master controller opens the dampers and increases the air flow through the boilers. This increase in air flow is measured by the fuel/air ratio controller on each boiler which proportionately increases the rate of fuel feed and the reverse actions take place with a rise in pressure. As the relations between fuel and air will vary according to the conditions of each boiler, a simple cam is provided in the fuel/air ratio controller, which is cut separately to suit the characteristics, while also there is an adjustment by which the fuel/air ratio may be altered to allow for conditions such as varying coal and different thickness of fire generally used.



Automatic Boiler Control: Hydraulic Motor Control Panel. (George Kent, Ltd.)

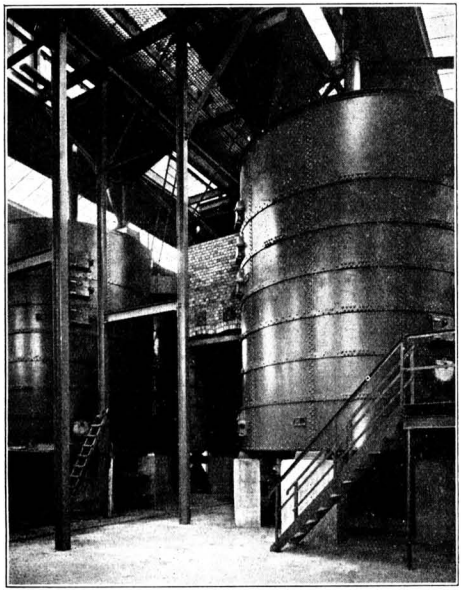
The master controller on the steam main consists of a Bourdon tube connected by a link to a light vane which it moves across the path of a jet of water as it passes across from one nozzle into a receiving nozzle, the pressure in which depends on the amount of the jet that is not interrupted by the vane and, therefore, on the steam pressure. By a small bore pipe the pressure is transmitted to syphon bellows on the power units which operate, say the induced draught dampers, so that the latter are moved the correct amount relative to the steam pressure. As regards the fuel/air ratio controller this may operate in various ways, one method, for example, being the control of an a.c. commutator electric motor with brush-shifting control used for driving the coal feed, the air flow being measured by an oil-sealed bell

suspended on springs moving in proportion to the pressure drop through part of the boilers. Any variation from the correct ratio will move a vane between two nozzles, as in the master controller, and the variable pressure in the receiving nozzle is taken to a power unit which turns the brush gear on the a.c. motor.

Mechanical Roasting Furnaces

IT is well known that in roasting ores the size and throughput of mechanically-operated furnaces on the slow moving rabble arm principle, with a series of superposed hearths, has hitherto been limited by the dust nuisance. The solution of this problem is the use of electrostatic precipitation, which separates over 96 per cent. of the total dust from the gases without difficulty, irrespective of the size of the particles. For example, the "Herreshoff" mechanical roasting furnace supplied by Huntington Heberlein and Co., Ltd., is now available in very large sizes with up to 12 hearths, : instead of 4—6 as in the original design, while in addition the hearths can be made as large as 21 ft. diameter.

One main field for furnaces of this type is the roasting of iron pyrites, giving sulphur dioxide gas for the manufacture

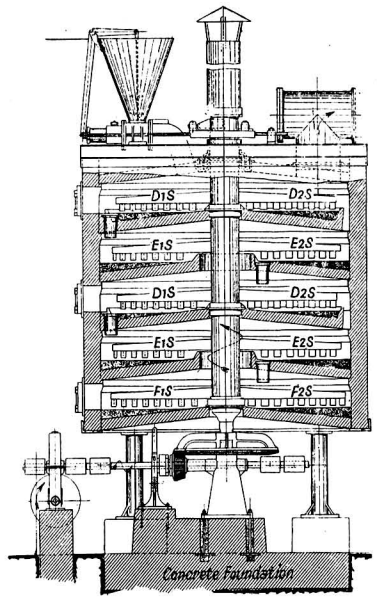


The burner house at a superphosphate factory at Ipswich, showing two of the four Herreshoff furnaces, each having a burning capacity of 12 tons of pyrites per day.

of sulphuric acid, and the latest types of machine with 12 hearths, 21 ft. diameter, has a throughput of 30-35 tons of pyrites (46 per cent. sulphur) per 24 hours, as compared with 3 tons for a machine of 5 hearths, 12 ft. diameter. A notable recent installation of this type has been supplied to the Indian Copper Corporation, this furnace has 8 hearths, 20 ft. diameter and roasts 100 tons of concentrates per 24 hours.

Essentially the " Herreshoff " furnace in its latest designs consists of a vertical, wide diameter, steel plate cylinder, heavily lined inside with refractory material, divided transversely by flat hearths or floors, forming a series of shallow roasting compartments. In each of the latter are operating slow moving replaceable cast iron rabble or scraper arms, attached to a vertical, air-cooled shaft, passing up through each compartment and driven from underneath the setting by suitable gearing. The speed of this central driving shaft is about one revolution in three minutes, and the power required is very small

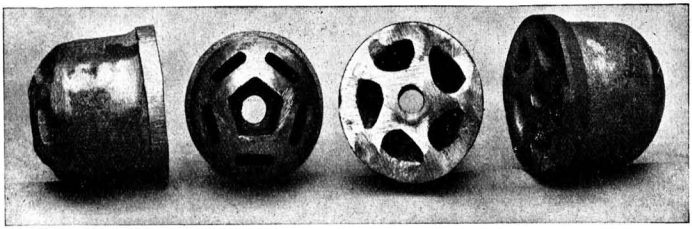
The pyrites or other sulphurous ore, in a more or less



The interior of the Herreshoff furnace, showing superimposed hearths and rabble arms.

finely-divided condition, is passed in continuously at the top from a hopper by an adjustable mechanical feed device, and falls down on to the first hearth or floor, and is scraped round with continual mixing in a relatively thin layer by the rabble arms, at the end of the travel falling through an aperture (at the periphery) to the next floor. Here it is scraped round again by the corresponding rabble arms, now passing from the periphery to an aperture near the centre for discharging to the third floor, and so on with final discharge of the sulphur free material at the bottom of the setting, after travelling in a spiral path for the maximum distance on each floor. A regulated current of air is passed in at this point and travels upwards, in counter-current to the pyrites, from one compartment to the other, burning the sulphur to sulphur dioxide. All the gases, containing 6 to 14 per cent. SO_2 according to circumstances, leave the top compartment by a wide diameter off-take pipe.

The main roasting action takes place as the finely-divided material drops down from each floor in turn, because of the



Monel metal has been used for these valves and seats on account of the excellent corrosion-resisting properties which are afforded.

intimate mixing at these points with the upward current of air, so that the large amount of dust formed in this connection is a great advantage now that the efficiency of electrostatic separation prevents any nuisance without limiting the size of the machine.

Refinements in Stoneware Containers

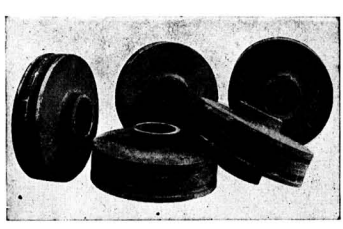
STONEWARE jars and bottles for packing chemicals are now obtainable in a wide range of patterns, due to the fact that a very large number of chemicals—both liquid and crystalline—are of a corrosive nature and therefore demand an acid-proof receptacle which can withstand transport hazards. The

Left: Stoneware jar with air-tight cover. Right: Stoneware bottle with rubbed surface to indicate poison (Doulton and Co., Ltd).

accompanying illustrations show two stoneware containers manufactured by Doulton and Co., Ltd. The bottle with the ribbed surface is used for the transport of poisonous liquids. The air-tight cover on the jar is also of special interest, for certain corrosive crystalline materials are also hygroscopic and therefore require additional protection during storage.

Corrosion Resisting Castings

MANUFACTURERS of chemical equipment are large users of castings, and particularly of castings made from corrosion-resisting materials. Two important properties are generally needed in castings required for use in the chemical industry—resistance to the corrosive media encountered and non-contamination of the product handled. Other properties, which may also be required according to the service, are high physical strength and toughness, resistance to abrasion and erosion, resistance to heat and, almost invariably, soundness and the ability to remain pressure-tight under varying conditions of temperature, pressure and vacuum.



Pump impellors cast in Monel metal for use with Rees' Roturbo pumps.

Numerous factors must be considered in deciding upon the metal to use under a given set of corrosive conditions. These factors include concentration of the corrosive agent, impurities present, temperature and pressure, length of exposure, whether at rest or in motion, degree of aeration, possibility of electrolysis, and ratio of area exposed to volume of liquid. Usually the variables are too numerous and involved to be duplicated satisfactorily in laboratory tests, and when considering the question of materials for chemical plant it is better to be guided by previous commercial experience if possible.

It is also essential in many branches of the chemical industry, and particularly in the production of fine chemicals, to guard against contamination of the product. In the case of light coloured or transparent products, discolouration also must be prevented.

Nickel and Monel metal are employed in many industries to safeguard products against contamination. Among all available engineering materials these metals offer the greatest resistance to the corrosive action of concentrated caustic soda. Nickel is used for pumps and also for evaporating and settling equipment. Pure nickel is used in the artificial silk industry to protect the purity of the raw materials employed. Sodium sulphide is handled in Monel metal. In the cuprammonium process and certain parts of the acetate process, Inconel, a nickel-chromium alloy, appears to have advantages. Another very important use of Monel metal is in the manufacture of salt. Here resistance to corrosion and abrasion in order to prevent contamination and discolouration are essential. In the manufacture of synthetic resins and many plastics, harmful metallic contamination is also guarded against by the use of pure nickel and Monel metal. Paleness of colour is an important factor in lacquers and varnishes, particularly for lithographic work.

Stoneware Storage Vessels

STORAGE of acids and corrosive liquids, either in bulk or in relatively small quantities, calls for care in the selection of suitable containers. Storage jars in Hathern chemical stoneware obviate leakage, waste and corrosion. These jars are made in sizes 500, 1,000 and 2,000 litres (110, 220 and 440 gallons); open jars and circular vessels are also used for storage to suit particular requirements, whilst closed jars with ground-on lids are especially suitable for volatile essences, bleaching liquors, acids, etc. Hathern white stoneware, which is finding increasing use in the food products and pharmaceutical industries, as a vitreous white semi-porcelain body covered with a high quality leadless glaze, giving absolute cleanliness in use. It resists corrosion and does not contaminate contents, and is manufactured by The Hathern Station Brick and Terra Cotta Co., Ltd., whose technical department are able to put forward schemes for bulk storage installations and pipe lines.

