The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

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The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

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Research or Die!

THE conference convened by the Federation of British Industries was designed to put before British industry the need for research. The application of science to industry, the relation between research and industrial expansion, and the practical means by which research can assist industry were among the more important matters under discussion. That such a conference was attended by no less than 1400 delegates from all parts of the country augurs well for the new spirit that has come into industry. Years ago King George V gave a clarion call: "Wake up, England!" The sleeping giant has at last stirred. Research is being harnessed to his chariot.

We are bound to say that so far as the chief speakers were concerned nothing very new emerged. What they said was exactly what we have been preaching in these columns for years. We have never ceased to call attention to the need for research and yet more research if we are to keep ahead of our competitors and retain our place in the world. If, in commenting upon the remarks of the chief speakers, we seem to say things which our readers have heard before, that is the reason.

It is a sign of the times that all six speakers in the first morning's discussion were Knights of the Realm. There was a time when knighthood was bestowed only for great deeds, mostly on the field of battle, though sometimes for services in the council chambers of kings. That has changed, and the accolade is now bestowed on men who, through their skill in science, in medicine, in the arts, or even in the business, have benefited their fellows. We look for an increasing recognition of science in the councils of the nation. It is of no use asking for greater application of science if scientific men are not accorded recognition. The scandalous comments of a certain Minister of the Crown on the capacities of colliery managers will not lightly be forgotten. "They know no more about social matters," he said, "than a pig knows knows about a piano."

The most significant fact facing us to-day is that as one result of the war the whole world has become industrialised. Nations that were happily content to buy their manufactured goods before the war have turned themselves into vast workshops. The goods that these people can make are those on which our own industrial supremacy was based. They are what might be called the commonplace manufactures, but manufactures

On Other Pages

nevertheless requiring great capital expenditure and technical skill. It is skill, however, which can be learned because it is the common knowledge that is taught in every university and technical college. The great basic industries of this and other countries are likely to lose their export markets because of this upsurge of industrialism in every country. Sir Clive Baillieu pointed out that as a consequence of this we must change from a nation of manufacturers to one of creators. "Britain delivers the goods" is a good slogan and one that must never be neglected, but it must be supplemented by a new slogan: "Britain creates the goods." How can new goods, new processes, new industries be created except through research? If our readers seem to have heard that before, our answer is that we have preached it for years, but reiteration in the end carries conviction.

What research will create the new things upon which our future so greatly depends? First, there must be adequate fundamental research, for, although its results may be slow in coming to fruition, they are frequently of greater ultimate benefit than those of applied research. "Who could have foreseen," remarked Sir Edward Appleton, "that O. W. Richardson's experiments on the loss of electrons from hot wires would lead to broadcasting and that J. J. Thomson's cathode-ray tubes would lead to television? Both of these have created new industries and employment on a large scale and have altered our social habits." The electrical industry arose in exactly the same way from fundamental research by Faraday, Kelvin, and others. The really spectacular advances in industry, and in particular the creation of industries that produce great changes in our social habits and modes of living, come from this type of research. How are we to set about getting enough fundamental research? Perhaps the advice of Sir Robert Robinson is as good as any: "The prescription for the attitude of industry to university departments is a simple one. Support the universities, give them their head, and keep in touch with them."

What of industrial research? The value of the Research Associations is unquestioned. Founded some 30 years ago, they have proved their worth and have stood the test. Their organisation to-day is not greatly changed from what it was then. They have assisted many a small firm that could not operate a research department of its own; they have brought realisation of science and scientific methods and teachings into many a boardroom where it was previously unknown. What is needed is that every firm should have upon its staff at least one man who can appreciate what can be done by the application of research and who can understand and explain to his colleagues the meaning of the research results that are made available to him either through the research associations or through publication.

Many firms maintain that the gamble of research is more than they can afford. Our reply is that they cannot afford to neglect science. Even if they discover nothing, the scientific method will leaven the whole works. Knowledge is power. One speaker after another threw out the simile of fishing. "If you fish," said Sir Edward Appleton, "you may not catch fish. If you don't fish, you won't catch anything." This country must fish in deep waters, it must fish in shallow waters, it must fish in every kind of water known to science and industry. For upon its catches all must live in the future.

Let there be no despondency because of the changes in our condition which render us dependent upon our scientific achievements for success in the future. We have a great record of scientific achievement behind us. Sir William Larke declared roundly that all modern civilisation is based on British discovery and achievement. He vowed that our national tendency to understatement and self-depreciation was a positive danger to the State, and that our reticence had now been carried to such a pitch that it savoured of defeatism. We have declared many times that Britain must tell the world. That has not, in general, been regarded as a dignified proceeding in academic circles, but we for our part re-echo with acclamation the words of Sir William Larke: "It is well to remember what British industry has achieved in the last 200 years, and the benefits that it has conferred on the social and material life of mankind as a result of the fact that this country was the birthplace of the fundamental discoveries of such men as Dalton, Priestley, Davy, Faraday, Watt, Rutherford, and Thomson, these discoveries being translated by British industries into the provision of the amenities and services of our daily life. A similar

revolution is in progress to-day. Never before in the history of mankind has there been such a flowering of the tree of human knowledge as in the present century, and particularly in this country in the last ten years. The results of the application of that knowledge are even yet immeasurable; for example, in the production of new materials; in medicine; in the internal combustion engine; in aeronautics; and in the release of atomic energy, to name only a few outstanding groups."

We have, too, the men. Where the students are to come from has long been a headache to many. Sir Ernest Simon pointed out that it was a soluble problem. The Intelligence Quotient (I.Q.) of the average individual is 100; that of the most brilliant is about 150. The upper half of the students at Manchester University showed 127 and upwards. It has been proved that only one in six of the people in this country who have I.Q. values of over 127 ever gets to a University. We must indeed go into the highways and compel them to come in.

We have, too, the money. A recent survey made by the F.B.I. showed that there are some 9000 graduates engaged in research and development in British industry and that the total expenditure on research and development, *so far as it has been ascertained*, is of the order of £20,000,000 annually. Moreover, those industries which have been investigated propose to extend their research staff during the next two years by 25 per cent. and vastly to increase their laboratory space. That is a heartening fact. It is clear that Britain is pulling up her research socks.

The conference may certainly have repeated old truths, but it has also shown that British business is becoming fully alive to the value of research. It has been an immensely heartening experience. It has also been a warning to those who will not listen that unless they, too, place their faith in research, unless they, too, fish in the waters of science, they will surely sink submerged by the very waters that they would not heed.

NOTES AND COMMENTS

Research in Technical Colleges

SOMEWHAT belatedly, the Ministry of Education has issued a "directive" to Local Labour Authorities, instructing them in their attitude to their local technical colleges, with special reference to the manner and method in which research should be carried on therein. It is very much what we have been preaching for years past, and we sincerely hope that official sanction will lead to suitable action. Not the least interesting part of the document (which, by the way, is entitled "Circular 94," price one penny from H.M. Stationery Office) is the recommendation that research should be linked closely with local industry. "Every encouragement," it is stated, "should be given to the development of schools of research which enhance the reputation of the college no less than that of the investigator. The provision of adequate laboratory equipment and laboratory assistance is an important contribution to success." It then goes on to say that the most suitable type of research is that undertaken at the direct or indirect suggestion of industry, thus bringing college and industry into close contact. Routine testing for industry, however, should be done only when industrial facilities are not available.

Three-Fifths Teaching

AS to the teachers themselves, it is recommended that they should, when they have given satisfactory evidence that they are competent to undertake research, be given every facility to get on with the type of work in which they are interested. More particularly, any competent scientist or technologist serving on the staff of a technical college should be encouraged to act as a consultant to industry, provided that such work does not interfere with the proper discharge of his teaching duties. It is laid down that three-fifths of a teacher's time must be devoted to "actual teaching," but this is permitted to include research work when such work includes the actual instruction of students. It is, incidentally, "very desirable" that teachers should carry out research with their senior students. Special arrangements are suggested for occasions on which it may be desirable for

a teacher to devote all his time, for a limited period, to a particular piece of research work, and due consideration is given to the publication of research results. The attention of Local Authorities and College Principals is called to the existence of the grants made through the D.S.I.R.—but they surely ought to have known about them. This is all very satisfactory, provided that it is not merely lip-service, and provided that the Ministry of Labour allows enough students to be released to make the carrying out of research a reasonably stable job. We shall watch for developments with an interested eye.

Further Thoughts on the Budget

MR. DALTON'S way of giving warning is good. Last autumn he announced changes to come into effect this April. To-day he announces alterations which will only take place at the end of the year. While relief is all the kinder for being given quickly, change of any kind is all the better for being made with caution and deliberation. The Budget causes no immediate upheaval anywhere. It has not been the cause of Stock Exchange speculation or of speculation of any kind. The overriding national needs are work and enterprise. It remains to be seen whether the wholesale remission of taxation in the lower grades of income is likely to encourage work. On the other hand it is certain that the failure to give any relief to the higher ranges in the Income Tax scale and the removal of all incentive to great wealth, whatever else may be said for it, is not calculated to encourage enterprise. To say that the nation is not now working as it should is far too wide a generalisation, but the fact is not in dispute. The Budget tends to remove further the apparent need for work for the mass of the population, and to promote the notion of punishment for those on whom the prosperity of trade and commerce have hitherto relied.

What of Inflation ?

THE removal of E.P.T. was inevitable, and the Chancellor is rather less than honest in his presentation of this part of his proposals. After the last war, Excess Profit Duty was taken off when, by reason of falling profits and claims for repayments, it became a liability on the Exchequer; and a similar position is now approaching. Mr. Dalton, however, attempts to claim credit for a concession which is, in fact, nothing of the kind, and makes it the excuse for the introduction of an entirely new form of profits tax. This revolutionary proposal is cleverly camouflaged by the suggestion that it is merely an alteration of the name of the out-of-date National Defence Contribution. The Chancellor is to be congratulated on the policy of going slow with tax remissions. We have always paid our way, and we hope always to do so. The business classes certainly do not want the spurious relief of overdrafts and loans. The Chancellor might, however, with advantage, have extended the same sound principle to the other side of the account and considered going slow also with expenditure. Mr. Dalton's references to inflation conform to the oldest of oratorical devices, the method of confess and avoid. A Chancellor who connives at a continuous process of increasing wages, who himself distributes large sums by way of remission of taxation, who perpetuates a pernicious system of subsidies to keep down the cost of living, and who finally admits that his proposals are dependent upon an American loan, is wholly out of court in pleading any real interest in the very present dangers of inflation.

Fuel Economy and Soap

THE interim report issued by the Fuel Efficiency Committee of the Soapmakers' and Fat-splitters' Federation, covering the first half of 1945, shows continued progress. It is a clear indication that even when fuel economy measures have been in force for some time, there still remain further worlds to conquer. Although this committee had achieved much by the end of 1944, a higher target was set, and this, too, has been achieved. The year 1943 showed a saving of 7 per cent. of the fuel used as compared with 1942, equivalent to 380 tons a week. The first half of 1944, compared with the year 1943, showed an additional saving of 17.4 per cent., amounting to 1000 tons of coal per week. Compared with the first half of 1944, the 12 months ending June, 1945, show a still further saving of 323 tons a week, or 6.6 per cent. of the first half-year 1944 basis. Thus in the 2½ years since 1942 the industry has saved 151,275 tons of coal.

Papers on Pigments

Manufacture and Pre-Treatment Discussed

AT the meeting of the London Section of the O.C.C.A., held on March 22, Dr. D. M. Stead, of the Scottish Section, presented a paper on "Some Aspects of Pigmentation and Pigment Manufacture," in which he discussed pigments rather generally; and inasmuch as his experience lay with the colour pigments rather than the white, the emphasis was on colour. He examined (a) the properties sought by the pigment users, and (b) the more fundamental properties controlling the class (a) properties.

The paint manufacturer, he said, looked for pigments of good wettability in oil media, optimum development in those media, insolubility in oil, low absorption, and so on. There were particular properties the printing-ink maker required. Pigments might have to be non-bleeding in a number of environments other than drying oils.

The more fundamental properties in class (b) could not be defined quite so readily as those in class (a), but it was fairly certain that control of particle size, size distribution, particle shape, surface characteristics, refractive index, and specific gravity would, given compounds of suitable constitution, enable any particular property to be developed to its optimum value.

Constitution and Control

Dr. Stead touched on the constitutional trend in several colours. The molecules of coloured substances, he said, were the bricks from which pigment structures were built, and he discussed not only the modifications and alterations of properties that were possible, but also the various properties of pigments and the controlling factors. He felt that in the use of dispersing agents and surface-acting compounds we were learning to exercise a control of pigment properties which was likely to exceed in importance any other controlling factor he had mentioned. But developments in that field did not rest entirely with the pigment maker.

He would be giving quite a false picture of pigment making if he did not point out that, in pigment manufacture, practice had far outstripped theory; control was being exercised by empirically determined methods long before theory gave the reasons for such control. A great deal of work remained to be done, and called for the utmost refinement of physical methods. Improvements would be effected more rapidly the more complete was the co-operation between pigment user and maker.

In the discussion which followed, the Chairman (Mr. R. J. Ledwith) asked whether surface-active agents, with which one obtained from time to time some rather strange results, were frequently added by pigment manufacturers to the pigments as they were sold to the paint industry.

Dr. Stead replied that some types of surface-active agents were generally added when some particular properties which they imparted was required, such as ready dispersibility in aqueous media. In general, these agents were added deliberately, but not as a secret means of deluding the user!

The Flocculation Question

Dr. R. F. Bowles asked whether Dr. Stead considered it better for the pigment maker to add dispersing agent to the pigment during its manufacture, or whether it was better or as good for the paint or ink maker to put the dispersing agent into the medium and to grind it on to the pigment surface that way. Secondly, was it better, from the pigment maker's point of view, to have a pigment flocculated or deflocculated in the final product? In that connection, when doing some work on the flushing of pigments some years ago he believed that in every case in which pigments were displaced from water into oil they were completely flocculated, whereas by dry grinding more often than not the same types of pigments were deflocculated.

The lecturer replied that the effects produced by dispersion were different according to whether dispersion was effected during or after manufacture. In many cases there was no enhancement of strength by subsequent incorporation, and in those cases it was necessary that the pigment maker should do it during manufacture. From the manufacturing point of view, the working up was easier when pigments were flocculated than when deflocculated. But the pigments, as they were sent out by the maker, were in most cases considered to be better for the user if they were deflocculated; that was achieved in many cases by the users, in their subsequent processes, by the use of dispersing agents.

There had been controversy for a good many years as to whether flushed pigments were better than pigments which were dried out and subsequently incorporated in the media. In some cases improvement was achieved by flushing, whereas in other cases there was a deterioration in respect of some properties. In a way it was not easy for the pigment maker to enter into the flushing field, because pigments were required in such an enormous variety of media; if a pigment maker flushed a pigment into a medium, then he was partly determining the product which the user was going to

make. His feeling was that the flushing process should be carried out by the user where he found that an improvement in properties was effected, as it certainly was in some cases.

More Information Wanted

Dr. F. W. Stoyle, emphasising the real necessity for co-operation between the pigment maker and user, suggested that chemists might try to take advantage of the occasion to try to bring all the users of pigments of the same type into some sort of group, so that by discussion they might determine common ground. He also suggested that intermediate manufacturers might need encouragement by being given a picture of the potential demands. He also reinforced Dr. Stead's plea for the use of simpler names in discussing the various products, so that chemists who dealt with them might know what they were. If pigment users could be encouraged to take the chemists more into their confidence and to use names which meant something, that would help to reinforce co-operation.

Dr. Stead agreed, suggesting that co-operation might be promoted if the user furnished to the maker the maximum amount of information about his needs. The makers would like to be informed in advance of trends and of exact needs. They did not wish to know the user's secrets; they just wanted information which would help them to give the best service.

Mr. Wells urged that the pigment manufacturer could give more help by the provision of data which the paint chemist was forced to determine for himself. Often, for instance, they liked to know the oil absorption and sometimes even the specific gravity. It was not at all easy, in a matter such as oil absorption, to obtain consistent results. The pigment makers carried out such tests much more frequently and were much better practised in the actual determinations; but it did not appear easy to obtain the figures from them.

Dr. Stead suggested that the determination of specific gravity might well be done by a central body and the figures published for the whole trade. In the determination of oil absorption it was difficult to secure consistent results, and he suggested that at first some centralised research was necessary in order to arrive at a standard method which would enable any operator to obtain consistent results.

On pigment nomenclature, he favoured a name which was moderately descriptive. Pigments of known constitution should be named uniformly and sensibly, and he believed the trend was in that direction.

Mr. Holness, proposing the thanks of the meeting to Dr. Stead, remarked that the pigment user who wished to disperse a pigment in oil required a pigment of very different properties from the user who had to disperse a pigment in aqueous media. Was it possible for the pigment maker to do a good turn simultaneously to himself and to those who dispersed their pigments in oily media by flocculating his pigment when he had it in the water phase or water dispersion by the use of a hydrophobic film on the surface? Surely, if it were possible to flocculate a pigment in that way, it would have surface properties which would enable it to disperse with the greatest of ease in oil. As to the effects of small amounts of impurities in pigments, he recalled a recent claim that when a nickel salt was added to an iron blue, the iron blue was resistant to alkali. If that were so, he said, it was probably one of the most amazing changes which a quantity of impurity could produce in a pigment.

Dr. Stead said the incorporation of a hydrophobic compound to assist dispersion in an oil media was actually done. Theories had been advanced with regard to the effect of nickel in iron blues.

Meetings at Bristol

The Bristol Section of the O.C.C.A. met on March 29 to hear Mr. G. A. Campbell, M.Sc., lecture on "The Pre-treatment of Pigments."

Introducing his subject, Mr. Campbell referred briefly to the well-known processes employed in the industry, as follows: (1) flushing of white lead; (2) incorporation of aluminium stearate; (3) introduction of gums and dextrines to water paste; (4) treatment of prussian blue with oxalic acid; (5) use of rosin in lake manufacture. In addition, reference was made to (a) the control of particle form by heat treatment as adopted in the manufacture of lithopone and titanium, and (b) the control exercised by concentration of solution and rate of stirring as well as temperature during production of precipitated pigments.

When the pre-treatment process was adopted to assist dispersion and/or wetting, this was usually accomplished by changing solids from the hydrophilic to the hydrophobic state, which was easily oil-wetted. An excess of dispersion agent, however, could in polar liquids produce "structure," and in this connection, it was explained that with a raw linseed-oil paint the continued addition would cause the system to pass from a flocculated stage, through a thixotropic, to what could be called a paint condition. With continued additions, this would produce thixotropy, and false body, reaching finally in all probability to a "livered" stage. The two related processes of wetting and dispersion were explained; the wetting agent essentially induced a lowering of surface tension.

As a pigment manufacturer, Mr. Camp-

bell stressed the desirability that paint chemists should solve these problems together, and suggested that controlled as opposed to complete dispersion was really desirable.

Lead Chromate Pigments

At an earlier meeting of the Bristol Section, Mr. H. F. Clay, A.R.I.C., and Mr. V. Watson, B.Sc., spoke on the factors affecting soluble lead in lead chromate pigments. After outlining the Home Office procedure, Mr. Watson explained that their tests had been carried out at a temperature of 15° C. and that stirring was substituted for shaking because a thermostat had been used, whereas the actual determination had been made with a polarograph.

Four factors were said to influence the soluble lead content of lead chromate pigments: (a) the relative proportions of lead chromate and lead sulphate; (b) the physico-chemical condition; (c) the presence of impurities; and (d) temperature. These four conditions were examined in detail, and a curve exhibited showing how an acetate chrome, prepared with lead sulphate varying from 0 to 30 per cent., gave soluble lead contents rising from 4 to 7.5 per cent. Another graph compared dry ground and co-precipitated acetate chromes with increasing amounts of lead sulphate, showing that, whereas dry ground material produced a curve rising sharply with 10 to 15 per cent. sulphate before flattening out, the co-precipitated type produced a regular but less steep curve.

The presence of impurities, such as residual acetate in a chrome, gave rise to higher values, a point which was borne out in another series where the pigments had been treated with 3 per cent. acetic acid in order to remove the basic compounds. Increasing the temperature of the determination was found to give higher values of soluble lead. Inert extenders such as blanc fixe tended to depress the value, but it was significant that in the early stages of addition the drop was very slight and did not become appreciable until after about 70 per cent. had been incorporated in the pigment mixture.

The effect of introducing other chromates had been examined, and it was found out that they tended to depress soluble lead, *e.g.*, comparison had been made with additions of varying amounts of zinc chromate ranging from 2 to 20 per cent., when it was found that with primrose, lemon, and mid chromes the value decreased in each instance with increasing amounts of added chromate.

The polarograph had proved most useful in this work; Mr. Clay exhibited the instrument which he had used, and described in detail the principal of polarographic analysis.

Monsanto's Expansion

Development Under Difficulties

AT the twelfth annual general meeting of Monsanto Chemicals, Ltd., held in London recently, the chairman, Dr. L. F. Nickell, referred to two plans of development and expansion on which the company is engaged. The short-term plan comprises improvements and extensions to existing processes and equipment to obtain better efficiency, lower costs, and increased output of products now in short supply. Already chemical engineering studies have given favourable results in a number of products with only moderate capital outlay. Respecting the company's further products, such as rubber chemicals, synthetic phenol, phthalic anhydride, salicylic acid, and benzoic acid, improvements and increases of output are also assured, and will be effected as soon as possible. However, all expansion and development is retarded to-day by lack of housing for staff, extremely long delivery quoted by equipment makers, and shortage of materials. Tax collection and Government controls make increasingly heavy demands on staff.

The company has always been largely dependent on export and must continue to be so, and the plans for the future take this into consideration. However, it has been a matter of much concern recently to find the company was unable to meet American competition, particularly in Scandinavia, because of costs due chiefly to the high prices we must pay for coal and some raw materials. This challenge the company will endeavour to meet by better efficiency, improved equipment, and more integrated manufacture. Although painstaking planning and unstinted effort will be required, the company believes this can, and will, be done. The company's long-term plan contemplates a new factory on a site already selected. Preliminary plans are now in hand.

We have received copies of the *Sulzer Technical Review*, issued quarterly by SULZER BROTHERS (LONDON), LTD., the British subsidiary of the well-known Swiss engineering firm, with headquarters at Winterthur. These copies cover the war period 1940-45, and are remarkable both for excellence of production and variety of interest.

The present position and the future of the electric welding industry in Great Britain is the subject of a memorandum which has been prepared by the Welding Sections of the BRITISH ELECTRICAL AND ALLIED MANUFACTURERS' ASSOCIATION, 36 Kingsway, London, W.C.2. Copies are obtainable, free, from the publications department at that address.

Fibrous Proteins

International Symposium at Leeds

THE Society of Dyers and Colourists is to hold a symposium on fibrous proteins, natural and synthetic, on May 23-25, at Leeds University. This symposium will have a national and an international character and is of outstanding importance in the dyeing, colouring, and textile worlds and to all interested in the chemistry, physics, and manipulation of fibrous proteins, whether natural or synthetic.

Many eminent scientists in great Britain, Australia, U.S.A., and the Continent have promised original contributions. These will be published in galley-proof form early in May at a price which will be announced as soon as possible. This price will include subsequent delivery of a bound volume which will be complete with reports of the discussions, etc. It is proposed that the person presenting the paper will give a short summary of about ten minutes' duration, after which some twenty minutes will be available for discussion.