Oil-Resisting Rubber

A Problem with Five Lines of Attack

ACCORDING to the August issue of "The Rubber Age" there is, as yet, no such thing as oil-resisting rubber. Karsten ("Kautschuk," 1933, *9*, 73) is forced to admit as much in a discussion of the subject. There are, however, degrees of resistance to swelling and disintegration of rubber in oil, and some quite serviceable products are now available. Just as highly inflammable textiles can be made reasonably fireproof, so by judicious treatment rubber becomes oil-proof for practical purposes.

The lines of attack on the problem have been fivefold. (1) It is possible to employ in the vulcanisate as little rubber and as much filler material as possible. The problems involved in this method relate to the types of filler, light or heavy; the inclusion of reclaim and substitute in the rubber, and the troublesome matter of retaining sufficient elasticity and softness to justify the name rubber. (2) There is also the use of glue, gelatin, and other gummy fillers, a method much patented. For packings and rubbers used in compression this is probably the best line of attack, but the products are too stiff for petrol hose and the like. (3) Soaps, like glues, have been found specifics—in some measure—against swelling in oil. (4) Some benefit is also gained from a right control of sulphur and vulcanisation by the judicious choice of organic accelerator. Short cures at high temperatures are a help in regard to oil resistance. The final line of attack (5) is frankly a confession of failure, for it consists in attempting to insulate rubber from attack by means of surface lacquers, varnishes, and other surface coatings. While such coatings remain intact, the remedy for oil resistance is excellent, but the elastic nature of rubber makes it practically impossible to attach permanent overcoatings to it.

The Place of the Constructor in Industry

THE constructor or builder of plant of any description is in a peculiar position. The writer, having been for many years on the constructional side of industry, though not now connected with that branch of activity, has encountered certain features of interest which may not have occurred to those who buy and operate plant rather than construct it. In order that nothing shall here be said to wound the susceptibilities of those who may read the article, all illustrations are taken from industries which cannot strictly be regarded as chemical industries, even though they may be regarded as companions in fortune—or misfortune. It can hardly be doubted that exactly the same problems confront the maker of all types of plant, whatever industry they may serve.

Conditions of Work

Manufacturers must offer their products at competitive prices if they are to continue in business, and, moreover, they must sell those products on such terms as will give them a reasonable profit. This generalisation, however, is not equally applicable to all manufacturers. Much depends upon whom the manufacturer serves. If we take the gas industry as an example, it will be clear that that industry serves the public and must so regulate the price and quality of its principal product—gas—that a considerable section of the public will be convinced that gas is better suited to its purpose than other competing fuels. Within those limits it is free to raise prices to suit conditions. As a direct subsidiary to the gas industry, there are the manufacturers of meters, cookers, lighting and heating appliances, and so forth, all of whom produce goods which are essential to the well-being of the gas industry, and which could not equally well be produced by that industry itself. These manufacturers must be supported and assisted by gas undertakings, but they must also sell ultimately directly to the public and they must, therefore, produce articles on a strictly competitive basis.

The makers of apparatus sold to the public directly must work on a strictly competitive basis. Moreover, these articles can only be made in a factory installed for the purpose. A factory costs money somewhat in proportion to the amount of goods it can turn out. A firm having a small works for manufacturing goods sold directly to the public will find their sales proportionately small; on the other hand, the big manufacturers who employ a highly competent technical staff will be in a position to make real advances in the technique of their trade and, having a proportionately larger works to turn out their improved product, will reap the reward of whatever advances they can make.

Plant Construction on Scientific Lines

The constructor of plant is in a different situation. The only staff he is forced by circumstances to maintain is that required for making proposal drawings and for estimating prices for new work. Other staff can be picked up when required and dropped again when the contract is finished. This is true however large is the work that he undertakes. There is thus no guarantee that a firm which employs a large technical and scientific staff and which is continuously endeavouring to improve the standard of its work will reap one penny more in the way of profit from its development work than will a small firm which builds a standardised product and which does not endeavour to do anything for the advancement of the industry. This argument, of course, deliberately excludes the case when the development work leads to a patentable product that cannot be imitated.

There are many constructional firms which are continually trying to improve the type of plant they erect and in so doing incur very considerable expense. There are other firms which do not make these efforts. Firms which do not employ a highly technical staff and do not endeavour to use all the resources of modern technical science to improve their product may be at an advantage when submitting quotations. This is especially true in times of trade depression, when people are careful in spending money. This advantage arises from the fact that establishment and overhead charges of the "hand-and-mouth" organisation are very small and consequently they can offer to build cheaper than the large firm. If, therefore, the value of a tender be judged on price alone, there is danger in times when work is scarce that the firms which are of real assistance to industry may be forced out of business, whilst the less valuable organisation can keep going.

The Correct Policy to Adopt

There are certain industries which are dependent upon the contractor who builds the works for their future well-being. It may be in some cases that the technical man engaged in the works makes some far-reaching improvement to an existing process, but the engineer or chemist who has made such an improvement generally becomes a constructor, since that is obviously the best way in which he can turn his invention to advantage. For these industries, however, improvements come directly from the construction companies and not from those employed on the operating side. The gas and coke oven industries may be cited as outstanding examples of this statement. Even if an idea is put forward by an individual not connected with a constructional company, there is still a very great deal of work to be done before it can be translated into practice. There are drawings to make, there are estimates to be got out, a trial plant must be built—probably at a loss—and so on, until ultimately after the expenditure of a considerable amount of money and travail, a new and improved plant is born into the industry.

The Result of an Experiment

Nor is the work of the contractor confined to new designs of plant. It may equally apply to the materials of construction or to the whole conduct of an industry. Two examples of this occur to the writer, and as the coke oven industry has been cited previously these examples may be taken from that industry. These examples are recounted here since they are largely in the nature of unwritten chapters of industrial history. Up to the year 1907, the whole of the coke used in the blast furnaces of America was manufactured in beehive ovens. By-product ovens had not previously proved successful in that country. About that time the principals of an Anglo-German construction company went to America to discuss with the United States Steel Corporation the installation of a new plant at Joliet. As an experiment the United States Steel Corporation ordered a first battery of 280 ovens. When these ovens were put into operation the constructors supervised their initial working period. The ovens proved to be unsuccessful in the sense that the consumption of the coke in the blast furnaces was very much greater than it was when beehive coke was used. The United States Steel Corporation decided, indeed, that the experiment was a failure. If a contractor had not been available, who really understood coke ovens, there can be little doubt that by-product coking would have received such a setback that the United States would have been poorer by millions of pounds worth of the by-products which have since been recovered from their by-product coke ovens. The contractor in this case, however, remained at the plant personally and with his technical staff to experiment, to adjust and correct. By the time that his labours were finished, the fuel consumption at the blast furnaces when using by-product oven coke was less than it was when using beehive coke. That is an example of how a contractor has been of assistance to a whole industry.

Where Research was Justified

The other instance which the writer recalls also took place in America. The desire for high outputs caused operators to demand coke ovens which would produce a greater output per unit. The obvious way of doing this was to work at a higher temperature, but the refractory materials available were not such as to justify confidence in their behaviour. The contractors thereupon started a comprehen

sive research into silica materials and laid down a specification for silica bricks which to this day is accepted in America, Germany and England with scarcely any modification. Moreover, the coke oven constructor—Dr. Heinrich Koppers—instructed the brick makers in the art of manufacturing silica bricks of good quality. Finally, finding that Europe was slower in following these instructions than America had been, two coke oven construction firms have each built their own extensive refractory works, one of which has been described by makers of refractory materials as " the finest silica brick works in the world."

Value of Research by Constructors

The two branches of industry—construction and operation—are interdependent and cannot in the long run exist without each other. The contractor who conducts research work both on the large and small scale, who is continually in the van of progress, and who carries on his business with initiative is of far more value to industry than the one who is content to build a standardised plant with as small a staff as possible and to confine his efforts to the building of repetition plant without regard to development work; it is also unfortunately true that a contractor of the latter type can very often quote cheaper prices than can the large concern with high overhead expenses. This situation, as has previously been indicated, is intensified in times of bad trade when contracts are scarce. A large contractor with many orders will have no higher overhead expenses than the smaller contractor with one or two orders, but a large contractor with one or two orders must make heavy losses while the small contractor with correspondingly small expense may even make a profit whilst quoting lower prices.

Plant Makers Deserve a Fair Profit

The labourer is worthy of his hire and cannot live without it. If industry does not give the contractor a reasonable flow of orders and a reasonable margin of profit, all the essential services now supplied by him will disappear and with the disappearance of the contractor many industries would return to the condition of thirty or forty years ago when progress was very slow and the additional burden was placed on the works manager of having to design his own plant and make all his own improvements. This raises the question whether unregulated competition is in the best interests of industry. The firms which survive the present depression are more likely to be those whose policy it is to keep staff, development and establishment charges as low as possible, and to let their technical staff scatter as soon as work is scarce.

Industry in general will not be seriously affected if the cost of a complete installation is raised or lowered by a small percentage. The conclusion that the writer has reached is that industry should not place orders on the basis of the lowest price. A possibly better proceeding is to fix a basis price either from the estimates of the company's own engineers or in conjunction with a consultant. This figure could then be indicated to all the contractors for their quotation. No figure should be expected to be below this basis price, whilst a figure should be allowed to be higher provided that the contracting company can prove justification in the way of superior plant, superior results, or lower operating costs. The plant which is ultimately installed should then be selected wholly by careful technical survey carried out by the technical experts of the company acting, if necessary, in collaboration with a neutral technologist. This proposal is equivalent to industry offering to pay a somewhat higher price than the minimum which could be got by tender in the open market.

A Change in Procedure

This change in procedure can be justified in several ways. An order obtained at cut prices, for example, is not likely to be so liberally interpreted by the contractor as one in which a fair margin of profit is allowed. The purchaser is, therefore, in the long run the loser by his own keenness. Again, the contractor should give guarantees which must be rigidly obtained under penalties. The guarantees should be such as would prevent any contractor from receiving full payment for a plant which was not able to give a performance similar to those put forward by other contracting firms.