By the courtesy of the Vice-Chancellor, facilities at the University of Leeds have been placed at the disposal of the Society for the presentation of the papers. It has also been arranged that parties may visit the electron microscope, the Brotherton Library, and other features of interest at the University. There will also be exhibits of natural and synthetic fibres and fabrics, etc.

The Society has been able to secure a certain amount of hotel accommodation for the evenings of May 22-24 in Leeds, Bradford, and Harrogate, but early application will be necessary to Mr. H. Foster, hon. secretary of the Symposium Committee, Society of Dyers and Colourists, 32-34, Piccadilly, Bradford, England.

POST-WAR RUBBER REPORT

A report of the conference on the post-war preparation and packing of rubber has been prepared by the London Advisory Committee for Rubber Research (Ceylon and Malaya) and published by the Imperial Institute. The conference included a strong representation of both scientists and manufacturers, and the report contains a table summarising the views of British and American manufacturers, and a discussion of the advisability of establishing large central factories, which was approved by a majority vote only. Alternatives to smoked sheet as the main product are discussed, and among the conclusions it was decided that the simplified system of grading smoked sheet and pale crêpe should be continued, that methods of packing required further study, and that the development of special types of rubber for specific purposes was of importance. A note on the large-scale manufacture of standard smoked sheet rubber, by W. G. Birnie, is added as an appendix.

Non-Ferrous Metals

U.K. Consumption in 1945

DETAILED figures of the consumption in the United Kingdom during the fourth quarter of 1945 of the metals within the scope of the Directorate of Non-Ferrous Metals have now been issued by the Board of Trade. These metals are copper, zinc, lead, tin, nickel, cadmium, antimony, cobalt, and manganese.

Total figures of the consumption of virgin metal only by quarters in 1945 and the year 1944 are shown in the table which is given above.

Particulars	1st quarter 1945	2nd quarter 1945	3rd quarter 1945	4th quarter 1945	Total year—1945	Total year 1944
Copper	81,103	72,378	65,244	69,888	288,613	348,139
Zinc	45,411	43,109	40,290	44,513	173,323	184,241
Lead	51,517	55,265	55,274	61,535	223,591	205,384
Tin	3,949	4,067	3,959	4,421	16,396	18,435
Nickel	2,388	2,214	1,966	1,820	8,388	12,420
Cadmium	114	121	101	103	439	377
Antimony	1,265	1,348	1,284	1,361	5,258	4,772
Cobalt	195	168	158	127	648	787
Manganese	144	134	107	105	490	861

In most of the more important metals, consumption in the fourth quarter of 1945 shows an increase of about one-tenth above the third quarter. In part, states the *Board of Trade Journal*, this is a reflection of the housing demands. The increase in the output of copper sheets and tubes, rolled zinc and zinc for galvanising more than counterbalanced the decrease in the demand for copper and zinc in brass products. The bulk of the lead increase is in sheets and pipes.

Institution of Chemical Engineers

Annual Meeting : Election of Officers

THE 24th annual corporate meeting of the Institution of Chemical Engineers was held on April 12, at the Connaught Rooms, London, W.C.2, with the president, Mr. Hugh Griffiths, in the chair.

The Council's annual report records another year of steady progress, membership of the Institution having increased from 1571 to 1704 (on December 31), with all categories, except that of honorary members, showing a rise. In the annual examination for associate membership, 29 out of 59 candidates satisfied the examiners, whose number had been increased to eight, in view of the increasing burden of setting and marking the papers. Co-operation with other institutions continued on a wide basis, and closer relations were entered into with the Chemical Engineering Group of the Society of Chemical Industry. The Institution, in accordance with its plans for the furtherance of education in chemical engineering, recorded its gratification at the three generous benefactions to this purpose which had been made to universities during the year.

Amendments to the by-laws included the abolition of the upper age-limit for the admission of students, and an alteration of the terms of admission of students to corporate membership; while the entrance fee payable by associate members was increased to five guineas.

The president, vice-presidents, and joint hon. secretaries were all re-elected (see THE CHEMICAL AGE, April 21, 1945): MR. F. A. GREENE was appointed to succeed Mr. H. W. Cremer as hon. treasurer. New members of council are MESSRS. JULIAN M. LEONARD, J. WATSON NAPIER, and JOHN A. ORIEL; while MR. A. REES JONES (hon. secretary of the N.W. branch) was elected associate member of council.

Presentation of medals for the year followed the election. The Osborne Reynolds Medal was awarded to MR. W. C. PECK, for services particularly in connection with the associate-membership examination. The Moulton Medal went to MR. T. WALLACE for his paper on "Starting up a New Chemical Factory"; and the Junior Moulton Medal and prize of books to MR. S. S. GRIMLEY for the paper on "Liquid Flow Conditions in Packed Towers." The William Macnab Medal, for the best set of answers in the associate-membership examination for 1945, was awarded to MR. E. A. K. PATRICK, MR. P. J. PLATT being highly commended. MR. E. T. MOSS received the Hinchley Medal for the best student in chemical engineering at Imperial College, London.

Vapour Phase Adsorption

Points from the President's Address

IN chemical engineering work we are called upon to solve problems of plant design; not only to estimate the leading dimensions of new installations, but to predict with commercial accuracy the technical and economic performances of projected installations. Not so many years ago, chemical engineering work was mainly based upon empirical data derived from experience, or at least upon a succession of semi-large-scale trials conducted with apparatus specially devised to imitate the final operating conditions as closely as possible. The tempo of industrial development is now so great that quicker methods have to be attempted. We try, so far as possible, to analyse the performance of plant and to trace separately the influence of each physical factor. We endeavour to calculate by logical application of fundamental scientific principles. Theoretical chemical engineering is now generally taught from the point of view that plant problems can, at least in principle, be solved by calculations from known scientific fundamentals. We are expected to make use of the results of scientific research in the widest sense.

The subject of vapour phase adsorption affords a particularly interesting example of the relation between the research worker and the chemical engineer. In this address some of the phenomena of vapour phase adsorption will be reviewed and a new interpretation offered.

The design of any installation for the recovery of solvents (illustrated by a carbon adsorption plant) involves application of a wide range of fundamental chemical engineering principles; the problems of heat transfer, gas dynamics, distillation, drying, separation, fluid measurement and control, for example, can at once be recognised as open to chemical engineering analysis. We shall, however, confine our attention to the properties of the carbon bed. The functioning even of this small portion of the system is, in fact, far more complicated than is generally realised. The process of steaming-out the carbon is now known to be not merely a heating process; it depends not only on

temperature, but on the balance between the equilibria of the carbon in contact with water vapour and with solvent. During the process of adsorption the air carrying in the solvent usually contains moisture. For this reason, the adsorption process is also more complicated than might appear at first glance. The drying stage is also influenced by the water-adsorbent characteristic of the carbon. So successful have these installations been that there is now a demand for very high efficiency. The realisation has now come that adsorption plants can be designed with efficiencies of over 99.5 per cent., and where such requirements have to be fulfilled, much more detailed analysis has become necessary.

Adsorptive Power of Carbon

It is possible to manufacture carbons which at 20° C., in contact with a 1/10 saturated air-benzene mixture (32 gm/m.^{3}), will adsorb well over 50 per cent. by weight of benzene, and even at 1/100 saturation will still adsorb 20-30 per cent. by weight of benzene. If these figures are compared with the absorbing power of oils, for example such as are used in the older processes of recovery, the industrial success of the vapour phase adsorption processes will easily be understood. In practice it is, however, necessary to choose the carbons with due regard to their mechanical properties, and to take into consideration the circumstances that the solvents have not merely to be adsorbed, but also to be steamed out again; but for many recovery operations carbons are used that are capable of taking up over 40 per cent. by weight in equilibrium with 1/10 saturated air-benzene mixture. In order to obtain a full understanding of the properties of these adsorbents, it is necessary to trace the dependence between the concentrations and also the effect of changes of temperature.

Vapour phase adsorption theories may be placed in two groups: (a) those in which the forces of attraction of the solid surface upon the vapour molecules are regarded as of first importance; (b) those in which the forces of attraction of the vapour molecules for each other are regarded as of first importance, and the following notes are given as a rough indication of the present state of "official" opinion:

1. There is substantial justification to support the hypothesis of surface forces based upon chemical physics and modern theories of atomic structure. The forces at ionic surfaces have been subjected to mathematical analysis. The surfaces of such adsorbent materials as carbon are not regarded as built up of ions, and the surface forces responsible for adsorption effects are usually described as van der Waals forces.

2. The theories based upon mutual attraction between the vapour molecules, *i.e.*, surface tension, including the capillary condensation theory, are regarded as unsatisfactory, but there is a kind of grudging admission that at concentrations approaching saturation, capillary condensations can occur. Most academic workers appear to support the view that it is only possible to correlate vapour phase adsorption data according to one of the numerous forms of the surface attraction theories. In the writer's experience, however, nearly every solvent recovery engineer and activated carbon manufacturer speaks the language of capillary condensation.

Capillary Condensation

The capillary condensation theory is of exceptional interest because it enables calculations to be made from adsorption data of the diameters of capillaries (usually assumed to be cylindrical), and a picture of the structure of any adsorbent to be formed. Curiously enough, most writers have applied the well-known Kelvin equation to calculations of this kind, and have found that although with a single adsorbent material the capillary diameters calculated vary considerably according to the nature of the vapour used, the distribution of capillary sizes so calculated shows some interesting resemblances. A few workers have boldly made use of empirical coefficients to correct the theoretical calculations of capillary diameters, occasionally suggesting that at least some partial correction could be made on the assumption that the meniscus in the capillaries is not a hemisphere, *i.e.*, that the liquid does not "wet" the walls of the capillary but makes a contact angle with the surface. It will be seen later that this unfortunately leads to some theoretical difficulties.

The following "refutations" of the capillary theory are usually put forward:

(a) That capillary condensation should cease at temperatures above the critical temperature.

(b) That the adsorbent, after taking up solvent, should shrink under the influence of the surface tension forces, whereas, in fact, all adsorbents expand slightly.

(c) That the capillary diameters calculated are sometimes too small in relation to known molecular sizes.

Persistent investigation has failed to disclose any sharp discontinuity in adsorption data at the critical temperatures, although it is known that at temperatures above the critical temperature the amounts adsorbed tend to fall off rapidly. There is every reason to believe that materials confined in small capillaries would exhibit entirely different critical data. The critical temperature is a characteristic of open systems.

The circumstance that the forces of surface tension should theoretically produce a contraction of the adsorbent is specially interesting. If we take the trouble to work out any typical case in detail, we are forced

to the conclusion, on the basis of the Kelvin equation, that the liquid in the capillaries must be subjected to what is ordinarily understood as a very high tension, *i.e.*, a negative pressure. It must not be forgotten, however, that fluid pressure in an open system has an entirely different significance from what might be expected to occur in a very small capillary. If we were able to measure pressure difference in fluid systems of small dimension, we should encounter the effect of cohesion or internal pressure, and this, calculated from the van der Waals equation, is of the order of a few thousand atmospheres. If we review the capillary condensation theory from a kinetic standpoint, it does not seem to be difficult to understand why adsorbents expand and do not contract on taking up their charge.

Molecular Sieves

The circumstance that the calculated capillary diameters come out too small is hardly surprising, in view of the fact that the perfect gas equation has been assumed in deriving the fundamental equation, but there is some important experimental evidence to show that adsorbents may, in fact, act as molecular sieves. Some solid adsorbents (*e.g.*, chabasite) will take up substances of small molecular size freely, and such substances will diffuse through these adsorbents quite readily, although they do not adsorb substances of larger molecular dimensions.

The greatest difficulty in this theory, strangely never mentioned, is of an entirely different kind, *i.e.*, to explain why the molecules of vapour should rush into and pack themselves closely in the capillaries. The usual concept is that a monomolecular layer is first formed and then additional layers are built up until the capillaries are filled. This, however, is from a logical point of view a complete sacrifice of the theory of capillary condensation, which starts off from the assumption that the walls of the capillary exert no surface forces. According to present views in the kinetic theory of gases, the inter-molecular forces are effective only at relatively short range, *i.e.*, they are inversely proportional to a relatively high power of the distance

After considering the theory of capillary condensation in some detail, the conviction is developed that it is perhaps surprising, in view of the nature of the assumptions on which all the calculations are based, that this theory presents such a useful picture of the observed facts. Most of the shortcomings of the theory seem to be due to the assumption that the properties of the liquid confined in small spaces—approaching molecular dimension—will be the same as those observed in large tubes, added to which we have the wholly unjustifiable use of the perfect gas equations. If, however, we look at the matter from the kinetic standpoint, we very soon acquire a totally different impression about the meaning of such words as pressure and surface tension.

If we imagine a region of very small dimensions in any gas, we can estimate the mean deviations in density due to molecular movement. Such calculations have been used in explanation of the blue colour of the sky and (on the basis of the van der Waals equation) the opalescence of liquids observed near the critical temperature. It is, however, easy to be misled by such calculations. Thus, for example, if we imagined instead of a geometrically defined small space a tiny bottle of the same volume, the calculations give precisely the same mean deviation as for the geometrically open. We can see at a glance that the two cases are physically very different only in the time element; the fluctuations of density in the " bottle " would persist for a much longer time than in an open unconfined space of the same size.

An Interesting Analogy

The President employed an interesting analogy of the billiard table and the snooker frame with a small hole cut in one side just large enough to admit the balls, to illustrate how the molecules crowd themselves together in the capillaries of the adsorbent. The fact that they are thus kept within the range of each other for a relatively long period gives a chance to the forces of attraction to cause " condensation." It will be realised that if the space is small enough, the range of molecular movement will not be so large as in the case of an ordinary condensed liquid, and one would expect that the amount of energy given out as heat would be greater than in ordinary condensation. This is, in fact, confirmed by measurements of heat adsorption.

A further interesting confirmation is obtained by measuring the amount of air displaced from carbon, for example as benzene is adsorbed. If the amount of air be plotted against the proportional saturation of the benzene, a curve is obtained which resembles the ordinary adsorption isotherm. This is a strong argument against those who maintain that surface adsorption is the ruling factor up to concentrations approaching saturation. If air were simply adsorbed as a monomolecular layer, one would expect that the whole of the air would be displaced by very low concentrations of benzene, *i.e.*, sufficient to form a monomolecular layer. Actual measurements show that nothing resembling this takes place within the range of concentrations in which we are interested.

The Annual Luncheon

Mr. Hugh Griffiths took the chair at the luncheon which followed the annual meeting and the presidential address. After the loyal toasts the chairman proposed the health of the guests, coupled with the name

of Sir John Anderson. In a brief and humorous speech he outlined the development of the chemical engineering profession. Sketching the early days of the process industries he remarked that these had had an easy task in the beginning, thanks to the assistance of wealthy industrialists, who were not averse to indulging in a little "philosophical research." Then followed the age of "book-keepers" who were interested purely in the financial aspect, and employed not only engineers of the sea-going type but also chemists, the latter, principally, to enable them to deal with complaints about their products! The duty of the chemist at this stage was little more than "the art of using second-hand junk." Some of the wealthier and more progressive firms perhaps went so far as to employ an analytical chemist at a salary of 25s. a week, while the "sea-going engineers" were valued at as much as £3 a week. This was all very well so long as there was no competition; but, meanwhile, Germany and the United States were progressing on carefully thought-out lines.

There had been too much talk latterly, Mr. Griffiths thought, about the skill of the chemist and the skill of the engineer working in collaboration, and the Institution had been created some 25 years ago so that the name "chemical engineer" might mean something definite. An encouraging feature of the recent progress of the Institution was found in the answers to the "home paper," part of the qualifying examination, which had often been of greater length and greater importance than the examiners had expected.

A point worth noting was that while the United States was turning out at the present time some 2500 graduates in chemical engineering every year, the corresponding figure in this country was 40. It was a crime, the President thought, that such a state of affairs should be allowed to exist. As a result, however, of a combined appeal on the part of a number of allied institutions, the Ministry of Labour and the Ministry of Education had at last decided that there was an urgent need for chemical engineers in this country. As a result of their efforts ten educational centres were to be started, at each of which 50 candidates from the Forces were to be trained in chemical engineering, the course to consist of not less than one year's intensive training. The President remarked that he had brought these facts to the attention of the company in order that they might see that the Institution had been neither idle nor indifferent.

Sir John Anderson's Speech

Sir John Anderson, P.C., G.C.B., G.C.S.I., G.C.I.E., K.C.B., M.P., the guest of honour, responded to the toast. He confessed that he had never been an engineer, and although at one time he might have called himself a chemist, his footsteps had since strayed. He further confessed that until recently he had never thought of chemical engineering as a separate calling. Indeed, he had deprecated the fissiparous tendency of the engineering profession—too many specialised bodies had emerged, in his view, leading to a state of affairs which was confusing to the outsider, including Government departments. He had therefore had to consider his attitude towards chemical engineers, but he had come to the conclusion that the claim of chemical engineers to recognition as a separate calling was fully substantiated. He based his views on the part to be played by the chemical engineer in industry. Their work had been thrown into great prominence by recent developments, and Sir John cited, as an example, the development of the manufacture of penicillin, where the United States production programme—the initiation of which he had been privileged to witness—had been improved out of all recognition by the collaboration of the pure chemists with the chemical engineers. The same could be said of synthetic drugs and antimalarials, while under the heading of petroleum technology and synthetic rubber a tremendous field was open—not to mention atomic energy, in the development of which a staggering industrial effort on the part of chemists and engineers of all types had been displayed.

Efficiency of Production

Sir John emphasised the vital importance to this country of developing every form of industrial technique. What was essential to-day was not so much increased production as increased *efficiency* of production. Where, he asked, are the chemical engineers on whom we are to depend? The United States output of trained chemical engineers is practically equal to their output of trained chemists. Here there is nothing comparable, but the need is at last beginning to be recognised. He cited for example, the establishment, by enlightened industrialists, of university professorships in chemical engineering, a step which had been made possible by allowing such endowments to be made from untaxed profits.

For immediate needs, however, some form of improvisation, he thought, would be required, *e.g.*, by brigading chemists and engineers on the same job, or by giving chemists and engineers a short course of supplementary training in engineering and chemistry respectively—and in this connection he stressed the importance of an early background of the mathematical sciences. He concluded by apologising, in case he had been too dogmatic; but at this critical juncture in our affairs he had put forward these views to stimulate thought and discussion.

SAFETY FIRST

Safety Considerations in Plant Design—III

by JOHN CREEVEY

IT is at the design stage that safety features may be most easily incorporated in chemical plant. Once the plant is constructed and erected on the spot where it is to be used, it will be found that even the installation of a relatively small feature may necessitate a considerable amount of rearrangement of pipe-work, and sometimes the need for dismantling heavy and cumbersome parts and returning them to the maker's works for operations which can be better done there. Nevertheless, it often happens that a certain aspect of safety is not noticed until the plant is actually in service. That is all the more reason why designers should spend a fair amount of their time assisting in the actual operation of pilot plants.

Faulty Environment

From 20 to 25 per cent. of accidents at works employing chemical plant are caused by faults in environment, and perhaps a like proportion is due to the faulty behaviour of individuals. As for the remainder, excluding exceptional cases, a combination of these two major causes can be considered responsible. Faulty environment, of course, may be largely corrected by good engineering practice in the construction of the plant buildings, in giving proper illumination and ventilation, and in providing good facilities for maintenance. The installation of safety features to offset likely hazards is really accessory to the elimination of accidents. So also is instruction for giving plant personnel confidence in aspects of safe working, including, of course, the necessary rules for wearing rubber gloves, goggles, respirators, and the like. Job training does much to make a generally safer atmosphere in the chemical works; alongside that there must be efficient supervision to detect the improper placement of men, as well as periodical medical examinations for the detection of any unsuspected hazards, or even of a mere falling short of the mark in physical endurance.

When minor alterations appear desirable for the elimination of a small trouble it is not always a matter of telling someone to get on with the job. A pool of liquid on the floor, caused by continuous drip from warm humid air coming in contact with overhead cooling coils, needs merely the provision of a drip tray connected to a pipe leading to a drain. It is quite easy to carry such a tray from the overhead coils by aid of a couple of wrought-iron strap hangers; then the job is apparently done and there will be no more trouble. Certainly the pool will be eliminated, but the introduction of this simple means for eradicating one inconvenience may provide a hazard which is not always detected until the accident happens. In this particular case, which occurred in a chemical works in a rather exposed position, additional action from a spell of cold weather caused the dripping condensate to freeze as it collected at the level of the drip tray, and no one observed the building-up of a bulk of ice until it was too late to prevent the falling of the drip tray with half-a-ton of ice attached. While the provision of the drip tray was desirable as a *temporary* measure, much more might have been done in shielding the cooling coils from direct impingement of the moisture-laden current of air. It would have been wiser still to devote attention to drying the air by previous passage through suitable equipment.

Icing of Stills

To mention another condition in which the formation of ice may cause an accident, it often happens that large stills are provided with a vent pipe terminating in a water-seal. Such stills, commonly used for carbon disulphide and similar dangerous volatile products, are built in open positions and are there exposed to acute changes in weather, and a sudden spell of cold may cause the water in the seal-pot to freeze. Normally, the escape of a small amount of warm vapour from the still would prevent freezing when the still was in operation, but cold weather may set in over-night and the frozen vent pipe may not be noticed when starting up the still in the morning. Indeed, this actually happened and the building-up of excessive pressure, which was unable to vent itself from the still, caused a serious explosion. The obvious remedy against a repetition was to provide the vent-pipe water-seal with a small coil heated by a by-pass of flue gases direct from the furnace, or (with a steam-heated still) direct from a point which steam had to pass after being turned on in starting up the still. Any provision for warming the seal-pot then necessitated keeping an eye on it to ensure that the water there was never completely evaporated.

Many safety features can be overlooked in the course of designing equipment. Some-

times the hazard appears insignificant, but experience of an accident as a direct result of inattention to seemingly small matters soon puts the matter into a different light. On every plant, gears, chains, and sprockets should be enclosed regardless of position or relative ease of access; it cannot be foreseen how a man may find it necessary to get very close to them. There must also be means for preventing contact with live conductors of electrical current; non-carrying metal parts of electrical equipment should be properly earthed. Valves and controls must be properly and plainly marked for immediate identification in an emergency, and where systems are interconnected there must be means for preventing two independent valves from being opened at the same time when doing so may cause a dangerous situation to arise. For a simple application of this, observe the taps controlling the supply of gas to the grill and the adjacent boiling ring on the hot-plate of a properly designed gas cooker. Automatic valves are also necessary to cut off fuel lines to a furnace in the event of a failure of fuel supply.

As regards moving parts of machinery, there should be means for interlocking the power control at the point of operation in all cases where it is necessary to feed, load, adjust, or repair such machines. All power-driven machinery, moreover, must give safe access for oiling, and for attention to moving features which have to be adjusted from time to time. Consider also the elimination of all points where a shearing effect can be exerted between moving and stationary parts.

False Economy

At times the omission of such details has been done intentionally for cutting the cost of competitive tenders for supply of plant, and the intending purchaser should be wary of such a possibility when tenders differ widely in amount for what otherwise seems to comply with requirements. Even in the case of a building such things may occur, with some slight loss of floor space or headroom to effect a saving in costs. It may happen that the provision of an adequate 20-in. walk-way has been overlooked for the entire length of a run-way served by a crane, and the space available for a man to walk safely has been reduced to about 15 in. when 20 in. was the desirable minimum. The provision of handrailing beside a walk-way which offers exceptional hazard in this connection of a moving load is a wise precaution; its initial cost will be far less than the compensation which may have to be paid as the result of an accident. But, of course, even the provision of a handrail will not always stop a man from walking on the wrong side of it. To prevent that, you must make the floor immediately covered by passage of goods relatively inconvenient by the provision of a ridged surface ill-tolerated by human feet, or by building that part of the floor in form of a channel with sides sloping at an incline of 1 in 3, or something of that order. If this part of the floor has sometimes to be used by hand-trucks, it may be arranged that the wheels of these trucks run in a groove pre-formed upon each slope. But any use of trucks in such a situation must be subject to controlled use of the crane and accessory run-way.