The state of affairs here depicted is a source of the gravest concern in many countries. A contribution in the German journal " Feuerfest," Vol. 8, No. 6, p. 289, points out that the situation in Germany has become very serious on account of the undercutting of the price quoted by large well-tried firms by numerous small organisations who have no proper backing. In the desire for cheap plants, industry in Germany and in neighbouring countries has involved itself in difficulties. Plants have been ordered from firms who have no proper backing and no real knowledge of the work they undertake. An instance is given, for example, of a firm who built a bench of retorts in silica without knowledge even of the transformations occurring in silica bricks when heated with the result that the plant failed entirely. Where the guarantees are not fulfilled moreover, the small firm is utterly unable to pay the prescribed penalties, whilst had the somewhat higher prices demanded by the large contractor been accepted, either the plant would have been successful or an adequate penalty could have been exacted.

Encourage all Scientific Firms

There must be no suggestion that the small deserving firms should be left out in the cold. The smaller man who makes every endeavour to improve his plant and organisation is as much to be supported as is the large organisation that performs a similar function. It is, however, of the utmost importance that the large and " live " organisation should exist and should continue to make reasonable profit, and that the small firm should be encouraged to develop its organisation and increase its staff by adding highly qualified specialists. These objects can only be achieved by making the business reasonably profitable and it is solely with this object that the foregoing suggestions are made.

There is another point which often escapes the manager of an undertaking, namely, the cost of preparing estimates. There are many instances in which even preliminary inquiries are sent out broadcast and all contracting firms whether their plant is favoured or not are asked to send elaborate quotations. In one particular instance, five firms were asked to submit proposals and estimates for three different types of plant. The money expended in preparing these fifteen different proposals amounted to 14,000 RM., whereas the proposal in question, even if it had been carried out, would only have given a gross profit of 5,000 to 6,000 Rm.

Suppose the cost of a job, apart from estimating, is £1,000. Suppose, further, that the average estimating cost to each of five competing contractors is £100, excluding any cost to would-be sub-contractors and to those contractors who " also ran " but never completed their estimate. Then it is clear that the actual cost of the job—to somebody or other, to the community if you will—is something over £1,500. Moreover, it has been increased from £1,100 to £1,500 through the entirely futile and unremunerative work; because, in short, it has been necessary to build five castles in the air. This is at the present time a really serious burden on certain branches of the engineering industry.

Bring Back the Consultant

Some may dispute this. They may argue that the cost in our hypothetical case, to the purchaser is £1,100, and that the other £400 odd, being spent by the parties who ultimately fall outside the contract does not affect the purchase in any way. In this argument lies the basic fallacy of the whole system. The actual gross cost of a job, in any self-supporting and economically sound system, must ultimately be borne by the purchaser. In our hypothetical case the cost to the successful contractor of estimating for this particular work may be a £100, but on the average he will have estimated in a similar way for five jobs before securing this one contract, and the cost of his four unsuccessful estimates has to be borne—since he is assumed to be economically stable—by the party which places with him the contract for the fifth. In other words, the cost of this job is not £1,100 but £1,500, and it is the purchaser who pays, in fact as well as in theory, for the castles he has caused to be built in the air.

Such a condition as this has no redeeming feature; it increases the cost of production to no purpose, and merely accumulates useless drawings as a memorial to good intentions.

But it is a condition which has tended to become more general in recent years, and for various reasons which will occur to most engaged in industry. Of these, perhaps the most important is the false modern view that it is costly or unprofessional to employ a consultant. Unquestionably the type of consultant who was common a generation ago is dying out. His disappearance is closely bound up with the false economic conception which is under discussion. In earlier days the job would have been placed in the hands of a reputable consultant, who would himself have done most of the design work and have delegated comparatively little in the way of estimation to contracting firms. His services would have commanded a fee which, appearing as an addition to the contractor's price, would seem to have increased the cost of the job. In more recent times, when technical training among engineers has become general, lay directorates and local authorities seem to have adopted the view that by employing an executive engineer of their own they can eliminate all consulting charges, and deal direct with contracting firms.

The remedy is not perhaps easy to apply, but the writer would suggest that it lies with the purchaser of plant. When the purchasing company is sufficiently large to employ a staff of experts, much of the preliminary work can be done by themselves and without troubling contractors; approximations to the capital cost can be secured that will be sufficient for a decision to be taken whether to proceed with the proposed plant or not. Where such an expert is not available or no one at the works has sufficient time to undertake the task, the proposal should be put into the hands of a consultant with experience in constructing work who could then prepare a report for the company, without calling upon the contractors themselves to bear more than quite trifling expense.

The Alsatian Potash Industry

A Survey of Progress during the Past Six Years

SINCE the close of the great war, France has become the possessor of one of the two great potash fields in Europe, namely, that near Mulhouse in Alsace, the second and greatest being at Stassfurt in Germany. The other European mines, for instance, in Polish Galicia (Kalusz and Stebnik), in Spain (Suria and Cadorna in Catalonia), in Italy (Istria), in Denmark, and to the west of the Urals in the Soviet Union (Solimansk), are not at present serious rivals to the Alsatian and Stassfurt fields, although some apprehensions respecting future competition from Spain, and the U.S.S.R., appear to be felt by French producers.

Output in Poland in 1931 amounted to no more than 40,000 tons of pure potash and in the U.S.S.R. to 18,000 tons: but in 1933 the three Spanish mines approached a total of half a million tons of the crude mineral, and exported 150,000 tons. In the United States, where efforts are being made to achieve independence of the European mines, there are large potash fields in Texas and New Mexico, where the mineral is moreover reported to be found nearer the surface than in France or Germany. American production in terms of pure potash is put at 60,000 tons for 1931 and is said to meet only one-tenth of the requirements of the United States. In Asia, the Dead Sea may eventually become of importance for potash. Potash salts are also reported to exist in the French zone of Morocco.

Output of Crude Salts in Alsace

According to a recent report of the Department of Overseas Trade on "Economic Conditions in France" (H.M. Stationary Office, price 7s.), the output of crude salts in Alsace amounted in 1928-33 to 2,580, 3,134, 3,136, 2,203, 1,901 and 1,910 thousand tons of potash salts equivalent respectively to 448, 531, 546, 396, 321 and 322 thousand tons of pure potash. These figures show great advance compared with ten years ago: in 1920 and 1921 the output was 1,222,000 and 903,200, with 204,000 and 154,000 tons of pure potash. The output of 1930 was officially valued at 530 million francs. In normal years over half of the total production is exported; in 1930 the quantity exported in terms of pure potash was 213,000 tons against 212,000 sold at home. In 1931 this proportion had declined to 41 per cent. and in 1932 it was less than 17 per cent.

Exports of the poorer salts (carnallite, sylvinite, etc.) were much lower in 1931 than in the two previous years and amounted to 356,888 tons as against 658,990 and 731,750 tons respectively. The fall was chiefly the result of greatly reduced sales to Belgium and to a less extent to Holland. There was, on the other hand, a rise in exports of the richer salts (chloride of potassium), which in both 1930 and 1931 were nearly twice as high as in 1929, the respective figures being 122,000, 125,000 and 62,000 tons. Belgium, by far the best customer greatly increased her purchases. Both the United Kingdom and the United States, but to a far less extent, bought more; sales of chloride of potassium to those two as well as to all other countries are of little consequence compared with those to Belgium.

In 1932 there was a sharp drop in exports of both the poorer and the richer salts, mainly in consequence of a heavy fall in sales to Belgium (50 per cent. in the case of carnallite, sylvinite, etc., and over 30 per cent. in that of the richer salts), this reduction being compensated to a certain extent by a more active demand from Holland. Total figures of exports for that year amounted to 235,111 tons of the poorer salts (of which, 147,700 tons to Belgium, 58,116 tons to Holland, and 12,000 tons each to Italy and Switzerland); and 86,633 tons of the richer salts (of which, 68,312 tons to Belgium and 2,107 tons to the United Kingdom). In 1933 exports of the poorer salts advanced to 341,951 tons (of which, 242,088 tons to Belgium and 73,189 tons to Holland); and those of the richer salts to 72,231 tons (of which, 54,902 tons to Belgium and 2,349 to the United Kingdom).

Utilisation as Fertiliser

The use of potassic fertilisers in France and her colonies has greatly increased since the war, though it is still far behind that of other European countries such as Holland, Germany, Belgium. In the season 1919-20, according to a parliamentary paper, French consumption in terms of pure potash was less than 47,000 tons, whereas in 1926-27 it had risen to over 165,000 tons, in 1929-30 to 231,000, falling in 1930-31 on account of the crisis to 183,700 tons and in 1931-32 to 185,800 tons. A consumption of 500,000 tons in 1935 has been anticipated. Whereas in Germany consumption of this class of fertiliser was 21.4 kilogrammes the hectare as long ago as 1913, in France it was only 8 kilogrammes in 1928. In the latter year Germany, with 20,500,000 hectares of cultivated land, consumed 872,000 tons of potash, while France, with substantially the same area under cultivation (21,000,000 hectares), consumed only 187,000 tons.

One of the difficulties of promoting the use of potash as a fertiliser is the high cost of transport, in spite of special rates given by the railways. It has been calculated that over a distance of 500 kilometres the cost for rich sylvinite is 37.9 per cent. of the production price and 46.9 per cent. over a distance of 800 kilometres.

Selling Organisation

The French potash selling organisation, the Société Commerciale des Potases d'Alsace, is carrying on an active propaganda campaign throughout France to encourage the use of the fertiliser. It has forty-two district offices, each with one or two engineers and usually an exhibition lorry or a light vehicle with a cinema apparatus. Similar offices have been opened in Algeria and Tunisia.

Practically no progress has been made in recent years in the settlement of the long-outstanding question of the legal status of the organisation which is to control the ex-German

potash mines in Alsace. The Bill passed by the Senate in November, 1927, recently revived in the Chamber of Deputies, has formed the subject of two parliamentary reports in December, 1932, and February, 1933, but these have yet to be considered by the Chamber. By a law of 1921, the French State was empowered to purchase the sequestrated mines, which was done in 1924. The mines were worked under the sequestrated régime until the end of 1923, but as from 1924, pending legislative determination of the status of the Mines, the Ministry of Public Works assumed the supervision of their working. The intention of retaining the control of the mines through a form of public utility organisation seems fairly certain. The board of management would include representatives of State departments, of the (semi-official) Chambers of Commerce, of the three counties of Alsace-Lorraine, of the chemical industry and trade, and the net profits would be divided between the State, the three counties and the owner of the founder-shares. The new dispensation would in some respects extend to other potash mines: thus the latter would compulsorily be members of the central potash selling organisation, which alone would sell in France and abroad; and maximum selling prices would be established yearly by the State.

State Potash Mines

As to the results of the working of the State potash mines or Mines domaniales de Potasse d'Alsace, it was stated officially in April, 1933, that for the four years 1926-29 the State had made a gross profit of 440 millions, and that 1,100,000 tons of pure potash had been sold by these mines at home and abroad, out of a total of 1,552,000 tons (693,000 tons at home and 859,000 tons abroad). In 1930 and 1931 they had sold a further quantity of 628,000 tons, and had obtained a gross profit of 115 millions. In these and the Kali-Sainte-Thérèse mines an average of 10,270 people were employed in 1930, of whom 5,685 were underground and 4,585 were surface workers. Of the total labour force, over 36 per cent. were foreigners, almost without exception Poles. In 1931 the average number employed fell to 8,632 and in 1932 probably to 7,000.

Privately-Owned Mines

The Kali-Sainte-Thérèse company, having been entirely controlled before the war by Alsatian-French interests, was therefore exempted from sequestration as ex-enemy property. It is independent of the State mines, but it effects its sales through the same agency (Société Commerciale des Potasses d'Alsace) as the State mines. Its output has annually been about 30 per cent. of the total produced: 452,000 tons of pure potash out of the 1,552,000 tons produced in the years 1926-29: in 1930 its production of potash salts was one million tons (as against 681,000 tons and 435,000 tons in 1927 and 1924), that of the State mines 2,133,000 tons (1,643,000 tons and 1,230,000 tons in 1927 and 1924). Great progress has been made by the Sainte-Thérèse mines, which were badly damaged during the war: in 1919 only 89,000 tons were mined. Its salts are of remarkable richness, having from 16 to 21 per cent. of pure potash, whereas Stassfurt mines are asserted to average 10 per cent. In 1931 it established near Rouen a separate company (capital 20 millions) and works for the manufacture of sulphate of potash and its by-products.

A third potash undertaking, the Mines de Potasse de Blodelsheim (capital 60 millions) has been in process of development snce 1926 in the same Alsatian district, ten miles north-west of Mulhouse. Its area covers 4,000 acres—has a thickness of seam of 1.30 to 1.60 metres, and its tenour in pure potash is estimated at about 13 per cent. Two pits are in course of installation and working was to have started in 1931, but the company decided in 1931 not to continue at this mine, but to operate a new and far superior concession Heltenschlag-Oberhergheim which has two rich seams—16 to 20 per cent., and 4.50 to 7 metres thick—which can be worked as from 350 metres depth. The first seam is given by the head of the company as having a tenour of 22-25 per cent., and the second one of 16 to 18 per cent.

The ten-year agreement made at the end of December, 1926, between the French group, represented by the Société Commerciale des Potasses d'Alsace, les Mines Domaniales and les Mines de Kali-Sainte-Thérèse, and the German Potash Syndicate, remains in existence. Thereunder, each party retains the exclusive selling rights for its respective territory, but in other markets German sales may reach 70 per cent. and the French 30 per cent. up to a total of 840,000 tons a year. Should such foreign sales exceed this figure, the margin is to be divided equally; and if in 1932 this figure was not reached, the margin of excess of the highest annual figure of the five years—May, 1926 to May, 1931—was to be equally divided.

Transport Facilities

Strasbourg, situated only about 50 miles north-west of the mines, handles a large part of the potash exports: in the years 1929-32 it cleared 573, 654, 414 and 281 thousand tons. Antwerp receives likewise a large proportion. By virtue of the contract in 1925 between the Société Commerciale des Potasses d'Alsace and the Antwerp Municipality, the former was provided, in 1927, with two warehouses having a maximum capacity of 120,000 tons, but in 1928-30 the Antwerp facilities were found to be inadequate, and negotiations were opened with Rotterdam for the dealing with a certain part of the Alsatian potash exports. The draft convention with Rotterdam was not, however, proceeded with, as Antwerp in April, 1930, agreed to place at the disposal of the Société Commerciale the means for enlarging the then existing warehouses. Dunkirk, the French port, fails to get its share of this traffic because the transport cost to that port is more than double that by the Rhine route (1930 charges: 70 francs by rail and 30 by water). A scheme has been proposed for the construction of a new canal to link the potash mines with the Rhone-Rhine Canal at an estimated cost of twelve million francs in which the Kali-Sainte-Thérèse would participate to the extent of one-third.

Lawn Tennis Tournament

An All-London Doubles Final

By kind invitation of the Anglo-Persian Oil Co., Ltd., the finals of the fourth annual CHEMICAL AGE Lawn Tennis Tournament are to be played at the Britannic House Club, Kingley Bridge Road, Lower Sydenham, on Saturday, September 15. THE CHEMICAL AGE silver challenge cups will be awarded to the winners of the doubles and singles respectively, to be held jointly by them and the firms they represent, for twelve months. In addition, Thomas Hill-Jones, Ltd., of Invicta Works, Bow Common Lane, E.3, have kindly promised to present "Invicta" silver statuettes to be awarded outright to the winners of the doubles and the singles, and Mr. W. Lloyd-Willey, director of the same company, is presenting silver statuettes of similar pattern, to be known as the "Lloyd-Willey" statuettes, for each of the three runners-up.

The last of the doubles semi-finals was played at Ruabon, North Wales, on August 9, a strenuous match resulting in a win for V. J. Prosser and A. Baxter (John Haig and Co., Ltd.) by 5-7, 6-4, 7-5, against S. E. Chaloner and C. Thetford (Monsanto Chemical Works, Ltd.). Particulars of matches now remaining to be played are as follows:

DOUBLES—FINAL.

Hawley, F. G., & Haines, J. Anglo-Persian Oil Co., Ltd., Britannic House, Finsbury Circus, London, E.C.2. (National 1212.)	*v*	**Prosser, V. J., & Baxter, A.** John Haig & Co., Ltd., Kinnaird House, 2, Pall Mall East, London. (Whitehall 1040.)

SINGLES—SEMI-FINALS.

Bruce, R. N. B. D. Gas Light & Coke Co., No. 1 Laboratory, Kings Road, Fulham, S.W.6. (Fulham 5531.)	*v*	**Baxter, Albert.** United Yeast Co., Ltd., 238, City Road, London, E.C.1. (Clerkenwell 0303.)
Grape, L. F. Borax Consolidated, Ltd., Regis House, King William Street, London. (Mansion House 8332.)	*v*	**Tunstall, P. A.** Salt Union, Ltd., 20, Water Street, Liverpool. (Central 4370.)

Results of the singles semi-finals should be forwarded to the Editor of THE CHEMICAL AGE, Bouverie House, 154 Fleet Street, E.C.4, within the next few days, in order that complete details of the finals on September 15 may be published as early as possible.

Continental Chemical Notes

THE CZECHO-SLOVAKIAN BATA CO. is now erecting its own oil refineries at Batov.

* * *

ITALY'S PRODUCTION OF ACETIC ACID from all sources increased in the first quarter of the year to 4,205 tons against 3,080 tons in the corresponding period of 1933.

* * *

PARTIAL HYDROGENATION OF CASTOR OIL has been proposed with a view to improving the odour and palatability without reducing the purgative action (Swiss Pat. 167,955).

* * *

THE NAVROTZKY PROCESS for recovery of alcohol from bread-baking ovens is to be exploited by a French company, Soc. pour la Récupération de l'alcool de Panification.

* * *

A PROCESS FOR INCREASING THE BENZOL and diesel oil yields, without at the same time raising the coke output, will shortly be put into operation at one of the plants of the Lower Silesian Bergbau A.-G.

* * *

THE ITALIAN MINISTRY OF CORPORATIONS has approved the erection or extension of plant in connection with ureaformaldehyde resins, calcium cyanamide (maximum annual production of 7,000 tons), hydrogen peroxide (electrolytic), calcium polysulphide and liquid sulphur dioxide.

* * *

CRYSTALLINE POLYMERS OF FORMALDEHYDE (polyoxymethylenes) in high yield can be obtained by a new process based upon treatment of exceptionally highly concentrated aqueous formaldehyde solution with a very small amount of an organic or inorganic base (French Pat. 765,540). Complete freedom of the raw material from methyl alcohol is an essential condition for a good yield of crystalline polymer which may amount to as much as 90 per cent. As example a 55 per cent. formaldehyde solution obtained by distillation of the commercial 40 per cent. solution in a special apparatus, and containing less than 10 per cent. of methyl alcohol, is treated with a small amount of saturated ammonia solution when spontaneous rise in temperature takes place. The reaction mixture is cooled and concentrated to leave a residue which is dried at 25 to 30° C. for at least 12 hours. The yield of crystalline polymers represents 75 to 80 per cent. of the original formaldehyde, the remainder being mostly recovered in the distillate.

COPPER SULPHATE IS NOW PRODUCED at Allawerdy in Soviet Armenia and will supply the pest-combating requirements of the Transcaucasian farming communities.

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THE BREGEAT PATENT (Ger. Pat. 338,351) relating to recovery of volatile solvents on the basis of absorption by cresols has recently expired.

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GOOD PROGRESS IN SYNTHETIC RUBBER MANUFACTURE is reported to have been achieved by the Jaroslawl (U.S.S.R.) factory in the first two years of operation. The annual output rose from 381 tons to 2,363 tons.

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INEXPLICABLE EXPLOSIONS OF ETHER VAPOUR and similar gaseous mixtures are now believed to be caused by electric charges on the human body and sparks developed in warm, damp rooms. Suggested precautions ("Chem.-Zeitung," August 11) are careful earthing of apparatus and avoidance of shoe soles of rubber or crepe rubber.

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BY-PRODUCTS OF THE ELECTROLYTIC PRODUCTION of molten beryllium in the glass industry include alumina, sodium oxide and sodium silicofluoride, all of which can be worked up to artificial cryolite. According to "Chem.-Zeitung" (August 8) the silicic acid can readily be isolated in the pure condition and utilised for special glasses.

* * *

CONSIDERABLE PROGRESS HAS BEEN MADE in the problem of reducing the losses during the running of amber, a process analogous to copal-running. Amber can now be quantitatively converted into a readily soluble form by heating at a temperature well below its melting point and without any deterioration in properties ("Metallbörse," August 8, page 1,003).