Valve Locks

The safe locking of valves controlling flow of liquids and gases through pipe-lines is a matter to which much greater attention might be given, for the sake of eliminating the spurting of acid from a valve or the accidental flow of acid through a disconnected pipe. All large valves on acid lines should be provided with a metal shield to cover the stem and bonnet, above which the hand-wheel projects sufficiently to enable the valve to be operated; that will largely give protection against a sudden spurting of acid when maintenance of the gland has been overlooked. There should also be an emergency "isolating" device, which can be locked if need be, showing that matters are to be investigated before there is any attempt to turn the valve. More than one death has been caused by failure to lock a valve against accidental operation when repairs have been in hand; compensation paid for loss of eyesight in similar circumstances is surprisingly high. The key for such a locking device should be held by the man engaged in the repair work, and he should never forget to make use of it. From the point of view of the maintenance man a ready means of locking a valve by the aid of a simple clamp and padlock is preferable. Even in possession of this means for ensuring safety, it is still wise to continue the use of a red signal disc attached to the valve wheel to indicate that repair-men are at work, only the man in charge of repairs being authorised to touch that valve so long as the warning signal remains attached.

If rotating mixers of the barrel type, or other vessels provided internally with power-operated arms for mixing or agitating, have frequent need of internal cleansing, an electrical "cut-out" should be fitted to the manhole door to prevent accidental operation while cleaning is in progress. This cut-out functions automatically by breaking contact to cut off current from the motor whenever the manhole door is opened. Any likelihood of accidental closing of the manhole is generally overcome without special effort, since all communication for cleaning is usually established through the manhole opening. Otherwise it is possible to arrange for that part of the cut-out

attached to the manhole ring to be spring-operated so as to fall into a position where it fouls the door, it being a simple matter to pull this back when the manhole door is purposely closed.

Locking devices are also a rather essential feature for electric switches on machines with moving parts. The common type of cupboard lock can be conveniently fitted to push-button switches, and so arranged that the inserting and turning of the key will cause the slide of the lock to engage a slot and hold the switch in the "off current" position. It is thus possible to assure complete isolation so long as the key is always used and is carried by the person doing maintenance or cleaning duty. Such a device enables a cleaner to get right into interior parts, without fear that the machine may be started. This form of locking device is also useful on hoists, conveyors, and elevators, where a person engaged in maintenance or cleaning may be quite out of sight of anyone at the starting switch.

All conveying systems should have one point only for starting movement; but there should be a number of points for stopping in an emergency with normal working conditions. Starting should be in the hands of one person duly authorised in that connection. A steel plate which is designed to fit studs on the casing of the push-button switch and which prevents operation by merely covering the push-buttons is useful for putting in position during periods of temporary stoppage, and it can be made a punishable offence to remove such a plate without authority.

British Plastics Federation

Speeches at Annual Luncheon

THE belief that the economic problem was within measurable distance of being solved, although he might not live to see it, was expressed by Mr. Oliver Lyttelton, M.P., President of the Board of Trade and Minister of Supply in the late Government, at the 12th annual luncheon of the British Plastics Federation at the Savoy Hotel, London, on April 10.

Responding to the toast of "The Lord Mayor, Sheriffs and the Corporation of the City of London," proposed by Mr. H. W. Graesser-Thomas, immediate past-chairman of the Federation, who presided, the Lord Mayor (Ald. Sir Charles Davis) said plastics was an old industry revivified by the tremendous opportunities of expansion brought about by initiative and research.

Mr. Graesser-Thomas, in submitting the toast of "The Guests," said the membership of the Federation continued to increase, and there was now a raw materials group, comprising those members who supplied to the plastics industry proper, basic raw materials from which their products were manufactured. Such things as phenol and paper, cresol and cotton, wood flour, formaldehydes and industrial solvents came within their scope. Sections representing those varying interests would be formed within the group, so that they could consult with consumer members of other groups. Thus there were linked within the framework of the Federation the manufacturers of the primary raw materials, the moulders and the fabricators of the very end products which were in daily use.

After referring briefly to some of the main uses and virtues of plastics, the chairman said they, like other industries, were hampered by lack of new tools due to the calling-up of their skilled tool makers. He regretted to say that their representations to the Government on the matter had, so far, fallen on deaf ears. For six years of war more than 95 per cent. of the total plastic production of this country had gone either directly into the forging of weapons of war or passed into the hands of the various Government Departments for the furtherance of the war effort. In the transition problem that now confronted them—the provision of new plant and equipment, and particularly tools and moulds—they were entitled to expect the understanding, support and collaboration of the Government. An exhibition linking the industry, through the Federation, with the Worshipful Company of Horners, was to be held in one of the ancient City halls, and there had been formed a joint committee, which could be described as a team of artists or designers, who would paint on canvas a picture covering centuries and depicting British energy, enterprise and accomplishments from the ancient handicrafts of the horners to the products of modern machinery.

Mr. Oliver Lyttelton, replying to the toast, said he was glad to see that the Federation had maintained close contact with the Council of Industrial Design. He was still strongly of the opinion that we were not yet paying sufficient attention to the artistic side of industrial design. There was no reason why, in the interests of cheapness, the fundamental æsthetic principles of proportion, simplicity, harmonious colours and the like, should be neglected. The discoveries which were now being made, and had been made, were no less remarkable in the field of raw materials than they were in the application of machines and chemical

and mechanical science. In the plastics industry, the command of an immense number of new materials had opened up. The use of those materials, which should never be spoken of as substitutes, had received a great impetus from the war.

Referring to the solution of our economic problem, Mr. Lyttelton said that in the field of raw materials, whether food or other materials required for human use, we could by science produce them in such abundance that want as we had known it even in the last century could be banished. Locomotion could be made so cheap that the world and its wonders would be open to everyone. The exertion and labour of keeping ourselves fed, clothed and housed could be reduced to such negligible proportions that they would no longer play that dominant part in human life which they played today. He really believed that those things were not far away. The organisation and philosophy of leisure would, before many years had passed, require as much study as the organisation of work now required. Such a state of things was nearer than we thought, provided that we were able to tackle the problem of how the human race was to live together in reasonable peace. If there were forms of energy other than oil and coal, many international questions and causes of friction over the control of oil would disappear, and some of the difficulties of the National Coal Board would be solved over their heads.

A Great Opportunity

Sir John Woods, Permanent Secretary to the Board of Trade, proposed the toast of "The British Plastics Federation," and referred to the development and applications of plastic materials during the war. War development in this country, he said, might have helped along a situation which was not quite so favourable to us. While the original fundamental inventiveness was largely British, the development might have fallen into other hands; he did not say wholly; he did not know, but he had heard it said that to a considerable degree it had fallen into other hands, particularly American hands, because they were able to superimpose their war economy on top of the peace-time economy. He did not think it was a thing to be depressed about, at any rate in the plastics industry. There we had a field in which we were only at the very beginning, so far as anyone could judge now, of invention and development. If that was so there was a very great opportunity, and we ought to do everything we could to maintain our lead in the fundamental inventive approach, and at the same time to improve our performance in the development stages which followed fundamental inventive research and eventually led to products of all kinds which could be used by all sorts of industries. We must concentrate on developing new techniques and making new things and also on being always one jump ahead of the other fellow. Anything which could increase the rapid and effective development of British effort in the international field would be welcomed by the Board of Trade with open arms and both hands, and the industry could rely upon their full co-operation and support.

Mr. W. Charles Waghorne, the new chairman of the Federation, responded.

Closed Carbide Furnace

I.C.I. and Fuel Stocks

A STATEMENT on the recently closed calcium carbide furnace at Runcorn has been issued by the regional chemical division of the I.C.I. in reply to a question which was put to Mr. Ernest Bevin at his meeting in Manchester on Thursday last week. The furnace (it is stated) is temporarily closed in order to conserve fuel stocks, which have been dropping for the last few weeks to a level which might endanger the whole output of the chemical processes operated by I.C.I. in the Merseyside area.

Stocks of calcium carbide available in the country are sufficient to ensure that no chemical process dependent on it will be jeopardised for the next few weeks. On the other hand in order to ensure adequate production of other basic chemicals of which stocks are not available it is essential to utilise all available coal and power to maintain their production. It is hoped that with fuel supplies increased with the summer programme, fuel will again be available to restart the calcium carbide furnace. In the meantime all the labour employed on the calcium carbide furnace is being maintained in employment by I.C.I. on other projects.

It is only with great reluctance that I.C.I. closed the furnace, as it cannot be certain that there will be no deterioration while it is out of production.

DEATH FROM DDT

The first recorded case of death in England, and the second only in the world, from DDT insecticide was investigated by Mr. C. Bolton, the S.W. Lancs. Coroner, at a Formby inquest on April 12. He found that Michael Geoghegan (32), an Irish farm labourer, had died from the toxic effects of drinking a quantity of mushroom-fly DDT concentrated emulsion, but in what circumstances he took the emulsion there was no evidence to show. The Coroner suggested that, although DDT was not scheduled as a poison, manufacturers should place "not to be taken" on their tins.

Imperial Institute's Report

Testing Empire Materials

THE annual report of the Imperial Institute, South Kensington, issued last week, reflects the steady transition of its scientific work from war to peace conditions. Important and comprehensive inquiries have been dealt with relating to world reserves and supplies of bauxite, selenium, tellurium, and beryl. Interest in the last-named mineral is increasing. Assistance has been given in connection with a promising scheme, already in operation on a restricted scale, for the preparation and supply of phosphatic fertilisers in East Africa, particularly Kenya, from extensive deposits of apatite-bearing rocks in Uganda. Advice has also been given to the authorities in Cyprus in their desire to conserve the forests by using oil in place of wood in the local gypsum-burning industry. Interest continues in the marketing of Empire vermiculite and further samples have been sent from South Africa for distribution among inquirers.

New Chromium Mineral

A chromium mineral from British Guiana, sent for identification, examination, and chemical analysis, was found to be apparently a new mineral consisting essentially of hydrous chromic oxide, on which further work, including X-ray tests, is in progress. In contrast, a sample of ilmenorutile from the same Colony, provisionally claimed to be a new mineral after an analysis in the U.S., was found to be of a known type. Samples of lignite from the substantial deposits in Sierra Leone continue to show favourable comparison with the best lignite found in Southern Nigeria, and a request has now been made for a 10-ton lot for practical tests in an experimental washer in Britain.

Food Products

In Mauritius, the question of turning the cassava industry into an export trade has been considered, entailing the chemical examination of the prepared products. Papain, a digestive agent and a "tenderiser" of meat, derived from the pawpaw fruit, chiefly obtained from Ceylon and Tanganyika, has received attention in relation to steps to meet the expanding demand. Starches, isinglass, mangoes, palm nuts, and sunflower seeds have also undergone examination.

Perfumery and other essential oils, of which the market has been starved of recent years, have been under investigation, such as the possibilities of producing attar of rose, eucalyptus, and patchouli oils in Nyasaland, and, in another direction, the prospects of finding uses for new oils obtainable from Empire countries and not yet on this market.

An interesting problem is the question of the most suitable Empire resins for mixing with earth to form aerodrome runways and local roads, while the rubber department has devoted more time to long-range investigations, and has concentrated chiefly on the problems of producing rubber for tyres with enhanced advantages over synthetic substitutes, and the development of a new method of preparing dry rubber from latex by a continuous process.