* * *

THE FIRST HUNGARIAN ALUMINA FACTORY is due to commence working, reports the "Chemische Industrie." With a capacity of 4,000 tons per annum it will meet the demands of the textile, paper and leather industries and also supply raw material for the new aluminium factory at Csepel. The latter will be equipped to turn out 900 tons of the metal in the year although the present internal requirements do not amount to more than about 600 tons.

Chemical Notes from South Africa

Fertiliser Imports

THE average annual importation of fertilisers and raw materials for the manufacture of fertilisers is now nearly £300,000 f.o.b., with the weight about 144,000 tons. There is every indication of more interest in fertilisers among the farmer community, but the local fertiliser manufacturers are trying to encourage the Government to place a duty on imported fertilisers, so that they may monopolise the local market. No decision has yet been reached on this point.

Natal Wattle Industry

THE Natal wattle industry is now in a much happier condition than it has been for some years, and growers are now hoping to extend their markets. At present, however, the bulk of their products are being sent to Great Britain. It is hoped this year to export up to £800,000 of bark and £200,000 of extract, but the actual trade may fall below these figures. It is still hoped that the industry will again annually export over one million pounds sterling of bark, and if world conditions continue to improve, this may happen. Natal wattle bark, of great value to the boot and shoe industry, has attracted the attention of Japanese industrialists. As Japan does not grow sufficient wattles to serve its needs, it is anticipated that she will purchase some such requirements in the Union.

Essential Oil Extraction

IN view of the promising results of the recent experiments in the production of essential oils from indigenous aromatic plants in the Cape, it is not unlikely that a new industry will arise to produce the oils from indigenous plants cultivated by farmers as a sideline. Climatic conditions in France, India and China are said to be less favourable than in South Africa, yet these countries have developed into important producers of essential oils. The value of the oils produced in South Africa is expected to range from 3s. to £6 per ounce and they are said to be suitable for a large range of uses.

Lease of Salt Rights

A COMPANY has been formed at Lourenco Marques with a capital of £1,000 to work the salt pans near the bay. Two Portuguese have obtained salt rights over 10,000 square miles of ground near the bay on a five years' lease at an annual rental of £112. There has recently been more activity in the Cape Cross salt fields, in South-West Africa, where it is expected some 8,000,000 tons of rock salt and 14,000,000 tons of lime salt will be yielded. This pan, situated 80 miles north of Swakopmund, is nine miles long and six miles wide. As most of this product is sold in the mandated territory and as the prevailing demand has tended to fall, it has not been possible to maintain production at the 100 tons a month reached some time ago.

Weekly Prices of British Chemical Products

Review of Current Market Conditions

ACTIVITY in the chemical market has remained steady during this week, prices being well maintained. A good demand continues for formic, oxalic acids, and formaldehyde, the latter being in keen competition. A fair inquiry continues for ammonium chloride, acetone, and for sal-ammoniac, in which latter there is keen competition. Arsenic, barium chloride, Epsom salts, zinc oxide, and sodium chlorate continue dull. Cresylic acid and creosote oil remain steady, and there is an improvement in coal tar pitch inquiries. In the coal tar products markets, business continues satisfactory. No alterations are shown in prices for this week. Prices in the wood distillation products market remain steady, and the demand for charcoal and other wood distillation products continues good. In the pharmaceutical products section, most prices remain unaltered, save for a considerable reduction in iodide prices. The inquiry for hydroquinone is steady but limited, and diethyl barbituric acid and formaldehyde still remain sound. Citric acid and cream of tartar show fair activity, there being more inquiry for salicylic acid. The phenacetin market shows little activity, and is rather irregular.

LONDON.—Chemical markets have continued upon quietly steady lines and as only natural for the period of the year, the demand is affected by the general holiday conditions. Prices continue remarkably steady and there are no changes to report in the list.

MANCHESTER.—Although from the point of view of the flow of delivery specifications the Manchester market for chemical products during the past week has been rather less sluggish than it has been of late, there has not been much more fresh buying transacted in any department. A few odd contracts have been put through to cover requirements over the next few months, but otherwise sales this week have been confined mainly to near delivery dates. Traders are more than hopeful, however, that before the month is out the markets will have discarded almost entirely the seasonal sluggishness that have been in evidence for some time. The movements of prices since last report have been both few and of comparatively little importance, and the undertone is mainly steady. Among the by-products, the majority of the light materials are moving slowly and there is some uncertainty with regard to values, whilst excort buying of pitch shows little indication of increasing in activity owing to a belief among users that the outlook favours somewhat lower rates than those that are now current.

SCOTLAND.—There is a slight increase in business in the Scottish heavy chemical market, business steadily improving.

Price Changes.

Manchester.—ARSENIC, white powdered, Cornish, £20 10s. to £21 per ton, ex store. LEAD ACETATE, brown, £32 per ton. POTASSIUM PERMANGANATE, B.P., 9½d. per lb.

See also IODINE, POTASSIUM IODIDE and SODIUM IODIDE.

All other prices remain unchanged.

General Chemicals

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

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

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

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

ACID, CITRIC.—9d. per lb. less 5%.

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

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

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

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

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

ACID, OXALIC.—LONDON : £47 17s. 6d. to £57 10s. per ton, according to packages and position. SCOTLAND : 98/100%, £48 to £50 ex store. MANCHESTER : £49 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. 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, £20 10s. to £21 ex store.

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

BARIUM CHLORIDE.—£11 per ton.

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. 7d. to 2s. 11d.

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.—3¼d. to 5d. per lb. LONDON : 4½d. to 5d.

CARBON TETRACHLORIDE.—£41 to £46 per ton, drums extra.

CHROMIUM OXIDE.—10½d. 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.

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

DIPHENYLGUANIDINE.—2s. 2d. per lb.

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

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

LAMPBLACK.—£45 to £48 per ton.

LEAD ACETATE.—LONDON : White, £34 10s. per ton; brown, £1 per ton less. SCOTLAND : White crystals, £33 to £35; brown, £1 per ton less. MANCHESTER : White, £34; brown, £31 10s.

LEAD, NITRATE.—£28 per ton.

LEAD, RED.—SCOTLAND : £25 10s. to £28 per ton; d/d buyer's works.

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

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

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

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

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

NICKEL SULPHATE.—£49 per ton d/d.

PHENOL.—8½d. to 9d. per lb. without engagement.
POTASH, CAUSTIC.—LONDON: £42 per ton. MANCHESTER: £38 10s.
POTASSIUM BICHROMATE.—Crystals and Granular, 5d. per lb. net d/d U.K. Discount according to quantity. Ground 5½d. LONDON: 5d. per lb. with usual discounts for contracts. SCOTLAND: 5d. d/d U.K. or c.i.f. Irish Ports. MANCHESTER: 5d.
POTASSIUM CHLORATE.—LONDON: £37 to £40 per ton. SCOTLAND: 99¼/100%, powder, £37. MANCHESTER: £38.
POTASSIUM CHROMATE.—6½d. per lb. d/d U.K.
POTASSIUM IODIDE.—B.P., 5s. 2d. per lb. for quantities not less than 28 lb.
POTASSIUM NITRATE.—SCOTLAND: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.
POTASSIUM PERMANGANATE.—LONDON: 9¼d. per lb. SCOTLAND: B.P. crystals, 9d. MANCHESTER: Commercial, 8¾d.; B.P., 9¾d.
POTASSIUM PRUSSIATE.—LONDON: 8¼d. to 8¾d. per lb. SCOTLAND: Yellow spot material, 8¼d. ex store. MANCHESTER: Yellow, 9¼d.
RUPRON (MINERAL RUBBER).—£15 10s. per ton.
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, £15 ex station, 4-ton lots. MANCHESTER: Commercial, £9 5s.; photographic, £15.
SODIUM META SILICATE.—£16 per ton, d/d U.K. in cwt. bags.
SODIUM IODIDE.—B.P., 6s. per lb. for quantities not less than 28 lb.
SODIUM NITRITE.—LONDON: Spot, £18 to £20 per ton d/d station in drums.
SODIUM PERBORATE.—LONDON: 10d. per lb.
SODIUM PHOSPHATE.—£13 per ton.
SODIUM PRUSSIATE.—LONDON: 5d. to 5¼d. per lb. SCOTLAND: 5d. to 5¾d. ex store. MANCHESTER: 4¾d. to 5¾d.
SULPHUR.—£9 15s. to £10 per ton.
SODIUM SILICATE.—140° Tw. Spot £8 per ton d/d station, returnable drums.
SODIUM SULPHATE (GLAUBER SALTS).—£4 2s. 6d. per ton d/d SCOTLAND: English material £3 15s.
SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 15s. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 5s.
SODIUM SULPHIDE—Solid 60/62% Spot, £10 15s. per ton d/d in drums; crystals 30/32%, £8 per ton d/d in casks. SCOTLAND: For home consumption, Solid 60/62%, £10 5s.; broken 60/62%, £11 5s.; crystals, 30/32%, £8 2s. 6d., d/d buyer's works on contract, min. 4-ton lots. Spot solid 5s. per ton extra. Crystals, 2s. 6d. per ton extra. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8 2s. 6d.
SODIUM SULPHITE.—Pea crystals spot, £13 10s. per ton d/d station in kegs. Commercial spot, £9 10s. d/d station in bags.
SULPHATE OF COPPER.—MANCHESTER: £14 5s. per ton f.o.b.
SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quality.
SULPHUR PRECIP.—B.P. £55 to £60 per ton according to quantity. Commercial, £50 to £55.
VERMILION.—Pale or deep, 3s. 11d. to 4s. 1d. per lb.
ZINC CHLORIDE.—SCOTLAND: British material, 98%, £18 10s. per ton f.o.b. U.K. ports.
ZINC SULPHATE.—LONDON AND SCOTLAND: £12 per ton.
ZINC SULPHIDE.—11d. to 1s. per lb.

Coal Tar Products

ACID, CARBOLIC.—Crystals, 8¼d. to 8¾d. per lb.; crude, 60's, to 2s. 2¼d. per gal. MANCHESTER: Crystals, 7¼d. per lb.; crude, 1s. 11d. per gal. SCOTLAND: 60's, 2s. 6d. to 2s. 7d.
ACID, CRESYLIC.—90/100%, 1s. 8d. to 2s. 3d. per gal.; pale 98%, 1s. 6d. to 1s. 7d.; according to specification. LONDON: 98/100%, 1s. 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 9¼d. per gal.; standard motor, 1s. 3¼d. to 1s. 4d.; 90%, 1s. 4d. to 1s. 4¼d.; pure, 1s. 7¼d. to 1s. 8d. LONDON: Motor, 1s. 6¼d. SCOTLAND: Motor, 1s. 6¼d.
CREOSOTE.—B.S.I. Specification standard, 4d. to 4¼d. per gal. f.o.r. Home, 3¾d. d/d. LONDON: 3¼d. f.o.r. North; 4d. London. MANCHESTER: 3¼d. to 4¼d. SCOTLAND: Specification oils, 4d.; washed oil, 4¼d. to 4¾d.; light, 4¼d.; heavy, 4¼d. to 4¾d.
NAPHTHA.—Solvent, 90/160%, 1s. 6d. to 1s. 7d. per gal.; 95/160%, 1s. 7d. to 1s. 8d.; 99%, 11d. to 1s. 1d. LONDON: Solvent, 1s. 3¼d. to 1s. 4d.; heavy, 11d. to 1s. 0¼d. f.o.r. SCOTLAND: 90/160%, 1s. 3d. to 1s. 3½d.; 90/190%, 11d. to 1s. 2d.
NAPHTHALENE.—Purified crystals, £10 per ton in bags. LONDON: Fire lighter quality, £3 to £3 10s.; 74/76 quality, £4 to £4 10s.; 76/78 quality, £5 10s. to £6. SCOTLAND: 40s. to 50s.; whizzed, 70s. to 75s.
PITCH.—Medium soft, 57s. 6d. per ton, in bulk, at makers' works. LONDON: £3 per ton f.o.b. East Coast port for next season's delivery.
PYRIDINE.—90/140, 7s. 6d. to 9s. per gal.; 90/180, 2s. 3d. per gal.
TOLUOL.—90%, 2s. to 2s. 1 per gal.; pure, 2s. 3d. to 2s. 4d.
XYLOL.—Commercial, 2s. 1d. per gal.; pure, 2s. 3d.

Intermediates and Dyes

ACID, BENZOIC, 1914 B.P. (ex Toluol).—1s. 9¼d. 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

The following prices are current for the chief nitrogenous fertilisers:—

SULPHATE OF AMMONIA.—August, 1934, £6 14s. 6d., September £6 16s., October £6 17s., November £6 19s., December £7 0s. 6d., January, 1935, £7 2s., February £7 3s., March/June £7 5s., for neutral quality basis 20.6 per cent. nitrogen delivered in 6-ton lots to farmer's nearest station.
CYANAMIDE.—August, 1934, £6 15s., September £6 16s., October £6 17s., November £6 18s. 9d., December £7, January, 1935, £7 1s. 3d., February £7 2s. 6d., March £7 3s. 9d., April/June £7 5s., delivered in 4-ton lots to farmer's nearest station.
NITRATE OF SODA.—£7 12s. 6d. per ton for delivery up to June, 1935, in 6-ton lots carriage paid to farmer's nearest station for material basis 15.5 per cent. or 16 per cent. nitrogen.
NITRO-CHALK.—£7 5s. per ton for delivery up to June, 1935, in 6-ton lots carriage paid to farmer's nearest station for material basis 15.5 per cent. nitrogen.

Latest Oil Prices

LONDON, Aug. 15.—LINSEED OIL was cheaper. Spot, £21 15s. (small quantities 30s. extra); Aug., £20 2s. 6d.; Sept.-Dec., £20 17s. 6d.; Jan.-April, £20 12s. 6d., naked. SOYA BEAN OIL was quiet. Oriental (bulk), Aug.-Sept. shipment, £15 10s. per ton. RAPE OIL was steady. Crude extracted, £27; technical refined, £28 10s. naked, ex wharf. COTTON OIL was steady. Egyptian crude, £13 10s.; refined common edible, £17 5s.; and deodorised, £18 15s. naked, ex mill (small lots 30s. extra). TURPENTINE was lower. American, spot, 41s. 6d. per cwt.

HULL.—LINSEED OIL, spot, quoted £21 10s. per ton; Aug., £21; Sept.-Dec., also £21; and Jan.-April, £20 15s., naked. COTTON OIL, Egyptian, crude, spot, £14 10s.; edible refined, spot, £16 10s.; technical, spot, £16 10s.; deodorised, £18 10s., naked. PALM KERNEL OIL, crude, f.m.q., spot, £14, naked. GROUNDNUT OIL, extracted, spot, £20; deodorised, £24. RAPE OIL, extracted, spot, £26; refined, £27 10s. SOYA OIL, extracted, spot, £17; deodorised, £20 per ton. COD OIL (industrial), 25s. per cwt. CASTOR OIL, first, 31s.; second, 28s. per cwt. TURPENTINE, American, spot, 43s. 6d. per cwt.

Calcium Cyanamide Prices

THE new seasonal prices for calcium cyanamide 20.6 per cent. nitrogen, powdered and oiled, packed in paper lined bags of 2 cwt. gross weight for net, are announced by Shaw, Scott and Co., Ltd., as follows:—August, 1934, delivery £6 15s., September £6 16s. 3d., October £6 17s. 6d., November £6 18s. 9d., December £7, January, 1935, £7 1s. 3d., February £7 2s. 6d., March £7 3s. 9d., April to June £7 5s. per ton, carriage paid to any railway station in Great Britain in lots of 4 tons and over. For quantities of less than 4 tons, but not less than 2 tons an additional 5s. per ton will be charged; less than 2 tons, but not less than 1 ton an additional 1s0. per ton; less than 1 ton, but not less than 10 cwt. an additional 15s. per ton.

Cyanamide is sold on the basis of 20.6 per cent. nitrogen with no charge for excess, but with the following allowance for deficiency, if any, in analysis:—1s. per ton if the percentage of nitrogen is under 20.6 per cent., but not less than 20.5 per cent.; 2s. per ton if the percentage of nitrogen is under 20.5 per cent., but not less than 20.25 per cent.; 4s. per ton if the percentage of nitrogen is under 20.25 per cent., but not less than 20.00 per cent.

Inventions in the Chemical Industry

Patent Specifications and Applications

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

Applications for Patents
(July 26 to August 1, inclusive.)

CELLULOSE ESTERS, treatment.—H. A. Auden. 22221, 22356.

PREPARING CHEMICAL COMPOUNDS.—W. E. Austin. (United States, July 26, '33.) 21920, 21921.

FLUID TREATMENT of textile fibres.—J. Brandwood. 22398.

BASIC ALUMINIUM SULPHATE, production.—British Aluminium Co., Ltd., and S. F. Derbyshire. 22480.

ARTIFICIAL MATERIALS, manufacture.—British Celanese, Ltd. (United States, Aug. 21, '33.) 22428.

KETENE, ETC., preparation.—Consortium für Elektrochemische Industrie Ges. (Germany, Sept. 16, '33.) 22282.

KETENE, ETC., preparation.—Consortium für Elektrochemische Industrie Ges. (Germany, Feb. 12.) 22283, 22284.

EVAPORATION OF SOLUTIONS.—C. Cooper. 22143.

SOLUTIONS OF AMMONIUM SALTS, treatment.—C. Cooper. 22144.

TEXTILE MATERIALS, treatment.—H. Dreyfus. 21865, 22300.

HYDROGEN PEROXIDE, manufacture.—E. I. du Pont de Nemours and Co. (United States, July 29, '33.) 22243.

AROMATIC AMINES, manufacture.—E. I. du Pont de Nemours and Co. (United States, July 31, '33.) 22379.

EVAPORATION OF SOLUTIONS.—W. C. Holmes and Co., Ltd. 22143.

SOLUTIONS OF AMMONIUM SALTS, treatment.—W. C. Holmes and Co., Ltd. 22144.

CONTAINERS FOR ETHER, ETC.—Howards and Sons, Ltd. 22103.

TRICHLOROMETHYL-OXYARYL CARBINOLS, ETC., manufacture.—Howards and Sons, Ltd. (Austria, July 29, '33.) 22195.

NITRODIBENZANTHRONES, manufacture.—I. G. Farbenindustrie. (Germany, Aug. 4, '33.) 22180.

OXYALKYLATED AMINOBENZENES, ETC., manufacture.—I. G. Farbenindustrie. (Germany, Nov. 15, '33.) 22196-7.

ANTHRAQUINONE DERIVATIVES, manufacture.—Imperial Chemical Industries, Ltd., F. Lodge, C. Shaw, and W. W. Tatum. 21842, 22230.

DETERGENT COMPOSITIONS.—Imperial Chemical Industries, Ltd. 22049, 22231.

WATER-SOLUBLE MONOAZO DYESTUFFS, manufacture.—Imperial Chemical Industries, Ltd., and A. H. Knight. 22050.

SOLID CARBON DIOXIDE, production.—Imperial Chemical Industries, Ltd. 22051.

VARNISH INGREDIENTS.—Imperial Chemical Industries, Ltd. 22229.

AROMATIC HYDROCARBON DERIVATIVES, manufacture.—Imperial Chemical Industries, Ltd., and A. Kershaw. 22354.

INSOLUBLE AZO DYES on the fibre, production.—Imperial Chemical Industries, Ltd. (Du Pont de Nemours and Co.). 22048.

WETTING AGENTS, manufacture.—J. Y. Johnson (I. G. Farbenindustrie). 21997.

ELECTROLYTIC DEPOSITION OF ZINC.—Soc. d'Electro-Chimie, d'Electro-Métallurgie et des Aciéries Electriques d'Ugine. (France, July 21.) 21996.

HYDROCARBON HYDROGENATION METHODS.—C. Vieu. 22187.

Complete Specifications Open to Public Inspection

SETTING MEDIA for photographic emulsions.—Deutsche Maizena Ges. Jan. 28, 1933. 18168/33.

FUEL GAS FROM PETROLEUM liquid hydrocarbons, method of producing.—Carburetted Gas, Inc. Jan. 26, 1933. 28624/33.

DEVICES for producing calorific energy.—Soc. d'Etudes pour l'Exploitation des Brevets R. Audain. Jan. 26, 1933. 32652/33.

VINYL ESTERS, processes of making.—Carbide and Carbon Chemicals Corporation. Jan. 25, 1933. 35590/33.

FILAMENTS, films and the like from vinyl resins, production.—Carbide and Carbon Chemicals Corporation. Jan. 25, 1933. 145/34.