LETTERS TO THE EDITOR

Insecticides

SIR,—Mr. Colman Green cannot expect his gibes to have any effect upon a tough hide like mine. The picture he paints might be amusing in a fifth-form school magazine, but it does not deal with the points I raised. I complained that the information he was furnishing on DDT was misleading, but I did not imply that it was intentionally so. I indicated that Mr. Green was like a gramophone, receiving its material through but one ear, but with that ear attuned to the direction of one big firm in particular when the time came to "play" the annual "record" on insecticides. I gave particulars of personal experiences with DDT and not second- or third-hand impressions, and I still await confirmation of the supposedly toxic nature of DDT.

As suggested at the end of Mr. Green's letter, I will certainly send him some of my apples which have been defended against pests and parasites by means of DDT, and I will take special care to see that the apples are carefully cleansed from DDT before they are sent.—Yours faithfully,

F. N. PICKETT.

Road Safety

SIR,—This summer will see more cars on the road than for many years. How many accidents will there be? Last year, despite the number of cars laid up, 6507 people were killed on the roads compared with 6457 in 1938. Despite all the publicity given in the Press to the subject, it is clear that many people remain apathetic. They believe that "this cannot happen to me." But if people will not exercise care in their own interests, there is to-day another reason for them to do so. British industry needs the maximum output she can achieve. May I, as chairman and managing director of a company vitally concerned with road safety, appeal to executives in industry to do all in their power to convince their workers of the importance of road safety. Road accidents are costing the country over £50,000,000 a year and it is imperative that they should be stopped.—Yours faithfully,

GRAHAM CUNNINGHAM,
"Triplex" Safety Glass Co., Ltd.

Parliamentary Topics

Phosphatic Fertilisers

IN the House of Commons last week, Sir D. White asked the Minister of Agriculture whether in view of the abundant supplies of phosphates, he would consider decontrolling this commodity or otherwise increasing its availability to farmers.

Mr. T. Williams: Supplies of phosphatic fertilisers for the current season are not likely to exceed the amount required to meet the permits already issued and the recent allocations of these fertilisers for use of dairy pastures. I am, therefore, not at present in a position to withdraw the permit system of distribution of phosphatic fertilisers to farmers.

Smokeless Fuel

Mr. Keeling asked the Minister of Fuel and Power what steps he was taking to provide sufficient smokeless solid fuel to give effect to the recommendation of the Fuel and Power Advisory Council that such fuel should replace bituminous coal in domestic use as rapidly as appliances for burning it are available.

Mr. Shinwell said that, with the Ministers of Health and Works, he had set up an Interdepartmental Committee to make recommendations on the action required to implement the recommendations made in the report of the Fuel and Power Advisory Council. All possible steps were being taken to increase the production of all types of fuel, including smokeless fuels.

Pine Derivatives Imported

Captain Noel-Baker asked the President of the Board of Trade whether he would state the value of imports to this country, since the end of the war, of resin and other pine derivatives from France, Spain, Portugal, Italy, and Greece, respectively.

Mr. Marquand: During the nine months from June, 1945, to February, 1946, imports of pine resins from France amounted to £494,000, from Spain to £268,000, from Portugal to £940,000, and from Greece to £29,000. There were no imports from Italy. In addition, turpentine to the value of £11,000 was imported from Portugal.

Oil Development : Nigeria

Mr. Dumpleton asked the Secretary for the Colonies what steps were being taken for the development of the production of petroleum in British Colonies, especially Nigeria.

Mr. George Hall replied that a two-years' licence for exploration work in Nigeria was granted in 1943, but owing to war conditions a moratorium until July, 1947, was granted to the holders. The holders of the licence were expected to be shortly in a position to resume operations.

German Technical Reports

Details from Latest Lists

APPENDED are details from the Combined Intelligence Objectives Sub-committee (CIOS); the British Intelligence Objectives Sub-committee (BIOS); and the Field Information Agency Technical, U.S. Group, Control Commission (FIAT).

CIOS XXIII—2. Liquid oxygen plants, France and Belgium (1s.).

CIOS XXVII—50. I.G. Farben, Wolfen: Manufacture of hydroquinone (1s.).

CIOS XXVIII—40. The high-pressure hydrogenation plant, especially for brown coals, Wesseling (13s.).

CIOS XXX—51. Wrought copper alloy industry of Southern Germany (7s. 6d.).

CIOS XXX—70. The preparation of tetrahydrofuran polymers as a synthetic lubricant for metals (1s.).

CIOS XXX—84. Hermann Göring Works, Salzgitter: Iron ore beneficiation (6s.).

CIOS XXXI—21. Organic protective coatings: Paint lacquers and varnish (6s.).

CIOS XXXI—73. Vereingte Leichtmetall Werke G.m.b.H., Hannover Linden: Processing of aluminium, magnesium, and alloys (2s. 6d.).

CIOS XXXII—96. Ruhrchemie A.G., Sterkrade-Holten: Synthetic lubricating oil manufacture (9s.).

BIOS 5. Report on visit to the Zellstoffe Fabrik A.G., nr. Regensburg: Production of yeast (6d.).

BIOS 7. Süddeutschen Holzversuckerung Werke A.G., Regensburg: Saccharification of wood by the Bergius process (1s.).

BIOS 92. Leverkusen Plant of I.G. Farben: Production of acrylonitrile from acetylene and hydrocyanic acid (1s.).

BIOS 157. Zellstoff-fabrik Waldhof, Mannheim-Waldhof: Manufacture of artificial leather tanning agents from waste sulphite liquor (6d.).

BIOS 219. Work on synthesis and production of 2.2¹-dihydroxy—5.5¹-dibromobenzyl and 2.2¹-dihydroxy — 3.3¹.5.5¹-tetrachlorobenzyl (1s. 6d.).

BIOS 253. Production of silumin alloys, Horrem (2s.).

BIOS 288. Aluminium hydrate and alumina production (1s.).

FIAT 34. I.G. Farben, Dormagen: Production of cuprammonium, etc (1s. 6d.).

FIAT 41. I.G. Farben, Höchst: Some finishing and after-treatment agents (1s.).

FIAT 51. Vereinigte Glanzstoff, Obernburg, and Kelsterbach Spinnstoff Fabrik, Berlin-Zehlendorf: Comparison of German continuous alkali cellulose processes (1s.).

FIAT 62. I.G. Farben, Ludwigshaven: I.G. work on polyamides (6d.).

FIAT 65. I.G. Farben, Wolfen: Manufacture of dissolving pulp by the sulphite and nitric acid processes (1s.).

The Swiss Chemical Industry

Past Difficulties and Future Prospects

IT was recently announced that the semi-official Swiss Chemical Syndicate has relinquished its activities in consequence of the improved import situation, and has now gone into liquidation. The section for chemical and pharmaceutical products did its best, during the critical period of shortage, not to restrict the market and to respect the traditional liberal economy of the trade. As a result the price-control activities of this section were little criticised, and penalties for profiteering were few and far between.

The supply situation in chemical and pharmaceutical raw materials, semi-manufactures, and finished products did not become critical until 1941, when most stocks were exhausted and new imports were possible only under the greatest difficulties. Supplies from the West were blockaded by the war; and Eastern countries appeared instead as the main suppliers. For example, among petroleum derivatives, block paraffin, white oils, and white and yellow vaseline, which before the war came from the United States, after 1941 were supplied principally by Rumania, but since the Rumanian products, unlike those from the U.S., had a distinct odour, they could hardly be used for pharmaceutical manufactures; in addition to which the price was ten times as high as for the superior American grades. The situation in wool-fat (*Adeps lanae*) was especially interesting. This product was supplied before the war by countries of the British Empire in a light and odourless quality, while such wool-fat as came from the Balkans or from home production was not only of an inferior quality, but also cost 13 fr. per kg. as against the British product which is now again obtainable for 2 fr. per kg.

Essences Restricted

Essential oils, perfumes and essences before the war came chiefly from East Asia. The menthol of the Yao Peppermint Company in Shanghai was world famous, agar-agar came from Kobe and Sachalin, peppermint oil from Japan. The Japanese beeswax was especially used for cosmetics and Japanese spermaceti was an important ingredient in the soap production. A few items, mainly from old stocks or from captured prizes, were offered at fantastic prices in Switzerland, but they were in quality far below the former standard German products. The Swiss perfumery industry was thus practically restricted to essences from the French perfume district of Grasse; but as the German occupation force sent so much perfume home, only lavender was left for the use of the Swiss industry. Bulgarian attar of roses was offered in large quantities to Switzerland, but the Swiss demand for this is rather small, and it was not possible to make use of all the supplies. The well-known synthetic scent factories in the Geneva district had to reduce their production for lack of raw materials.

The pharmaceutical industry, meanwhile, would not accept the German substitute products, and in any case could not pay the exorbitant prices that were asked. Therefore, the manufacture of insulin, of vitamins, hormone preparations, alkaloids, and the like, had to be suspended for a considerable time. Only vitamin C (ascorbic acid) could be produced in sufficient quantities (by Hoffmann-La Roche) during the war, and considerable quantities were exported to the Balkan States. The production of vanillin was greatly reduced owing to the lack of eugenol and guaiacol.

French Colonial Products

Products from the French colonies such as gum arabic (Senegal and Sandarak), vanilla stalks (Madagascar), African beeswax, carnauba wax, etc., are now being once more imported in quantities which allow the pharmaceutical industry to expand anew. Certain fine chemicals, formerly supplied by the German syndicate "Igepha," are now more cheaply obtained from America than from the home industry. Borax, long unobtainable, is again being imported from America, while beeswax, gum arabic, vanilla stalks, styrax, etc., are now coming from Turkey now that the Danube navigation and railway transport are at last practicable.

Solvents and charcoal can be expected again from Yugoslavia and Slovakia; the Lonza works are not in a position to supply sufficient quantities for the Swiss varnish and dyestuff industry which has expanded considerably as a result of six years' lack of German supplies. The small wood distillation plants of Wimmis and Castione can produce inadequate quantities of methyl acetate and wood tar for the domestic market, whereas the large wood distillation industries established in the Balkans with American capital appear to be quite intact, and in operation. The Uetikon chemical works, the only Swiss producers of phosphate, is also not capable of satisfying home consumers, and some imports have arrived from Sweden; but while the Uetikon price was 56 fr. per 100 kg., the imported material was priced at 370 fr. per 100 kg. The new trade agreement with France will relieve the phosphate situation.

Sulphur, the import of which was interrupted by the Allied invasion of Italy, was in short supply for a period, offering a severe

obstacle to the chemical industry, especially to the new synthetic rubber plants and caoutchouc. Italy was also an important supplier of essential oils, and consumers are anxiously awaiting the promised trade treaty with Italy to allow the import of these materials, which are so important in the perfume, cosmetic and even the confectionery industries.

The situation regarding tartaric acid, cream of tartar, and citric acid was also precarious. Spain and Portugal delivered at a very high price and in rather poor qualities. Mercury came from Almaden, which also took advantage of its monopoly, although the uncertain political position of Spain had a healthy influence on the price, not only of mercury but also of tungsten and manganese.

The closing of the I.G. Farben works in Germany is not likely to have a great effect on the supply situation of Switzerland because her chemical-pharmaceutical industry has gained wide independence and is largely specialised. Export prospects are favourable. Labour questions have recently been settled at Basle and Geneva, and factory conditions are stated to be exemplary from all points of view, alike from the angle of health, amenity, or social security.

Personal Notes

MR. V. HACKNEY, chief chemist of the London Brick Co., Ltd., has been elected to Bedford Rural District Council.

PROFESSOR W. N. HAWORTH has been appointed chairman of the Chemistry Research Board of the Department of Scientific and Industrial Research.

MR. H. BRYAN BARNARD, great-grandson of the founder of H. B. Barnard & Sons, Ltd., metal merchants and manufacturers, Vauxhall, London, having recently attained his B.Sc. and A.R.S.M., is now actively engaged with the company.