PULVERULENT METAL ALLOYS, manufacture.—I. G. Farbenindustrie. Jan. 24, 1933. 1301/34.

RESINOUS COMPOSITIONS and methods of making the same.—British Thomson-Houston Co., Ltd. Jan. 26, 1933. 2355/34.

NEW MONOAZO DYESTUFFS, manufacture.—I. G. Farbenindustrie. Jan. 24, 1933. 2392/34.

ALIPHATIC CELLULOSE ETHERS, production.—E. I. du Pont de Nemours and Co. Jan. 25, 1933. 2472/34.

CHROMIFEROUS DYESTUFFS, manufacture.—Soc. of Chemical Industry in Basle. Jan. 25, 1933. 2474/34.

ELECTROCHEMICAL PROCESS.—Bullard Co. Jan. 25, 1933. 2591/34.

COLOURING of cellulose ester and ether materials.—E. I. du Pont de Nemours and Co. Jan. 25, 1933. 2619/34.

Specifications Accepted with Dates of Application

TEXTILE MATERIALS, treatment.—British Celanese, Ltd., and W. H. Moss. Jan. 18, 1933. 414,040.

CASEIN SOLUTIONS, methods for making.—F. C. Atwood. Jan. 23, 1933. 414,044.

QUINOLINE DERIVATIVES, manufacture.—I. G. Farbenindustrie. Jan. 26, 1932. 414,105.

EMULSIONS.—C. W. Richards, H. Dodd and Imperial Chemical Industries, Ltd. Jan. 26, 1933. 414,072.

RECOVERY OF SULPHUR from spent oxide.—W. G. Ragg, J. A. Weil, and Imperial Chemical Industries, Ltd. Jan. 26, 1933. 414,074.

CASE HARDENING of iron, steel and alloy steels.—Roessler and Hasslacher Chemical Co. Jan. 27, 1932. 414,092.

BARIUM FLUOSILICATE and its application.—Grasselli Chemical Co. Jan. 29, 1932. 414,110.

INDANTHRONE COMPOUNDS, manufacture.—Imperial Chemical Industries, Ltd., E. Burgoine and C. W. Soutar. Feb. 2, 1933. 414,136.

DYESTUFFS OF THE AZINE SERIES, process for the manufacture.—I. G. Farbenindustrie. Feb. 3, 1932. 414,138.

MANUFACTURE OR TREATMENT OF TEXTILE and other shaped materials and articles made of or containing organic derivatives of cellulose.—British Celanese, Ltd., E. B. Johnson and R. P. Roberts. Feb. 8, 1933. 414,153.

CHROME PIGMENTS, manufacture and production.—J. Y. Johnson (I. G. Farbenindustrie). Feb. 16, 1933. 414,160.

GASEOUS ATMOSPHERES for use in the heat treatment of metals, apparatus for the production and supply.—S. N. Brayshaw and F. C. Newman. March 14, 1933. 414,166.

POLYHALOGEN DERIVATIVES of pyrene and of pyrenequinones, manufacture.—W. W. Groves (I. G. Farbenindustrie). Sept. 11, 1933. 414,230.

ALKOXY ACETIC ACIDS, manufacture.—Resinous Products and Chemical Co. Jan. 23, 1932. 414,121.

CHROMIFEROUS DYESTUFFS, manufacture.—Soc. of Chemical Industry in Basle. July 19, 1932. 414,218.

CORROSION-RESISTANT AND MALLEABLE ALLOYS.—Oesterreichische Dynamit Nobel Akt.-Ges. July 8, 1932. 414,212.

From Week to Week

MR. D. R. BAIN, for many years an employee of the Seville Silver and Copper Co., Glasgow, died last week at the age of 63.

THE JULY ISSUE OF THE "HARCO" MAGAZINE, the house journal of G. A. Harvey and Co., Ltd., contains an account of the firm's Jubilee outing which was held on July 7. Mr. Denidge, chief engineer of the firm, in proposing the toast of "The Firm," stated that the outing had been a great success.

MR. ERNEST BROWN, M.P., SECRETARY FOR MINES, has appointed Mr. C. S. Wright, Director of Scientific Research under the Admiralty, to be a member of the Explosives in Mines Research Committee in the place of Dr. C. V. Drysdale, who has resigned on his retirement from the Civil Service.

IT IS ANNOUNCED that Sir John Cadman, chairman of the Anglo-Persian Oil Co. will leave for Australia on August 24 to view the shale oil deposits in New South Wales. It was anticipated that if Sir John's view is favourable, the Anglo-Persian Oil Co. may be induced to became financially interested.

BENN BROTHERS, LTD., publishers of THE CHEMICAL AGE, announce that they have opened a branch office in Birmingham, at Daimler House, Paradise Street, Birmingham. Telephone: Midland 0747. It should be noted that there is also a branch office in Glasgow, at 116 Hope Street, Glasgow. Telephone: Central 3970.

THE CONTEMPORARY INDUSTRIAL DESIGN EXHIBITION will be held at Dorland Hall, during November. The exhibition will cover a wide field, the architectural side predominating, and its aim is to show how contemporary "designs for living" show progress in efficiency both from a labour-saving and health standpoint.

THE DECISION OF SCOTTISH OILS, LTD., to proceed with a new mining development, has been received in the West Calder district with satisfaction. Inquiries have started on a new shale pit and it is believed that there are still large deposits of shale in the West Calder districts which are still untouched. When the pit is completed, it will provide work for a considerable number of shale miners.

THE JULY NUMBER OF "THE NAFT," A.P.O.C. MAGAZINE, published by the Anglo-Persian Oil Co., contains an article upon modern Persia. The substance of the article was given in a paper before the Royal Society of Arts on May 30, by His Excellency Sayyid Hassan Tagizadeh, the Persian Minister at Paris. The article gives a remarkably comprehensive description of the situation in Persia to-day.

A SMALL BOOK ON PATENT NOTES FOR INVENTORS has been published by Reginald W. Barker and Co. (price 6d. post free). In short and simple fashion it explains the main features of patenting, and contains much useful information, a list of countries in which patents or registrations may be obtained, "What can be patented," how to apply for a patent, etc. The work is compiled specially for the inventor.

AT THE SUMMER MEETING of the Royal Cornwall Polytechnic Society at Falmouth, Dr. J. Hambly Rowe delivered a paper upon the Cornish tin mines, in which he stated that mining in Cornwall had decreased. He referred to a lode at Wheal Alfred 9 ft. wide and thought that there was still much unexplored tin in the district. Mr. W. T. Hooper, in seconding the vote of thanks to the speakers, said that a lode had been found in one of the old mines of the County, which measured 80 ft. across. It was hoped, he said, that this lode would prove highly productive.

THE PART PLAYED IN THE AUSTRIAN TROUBLES by the Alpine Montan Steel Corporation, whose managing director, Herr Appold, was arrested, has led to the consideration in influential circles of the erection of new iron and steel works on the shores of the Danube, so that the Austrian market may be independent of the supplies from Herr Appold's company, which is controlled by the German Ruhr Steel Cartel. The cost of the new plant would be in the neighbourhood of £1,200,000, but steel and iron would be produced at rates cheaper than those obtaining at present, and this would lead to relief for Austrian industry.

GREECE WAS ONE OF THE FEW COUNTRIES to record a much greater production of chemicals in 1933 than in 1932. Since final statistics for industrial activity in Greece during 1933 indicate a volume of production greater than in any previous year, consumption of chemicals likewise must have increased. The volume of output in all the principal branches of industry (based on 1928 equals 100) was 113.04 in 1933, compared with 102.67 in 1932 and 108.88 in 1931. The chemical industry made the second important gain, with an increase of 400,000,000 drachmas, or nearly 50 per cent.; the textile industry ranked first in gain, by 600,000,000 drachmas. The value of output of chemicals in 1933 was 1,210,061,000 drachmas ($8,500,000), as compared with 825,499,000 drachmas ($6,200,000) in 1932.

FUELS DEVELOPMENT, LTD., have increased their nominal capital by the addition of £7,400 beyond the registered capital of £100. The additional capital is divided into 148,000 shares of 1s.

THERE WAS AN INCREASE in oil imported into Swansea of 22,243 tons for the year ending July 29. The total amounted to 42,243 tons. Exports amounted to 18,443 tons, as opposed to 8,845 tons of the previous year.

MR. CHARLES M'PHERSON, lately branch manager for Scotland of the International Paint Co., died at his residence, Ardhoig, Fairlie, Ayrshire, last week. Mr. M'Pherson retired two years ago, following illness.

BRIG.-GEN. SIR WILLIAM ALEXANDER, M.P., has consented to accept the presidency of the National Union of Manufacturers for a third year. He will be elected at the annual meeting of the Union in November.

THREE FIRMS OF CHEMICAL MANUFACTURERS, Imperial Chemical Industries, the United Potash Co., and Day, Son and Hewitt (Ireland), Ltd., were among the exhibitors at the Royal Dublin Society's Horse Show, held at Ballsbridge, Dublin, recently.

EXPERIMENTS ARE BEING CARRIED OUT in Batavia regarding a new fuel, consisting of a mixture of petrol with alcohol extracted from raw sugar, according to an announcement made in the People's Council to-day by the Government representative of Economic Affairs.

MR. JOHN ARMOUR AND MR. J. MCGUIGAN have been appointed president and vice-president respectively of the Scottish Council of the Amalgamated Society of Dyers and Kindred Workers. Other members of the Council are: Messrs. T. Abraham, Jamestown; J. Hamilton, Alexandria; E. Hawthorne, Barrhead; W. Kennedy, Glasgow; N. MacDonald, Paisley; and J. Nicoll, Perth.

MR. H. C. PRESSLAND, formerly for many years director and general manager of the Guelph Patent Cask Co., Ltd., died at the age of 72 in a hospital at Detroit, Michigan, on July 23. Mr. Pressland had been generally in good health, but it is thought that a recent slight indisposition coupled with the great heat prevailing at the time, had the effect of overtaxing his strength.

WORLD PRODUCTION OF RAYON during the first half of 1934 is estimated at 168,935,000 kg., which compares with 138,270,000 kg. in the corresponding period in 1933. The 1934 figure, however, only shows a slight increase over that for the second half of 1933. The continued rise of Japanese output is again very marked. During the first half of 1934 output in Japan amounted to 29,675,000 kg., which compares with 18,440,000 kg. in 1933.

IT IS ANNOUNCED that a new law relating to patents and trade marks will come into force in Italy some time during this year. It is anticipated that patents applications will be examined for novelty and published before grant and that the term for an Italian patent will be extended from 15 to 18 years, subject to payment of annuities. As regards trade marks, it is proposed to limit the duration of a registration to ten years, renewable for similar periods of ten years.

SEVEN MINERS WERE TRAPPED IN THE POTASH MINES at Ensisheim following two severe explosions on August 13. Three men, including the foreman, were rescued suffering from serious burns, and three others escaped unhurt after being trapped for some time. It is feared that it will be impossible to reach the four men still entombed for several days as the mine is filled with dense clouds of suffocating smoke. It is thought that the explosions were due to firedamp. They were followed by an outbreak of fire.

LA LIBRAIRIE DE CHIMIE INDUSTRIELLE announces that they have removed their offices in Paris from the Rue Saint Dominique to "La Maison de la Chimie," a building erected by international subscription to the memory of the distinguished chemist, the late M. Marcelin Bertholot. La Maison de la Chimie will be devoted to the activities of several French and International chemical organisations, such as La Société de Chimie Biologique, La Société de Chimie Industrielle, etc., and certain sections will be devoted to the housing of a large public library of technical and scientific works.

THE AUGUST ISSUE OF THE I.C.I. MAGAZINE contains a notice of the appointment of Mr. Holbrook Gaskell to the board of directors of Imperial Chemical Industries, Ltd. Mr. Gaskell began by joining the chief engineer's staff of the United Alkali Co. at Widnes in 1901, became chief engineer himself in 1914, which post he held until 1919. He was made a director of the company in 1922. In 1929 he was appointed vice-chairman of the executive board of the General Chemical Group and became chairman in 1931, in which capacity continues on appointment to the board of I.C.I. The magazine also contains an account of Mr. T. Rogers' Australian tour. Most of Mr. Rogers' time was spent in making contact with the I.C.I. organisation in Australia, and it is anticipated that the results of the tour will be of great advantage to the business connections of I.C.I.

ACCORDING TO THE SHIPMENTS of china clay and stone we are able to give it shows that the second half of the present year has opened favourably with the industry. The details are as follows:—Fowey, 37,604 tons china clay, 1,268 tons china stone, 1,286 tons ball clay; Par, 9,994 tons china clay, 632 tons china stone, 21 tons ball clay; Charlestown, 5,774 tons china clay, 533 tons china stone; Padstow, 667 tons china clay; Penzance, 666 tons china clay; Plymouth, 114 tons china clay; Newham, 42 tons china clay. By rail to inland towns direct 5,252 tons china clay, making a total of 60,113 tons of china clay, 2,433 tons of china stone, 1,307 tons of ball clay aggregating a total volume of 63,853 tons, against 64,611 tons for the previous month. China stone, for which Cornwall has the complete monopoly, was in less demand compared with June shipments. In June 4,903 tons were despatched, but in July they were only 2,433 tons.

BRITISH COLOUR COUNCIL DICTIONARY OF COLOUR STANDARDS, consisting of two volumes, one showing 220 colours presented on pure silk ribbon and named, numbered, and coded, and the other giving the history of each colour, the various names by which each has previously been known, and the authority for standarisation has just been produced. The dictionary is primarily intended for industrial and commercial reference, but it would delight the artist or the lover of appropriate words by its spread of fascinating colour tones and the imagery that has been brought to their naming. Cyclamen pink, nettle grey, battleship grey, bee-eater blue, Chartreuse green, buttercup, and banana may be given as a random selection from the list. The council state that a great deal of misunderstanding on certain points can now be cleared up. There is no separate and distinct set of colours for each industry, and it is possible to match any product from silk ribbon. The 220 colours contained in the dictionary have been adopted by the British Standards Institution and, through the director of that institute, have been put forward for acceptance to the standardising bodies in the British Colonies and Dominions. The range was drawn up on a system which makes it practicable as a definite colour language for all stages of colour education and in all colour-using industries.

BOTH GERMAN AND JAPANESE CONCERNS are interested in the bauxite mines on the Island of Bintan, in the Dutch East Indies, according to authoritative Dutch sources at The Hague. Bauxite is largely used in the preparation of aluminium, and the German aluminium trade has shown a particular interest in these mines, but so far Japan has a better chance of obtaining the mineral, because the freight charges to Japan are much lower. Japanese ships said from Japan fully loaded with goods from Java, India and other eastern countries, and can pick up the bauxite on their return voyage, while it is stated at The Hague that ships outward bound for Java from Europe are practically empty, due to Japanese competition, and consequently the rates for freighting bauxite to Europe would be double those for taking it to Japan. Bauxite exports to Japan are included in the present Dutch East Indies-Japanese trade negotiations. The Dutch are insisting that bauxite shipments to Japan must be made under the Dutch flag.

THE DROP IN EXPORTS OF SALT TO INDIA from 200,000 tons annually to 60,000 or 70,000 tons is causing grave concern to salt manufacturers in Liverpool, West Lancashire and Cheshire. It is pointed out by Mr. T. Holme, who has raised the question, that the trade is being taken away from this country as the result of the Government's policy under which English manufacturers have to pay the same duty as that on salt from Italy, Spain and other Mediterranean countries. "Many people," said Mr. Holme, "do not realise that for the production of one ton of salt half a ton of coal is required.". The case made out by Mr. Holme is unanimously supported by salt manufacturers in Liverpool and district. Mr. R. D. Hodges, secretary of the English Salt Union, said recently: "It is nothing less than disastrous that we are being blocked out of our own territorial possessions by treaties which nobody has ever before heard of, but which the Colonial Office try to persuade us do exist. It would be a very considerable thing for the Great Weston Point salt plant at Runcorn if we could recapture the Calcutta market." The salt trade formerly called for the manufacture of millions of sacks yearly, giving employment to many hundreds of Merseyside workers who were now idle.

New Chemical Trade Marks

Compiled from official sources by Gee and Co., patent and trade mark agents, Staple House, 51 and 52 Chancery Lane, London, W.C.2.

Opposition to the registration of the following trade marks can be lodged up to September 1, 1934.

Lissapol. 544,023. Class 1. Chemical substances used in manufactures, photography, or philosophical research, and anti-corrosives. British Dyestuffs Corporation, Ltd., Imperial Chemical House, Millbank, London, S.W.1. August 24, 1933.

Carlux. 549,288. Class 1. Paints, varnishes, enamels (in the nature of paints), colours, distempers, japans, lacquers, paint and varnish driers, wood preservatives, wood stains, anti-corrosive and anti-fouling compositions and anti-corrosive oils. Dry-Namels, Ltd., Rocky Lane, Aston, Birmingham, 6. March 8, 1934.

Zegal. 549,779. Class 1. Pigments and anti-corrosives. Metallgesellschaft A.-G., 45 Bockenheimer Anlage, Frankfurt-on-Main, Germany. March 23, 1934.

Rotax. 550,862. Class 1. Accelerators being chemical substances for the vulcanisation of caout-chouc. The Goodyear Tire & Rubber Co., 1144 East Market Street, Akron, Ohio, United States of America. May 3, 1934.

Texoprint. 552,096. Class 1. Chemical substances used in manufactures, photography, or philosophical research, and anti-corrosives. I. G. Farbenindustrie, Grüneburgplatz, Frankfort-on-Main, Germany. June 21, 1934.

Exchange. B540,896. Class 1. Derivatives of pectin being chemical substances for use in manufactures. California Fruit Growers Exchange (a Corporation organised under the laws of the State of California), 607 South Hill Street, Los Angeles, State of California, United States. April 21, 1933.

Clarotex. 550,515. Class 1. Paints, varnishes, enamels (in the nature of paint), colours, distempers, japans, lacquers, paint and varnish driers, wood preservatives, wood stains, anti-corrosive and anti-fouling compositions, and anti-corrosive oils. Pilchers, Ltd., 29 and 31 Davies Street, Berkeley Square, London, W.1. April 20, 1934.

Analar. 550,658. Class 1. Chemical substances used in manufacture, photography, or philosophical research, and anti-corrosives. The British Drug Houses, Ltd., 16-30 Graham Street, City Road, London, N.1; and Hopkin and Williams, Ltd., 17 Cross Street, Hatton Garden, London, E.C.1. April 26, 1934.

Pattinson's. 551,859. Class 1. Magnesium carbonates in solid form and calcined magnesium oxides, used in manufactures. Turner and Newall, Ltd., Woodland Road, Spotland, Rochdale, Lancashire. June 12, 1934.

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).

Canada.—A firm of manufacturing chemists at Montreal are prepared to represent United Kingdom manufacturers of pharmaceutical products generally, either on a commission or purchase basis, throughout the Dominions. (Ref. No. 148.)

Brazil.—A commission agent established in Rio de Janeiro desires the representation of United Kingdom manufacturers of chemical and pharmaceutical products. (Ref. No. 166.)

Trade Inquiries from Italy

Names and addresses in respect of the following inquiries will be supplied by the Secretary, Italian Chamber of Commerce in London (Inc.), 10 Queen Street, E.C.4.

A firm in Milan manufacturing concentrated natural fruit extracts used in the preparation of fruit syrups wishes to appoint selling agents. (Ref. No. 2951.)

A well-known producer and shipper of Lucca olive oils wishes to get into touch with London export merchants buying for overseas markets. (Ref. No. 2677.)

New Companies Registered

British & Colonial Chemical Company, Ltd.—Registered August 10. Nominal capital, £2,000. To adopt an agreement with Frederick B. Pickard, Sydney M. Waller and Solomon Lefkowitz, and to carry on the business of manufacturing, wholesale and retail chemists, druggists, etc. Directors: Frederick B. Pickard, Sydney M. Waller, and Solomon Lefkowitz. Solicitors: Aylett and Godwin, 14 High Holborn, W.C.

Ferramic Industries, Ltd., 21 Lime Street, London, E.C.3.—Registered August 11. Nominal capital, £2,000. To carry on the business of manufacturers, importers and exporters of and dealers in industrial, chemical and other preparations, cements, oils, paints, pigments and varnishes; founders, mechanical engineers, etc. Subscriber: Geo. Parnell, 67 Fenwick Road, Peckham, S.E.15.

Books Received

Official Publications Received

Mines Department. 12th Annual Report, Safety in Mines Research Board. 1933. London: H.M. Stationery Office. Pp. 130. 2s.