New Associates of the Textile Institute include MR. G. A. BAXENDALL, A.R.I.C., F.C.S., technical officer, Textile Branch of Economic Division, Control Commission; and MR. ALEC MURRAY, B.Sc., chief chemist, British Silk Dyeing Co., Ltd., Dumbartonshire.

DR. J. NORMAN DAVIDSON, of the Medical Research Council, and secretary of the Biochemical Society, has been appointed to the Chair of Biochemistry in the University of London, at St. Thomas's Hospital Medical School. He has previously held the post of Lecturer in Biochemistry at University College, Dundee, and at Aberdeen University, and is noted for his work on the chemical nature of enzymes and on nucleoproteins.

DR. S. E. CHANDLER, Principal of the Plant and Animal Products Department, Imperial Institute, retired last month after 41 years' service, and has been succeeded by DR. J. R. FURLONG, A.R.I.C., hitherto vice-principal in charge of laboratories. MR. F. FERRAR, vice-principal in charge of intelligence, has also retired, and the two vacancies have been filled by MR. H. T. ISLIP, F.R.I.C. (Laboratories), and MR. G. T. BRAY, F.R.I.C. (Intelligence).

MR. N. TAYLOR, an executive director of I.C.I. of Australia and New Zealand, Ltd., since 1934, has been appointed managing director in succession to SIR LENNON RAWS, who has relinquished that position, but will continue as chairman. Dr. F. T. MEEHAN, who recently arrived in Australia from England, has been appointed technical manager; and SIR FREDERICK BAIN, who is on the board of the parent company (I.C.I., Ltd.), and SIR DAVID RIVETT have been appointed to the board.

DR. L. F. NICKELL, chairman and managing director of Monsanto Chemicals, Ltd., was honoured last week, when, in recognition of the part he played in inaugurating a generous pension and life assurance scheme for the Monsanto staff, he was presented on their behalf with a portrait of himself and an album containing the names of subscribers to the gift. The portrait, which was painted by Madame Ratinoff and shown in last year's Royal Academy, was unveiled and presented to Dr. Nickell, together with the album, by Dr. W. H. Garnett, a director, in the presence of the staff at the Ruabon works. The ceremony was repeated later at the London office, when Mr. A. D. Daysh, another director, made the presentations on behalf of the London staff.

Obituary

MR. ALFRED WILLIAM VICARY SCOINS, who died at Wallasey on April 11, aged 62, was deputy chief accountant of I.C.I., Ltd., and was due to have retired shortly. He was well known throughout the chemical industry on Merseyside, having been for many years connected with the head office in Liverpool of the United Alkali Company, afterwards incorporated in I.C.I.

MR. WILLIAM BROTHERS, of Whaley Bridge, who died on April 8 at the age of 95, was a director of the Brothers Chemical Company, Trafford Park, Manchester, and, although he had not taken an active part in the firm's business for some time, still retained his interest in its work. Of an inventive frame of mind, Mr. Brothers had patented many of his ideas in connection with the chemical world. When he was 72 years old he bought his first motor cycle and for some years used it daily to travel to and from Trafford Park.

Liquid/Liquid Extraction

Application to Column Design

A JOINT meeting of the North-Western Branch of the Institution of chemical Engineers and the Chemical Engineering Group was held at Manchester on April 6, when a paper, " Liquid/Liquid Extraction : Removal of Acetone and Acetaldehyde from Vinyl Acetate with Water in a Packed Column," was read by Messrs. H. R. C Pratt, B.Sc., and S. T. Glover, B.Sc. To open the meeting, the chairman of the Branch, Mr. J. McKillop, reviewed the work done, commenting on the excellence of the papers and on the good attendances at the meetings.

The authors used a column, 1.78 in. in diameter and 4 ft. 11 in. high, randomly packed with Raschig rings, for the investigation of changes in the variable connected with the extraction. The end boxes of the column were enlarged to 2¾ in. diameter and the bottom box formed a Venturi entrance to the column to enable it to be operated at high rates of flow without flooding. Distilled acetaldehyde or redistilled acetone were mixed with monomeric vinyl acetate stabilised with 0.1 per cent. hydroquinone and the mixture passed up the column countercurrent to water. Mutual solubility curves were obtained by titrating a known mixture of the miscible components with the third component until a cloud-point was obtained; the compositions of such mixtures were plotted on a triangular diagram, tie-lines and plait-point being obtained on the same diagram.

Mass Transfer Coefficients

Mass transfer coefficients were calculated from the analyses of the mixtures obtained by experimental work on the column and from a materials balance. The equilibrium diagram giving solute percentage in vinyl acetate and in water was prepared; since the solute transferred and the solubility of vinyl acetate in water were both small quantities, the operating line on the equilibrium diagram was drawn as a straight line joining the terminal concentrations of solute in the vinyl acetate and the water phases. The number of theoretical stages was obtained and these were divided into the height of the column to give the height equivalent to a theoretical stage, this work being repeated many times for acetone and for acetaldehyde. The over-all mass transfer coefficients were calculated from the experimental data and were split into film coefficients which were assumed to be power functions of the velocities of the two phases through the apparatus. Expressions for the over-all mass transfer coefficients in terms of the velocities of the two phases were obtained for the extraction of acetone and of acetaldehyde from vinyl acetate dispersed in water and for the extraction of acetone by water dispersed in vinyl acetate. The results were applied to the design of a large extraction column.

Oil and Colour Chemists

London Section's Annual Meeting

AT the annual meeting of the London Section of the Oil and Colour Chemists' Association held at 26 Portland Place, on April 12, it was reported that during the twelve months ended December 31, 1945, there had been a net increase of 44 in membership. The fifth series of Post Graduate Lectures, entitled " Viscosity and Plasticity," given by Professor E. N. da C. Andrade, F.R.S., in the Royal Institution, had created a new record, with an attendance of approximately 350.

As refresher courses, a series of five lectures in three Polytechnics (Acton, Borough, and East Ham) was arranged for members of the industry demobilised from the Forces. They had proved highly successful, and might need to be repeated. The committee tendered its thanks to the lecturers and the Polytechnics for their generous help.

The committee recorded its appreciation of the work of its chairman, Mr. R. J. Ledwith, and thanked also the hon. officers, as well as the retiring members of the committee, Messrs. D. H. Hewitt, J. D. Morgan, and W. Palmer.

Adoption of the report, proposed by Mr C. M. Auty and seconded by Mr. W. H. Stitson, was unanimously resolved. The hon. treasurer, presenting the accounts, drew attention to the fact that the receipts in respect of post-graduate lectures were £173, compared with £97 in the previous year.

The following were re-elected for the ensuing year: *Chairman*, Mr. R. J. Ledwith; *hon secretary*, Mr. D. E. Roe; *hon. treasurer*, Mr. L. O. Kekwick; *hon. publications secretary*, Mr. H. A. Idle; *hon. auditor*, Mr. E. D. Wilson. As the result of a ballot, the following were elected to fill the three vacancies on the committee: Messrs. C. M. Auty, N. R. Fisk, and H. A. Newnham.

Press reports indicate that the suppression of the " everlasting match " is now at an end in the U.S., as a result of the " trust-busting " activities of the U.S. Attorney-General. The invention, credited to Dr. Ferdinand Ringer, of Austria, is believed to have been made in 1931, but its use was withheld owing to the action, it is said, of the late Ivar Kreuger, who acquired the patent rights, but failed to operate them, for obvious reasons.

General News From Week to Week

Billingham-on-Tees Urban Council has approved plans for the erection of process offices 121 ft. long, and laboratories 106 ft. long for I.C.I., Ltd.

"Hints to Business Men Visiting Colombia" is the title of a booklet just issued by the Department of Overseas Trade, from whom free copies may be obtained.

A delegation of Polish scientists has come to this country under the auspices of the British Council to visit universities and other organisations and to meet British scientists in London and the provinces.

The reduction in price of virgin aluminium, announced last week, was made possible by reason of a contract which has just been made by the Ministry of Supply for the purchase of 215,000 metric tons from Canada over the years 1946 and 1947.

L. R. B. Pearce, Ltd., potash merchants, will be at 3 Bucklersbury, London, E.C.4, on and after April 23 (telephone, CITy 4243; telegrams, Ellarbepea, Cannon, London). Mr. Geoffrey Pearce, who has just come from the Royal Navy, is joining the firm.

A new battery of coke-ovens and liquefaction plant, to cost £220,000, is to be put down at Evenwood (Co. Durham) by Messrs. Sadler and Co., of Middlesbrough. The ovens, of the latest design, will use about 300-350 tons of coal daily. The plant will also make plastic materials.

Among 66 new members whose election to the Textile Institute is announced, is a "Bevin Boy," T. D. Brown, of Bradford, who is admitted as a junior student. Despite the fact that he has been directed to work in the Monkton Main Colliery, near Barnsley, he is determined to carry on with his studies for a career in the textile trade.

Among the recent activities of Electric & Musical Industries, Ltd., is the formation of E.M.I. Factories, Ltd., a new company which will be responsible for the operation of the whole E.M.I. manufacturing network. The organisation is interested in the development of electronic, photo-chemical and chemical processes, the mass-production of specialised glass products, and the manufacture of special lacquers and paints.

The Scottish branch of the Institute of Petroleum was successfully restarted this month, when a large gathering of petroleum, oil, colour, paint, and allied technicians and executives gathered at the North British Station Hotel, Edinburgh, to hear an address by Professor F. H. Garner, O.B.E., past president of the Institute. Mr. Robert Crichton, Scottish Oils, Ltd., was appointed chairman and the new honorary secretary is Mr. W. R. Guy.

A clause in the Finance Bill will enable British manufacturers of theobromine to obtain the drawback of cocoa duty when they receive cocoa residues for manufacture, so that the drawback on export of theobromine will become unnecessary.

To the fund in memory of Sir Horace Darwin for re-equipping laboratories in enemy-occupied territories, 12 member firms of the Scientific Instrument Manufacturers' Association of Great Britain have promised instruments to the value of £3300.

An explosion, followed by a fire, occurred at the Billingham-on-Tees works of I.C.I., Ltd., on April 12. The N.F.S. from Billingham, Stockton and Middlesbrough got the outbreak under control within an hour. No one was injured, but considerable damage was done.

Among Courtaulds' new research plans announced in the chairman's annual address last week, is the construction of a new laboratory for fundamental research, probably in the London area, and a larger one at Coventry for applied research and development.

The Vitamin C (Control) Order, 1941, has been revoked by an Order dated April 12, 1946, under which the control of production and distribution of Vitamin C (ascorbic acid) has been transferred from the Ministry of Food to the Directorate of Medical Supplies, Ministry of Supply, Portland House, Tothill Street, London, S.W.1, to whom all inquiries should now be addressed.

An exhibition of British Chemical Research, the first of its kind ever held in Great Britain, will open in London in June. Organised by I.C.I., it will be designed to demonstrate to the public how, under the stimulus of war, British chemists made discoveries of permanent importance to mankind. By courtesy of the Empire Tea Bureau, the exhibition will be held at the Tea Centre, Lower Regent Street, London, S.W.1.

The question whether the shale oil industry, now owned by Scottish Oils, Ltd., will be nationalised along with the coal mines, is discussed by Mr. Walter Nellies, secretary of the Scottish Shale Miners' and Oil Workers' Union, in his annual report. The industry, he says, is being carried on at a loss and will require financial help from the Government either in the form of an increased preference for motor spirit and diesel oil, or a direct subsidy. There are now 3500 employed in shale mines, refineries, etc., in West Lothian, and it is desirable that this all-important industry, the only one of its kind in Britain, should be developed.

A new factory for the manufacture of mineral-water machinery and oil-refinery pumps is being opened at Portobello, Midlothian, by Hayward-Tyler & Co., Ltd., of Luton. The building, used during the war for the manufacture of landing-craft, etc., occupies 10,000 ft. of floor space. The company's Scottish representative, Mr. C. B. Thomas, states that he expects production to start early in May. Some 500 people will eventually be employed, and 75 per cent. of the machinery produced will be for export.

Fisons, Ltd., announce that they have approved plans to erect a new factory for the production of 100,000 tons a year of triple superphosphate and other fertilisers. Hitherto triple superphosphate has not been manufactured in this country, though during the war considerable tonnages were imported. Negotiations are proceeding for the acquisition of a site of 200 acres alongside the L.N.E.R. Dock at Immingham, Lincolnshire, which will provide facilities for large ocean-going steamers, together with excellent rail and road connections. Important extensions are already in hand at Fisons' works at Avonmouth, where the annual production of fertilisers will be increased to more than 250,000 tons.

Foreign News

Austrian production of salt, the most important export commodity after iron-ore, magnesite and petroleum, has reached 5230 tons per month and is still increasing.

Exploitation of new petroleum occurrences, discovered in the Italian province of Piacenza, is expected to cover one-third of the present home production.

In Slovakia a new aluminium plant is under construction, with production based on bauxite received from Hungary as reparations.

All government regulations in Belgium covering the rubber, carbonic acid, wire and nail, copper sulphate, window glass, bottle and flask, and pin industries, have been abolished as from March 31.

Chemical companies in the Swiss canton of Aargau have formed a new association to study scientific, technical, and economic questions of concern to the industry. Furthermore, a joint export policy is also being aimed at.

In non-ferrous metals, February output in France showed a striking increase, production of copper (Le Palais) being 1030 tons against 800 in January, lead 1198 (25), zinc 1926 (1573), and ferro-silicon (converted at 50 per cent.) 1400 (996). Aluminium production remained almost stationary (2300 tons against 2350), but a number of new electrolysis baths have recently been put into operation.

Spanish mercury production in 1945 amounted to 40,000 flasks (of 34.5 kg.) or 1380 tons. The highest production was 2950 tons in 1941, in which year 1395 tons were exported.

The net loss of the Montecatini concern for 1945 amounted to 97.3 million lire, compared with a net profit in the previous year of 171.5 million lire. A new board, on which French and Swiss interests are represented, was appointed at the meeting on March 27.

New copper deposits have recently been discovered in the Dzhezkazgan area of the U.S.S.R., known for its occurrences of non-ferrous metals. A new copper smelter is to be erected on the Kendyr river as part of an industrial scheme envisaging brickmaking, woodworking, and glass production.

The great expansion which the Department of Chemical Technology of the University of Bombay has undergone during the last three years in the provision for increased facilities of teaching and research in several important branches of chemical technology has been reviewed in the Department's annual report for 1944-45.

Forthcoming Events

April 24. Royal Statistical Society (Industrial Applications Section, Birmingham and District Group). Birmingham University, 6.30 p.m. Mr. W. A. Bennett: "Quality Control Economics."

April 24. Institute of Welding. Institution of Civil Engineers, Great George Street, Westminster, London, S.W.1, 6 p.m. Major R. J. Fowler and Major L. F. Denaro: "The Evolution of Welded Armoured Fighting Vehicles."

April 26. Oil and Colour Chemists' Association (Bristol Section). Grand Hotel, Broad Street, Bristol, 6.15 p.m. Annual general meeting.

April 30. Institute of Fuel. Rooms of the Geological Society, Burlington House, Piccadilly, London, W.1, 10 a.m. and 2.30 p.m. Conference on Industrial "Waste Heat" Recovery (see The Chemical Age, April 13, p. 390).

May 1. Institute of Fuel (Midland Section). James Watt Memorial Institute, Birmingham, 2.30 p.m. Mr. O. Lyle: "Inefficiency."

May 1. Society of Public Analysts. The Chemical Society's Rooms, Burlington House, Piccadilly, London, W.1, 6 p.m. Dr. E. C. Barton-Wright: "The Microbiological Assay of Amino Acids: I. The Assay of Tryptophan, Leucine, Isoleucine, Valine, Cystine, Methionine, Lysine, Phenylalanine, Histidine, Arginine, and Threonine." Dr. E. C. Barton-Wright and Dr. T. Moran: "The

Microbiological Assay of Amino Acids: II. The Distribution of Amino Acids in the Wheat Grain."

May 1 and 2. Iron and Steel Institute. 4 Grosvenor Gardens, London, S.W.1. Annual general meeting. May 1: 9.45 a.m., official business and discussion on "Fuel Economy in Iron and Steel Works": 2.30 p.m., continuation of discussion and further discussion on "Supersonic Testing": 8.30 p.m., first Hatfield Memorial Lecture, Dr. G. B. Waterhouse (at Institution of Civil Engineers, Great George Street, S.W.1). May 2: 9 a.m., dicussion on "The Overheating of Steel."

May 2. Royal Statistical Society (Industrial Applications Section, Sheffield Group). Sheffield University, 6.30 p.m. Mr. F. C. Lawrence: "Costs, Overhead Expenses and Effort Assessment in Practice."

May 6. Society of Chemical Industry (London Section). Rooms of The Chemical Society, Burlington House, Piccadilly, S.W.1, 6.15 p.m. Annual general meeting.

Company News

Pinchin, Johnson & Co., Ltd., report a net profit for 1945 of £552,381 (£526,661), and are paying a final ordinary dividend of 12½ per cent., making a total of 15 per cent. (10 per cent.).

British Paints (Holdings), Ltd., announce a profit, to March 31 last, of £43,238 (£25,576). The preferred ordinary dividend is 8 per cent. (same) plus bonus of 2 per cent. (nil); ordinary dividend is also 8 per cent. (same) plus bonus of 2 per cent. (nil).

Imperial Chemical Industries, Ltd., announce a final ordinary dividend of 5 per cent., making 8 per cent. for 1945 (same). Net income for the year was £7,409,593 (£6,972,988). Provision for taxation has been reduced by £1,100,000 (£629,000), brought to credit from past over-provisions for taxation. The directors have allocated to the central obsolescence and depreciation reserve a special addition of £1,500,0000 (£1,000,000). Carried forward, £1,337,280 (£1,145,274).

New Companies Registered

Alma Plastics, Ltd. (406,997).—Private company. Capital, £2000 in £1 shares. Manufacturers of and dealers in plastics, chemicals, etc. Directors: P. M. Gregory; A. G. Bisby. Registered office: Alma House, Rodney Road, Cheltenham.

Henault-Allan, Ltd. (408,027).—Private company. Capital £24 in 48 founders' shares of 10s. each. Manufacturers of and dealers in plastic materials, chemicals, etc. Subscribers: P. E. H. Henault; Doreen M. Callender. Registered office: High Holborn House, 52-4 High Holborn, W.C.1.

Toby (Chemicals), Ltd. (407,260).—Private company. Capital £5000 in 2500 cumulative preference and 2500 ordinary shares of £1 each. Manufacturers of and dealers in chemicals, etc. Directors: R. H. Toby; J. Bellwood. Registered office: Trevelyan Chambers, Boar Lane, Leeds, 1.

Harefield Industrial Products, Ltd. (407,199).—Private company. Capital £1000 in £1 shares. Manufacturers of and dealers in chemicals, paints, varnishes, printing inks, etc. Directors: E. W. Muirsmith; Dr. F. W. Stoyle. Registered office: Winstone House, 150-152 Clerkenwell Road, E.C.1.

Hicking Pentecost & Co., Ltd. (406,925).—Private company. Capital £430,000 in £1 shares. To acquire, for amalgamation, the businesses carried on at Nottingham, as "G. & W. N. Hicking," "Hicking & Pentecost," Lindley & Lindley," and "Adams & Co.," and to carry on the business of bleachers, dyers, manufacturers of vitriol bleaching and dyeing materials, etc. Directors are: Sir William Hicking, Bt.; S. J. Pentecost; L. S. Pentecost; D. C. Cheshire. Registered office: Queen's Road, Nottingham.

Commercial Intelligence

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

Company Winding-up Voluntarily

PHARMACEUTICAL PRODUCTS, LTD. (C.W.U.V., 20/4/46.) April 1. Mr. R. A. Jenks, of Jenks, Percival, Pidgeon & Company, 12 Finsbury Circus, E.C.2.

Chemical and Allied Stocks and Shares

THE combination of better international news and the decision to abolish E.P.T. at the end of the year continued to dominate stock markets, where business has been on a large scale. Industrials scored a general advance with attention naturally centred mainly on shares of companies at present hard hit by E.P.T. Markets were also aided by the further strength in British Funds, which, in response to the Government's latest cheaper money moves, have shown another all-round advance. Relief at the E.P.T. decision completely overshadowed the threat of a new scheme in the future to limit dividends; but buying became more selective, and in some directions profit-taking reduced earlier gains.

Shares of chemical and kindred companies participated in the upward market trend. Sentiment was also aided by the increased

profits shown by the I.C.I. preliminary figures for the past year. Imperial Chemical moved up to 40s. 10½d. xd., the maintenance of dividend at 8 per cent. being in accordance with general expectations. Hopes as to future benefits from the abolition of E.P.T. drew increased attention to B. Laporte, which made a fresh advance to 90s., while higher dividend hopes further advanced Dunlop Rubber to 57s. 6d. Reflecting the prevailing trend, United Molasses also jumped to 51s. 10½d., Distillers to 121s. 3d., Lever & Unilever to 53s. 3d., and Turner & Newall to 85s. 9d.

Borax Consolidated deferred were higher at 44s. British Aluminium receded to 35s. 10½d. on the lower price of the metal; but later firmed up on the belief that the latter will stimulate increasing uses of aluminium. Imperial Smelting rose to 19s. and Triplex Glass at 42s. were again higher on balance, although best prices were not fully held. De La Rue were in demand up to £11½ on higher dividend hopes, and British Industrial Plastics 2s. shares further strengthened to 7s. 9d., while Erinoid were 13s. 6d.

Iron and steels became firmer, but movements generally were small, not exceeding more than a few pence, nationalisation fears having continued to affect this section. Guest Keen further improved to 44s. 6d., Stewarts & Lloyds to 55s. 4½d., and Dorman Long to 24s. 9d. On the other hand, the past year's results were reflected by a sharp decline of 3s. 9d. to 46s. 3d. in Thos. Firth & John Brown. The latter eased to 28s., but elsewhere, Allied Ironfounders strengthened to 59s., and Babcock & Wilcox to 61s. 3d. Bennis Combustion 5s. shares firmed up to 11s. 3d., and Keith Blackman to 45s. Greeff-Chemicals Holdings 5s. shares were firm at 9s. 6d., and Monsanto Chemicals 5½ per cent. preference 23s. W. J. Bush ordinary remained tightly held and quoted at 85s. Estimates as to future E.P.T. benefits drew increased attention to British Drug Houses, which rose further to 65s. A feature was demand for electric equipment shares under the lead of Associated Electrical, which advanced to 63s. 9d. ex rights to the new shares. General Electric rose to 100s. Crompton Parkinson were 32s. 6d., and English Electric 60s. 6d.

Boots Drug moved higher at 59s. 9d., while Sangers were 30s. 9d., and Beechams deferred, on E.P.T. relief estimates, rose to 23s. 9d. Textile shares also received attention on E.P.T. abolition, Bradford Dyers improving to 25s. 9d. xd, Calico Printers to 22s. 6d., and Bleachers to 13s. Oils rallied, Burmah Oil and Shell participating in the upward trend, while there was a further rise in Canadian Eagle Oil, and V.O.C. were wanted on higher dividend hopes. Anglo-Iranian, however, were dull at 102s. 6d. at the beginning of the week.

British Chemical Prices

Market Reports

NEW business on the London chemical market during the past week has been on a fair scale and interest has been sustained in spite of the shorter week due to the holiday interruption. Prices throughout are on a firm basis and the only changes of note relate to the lead oxide and other non-ferrous metal products which were noted in the report of last week. In the soda products section, chlorate of soda and nitrate of soda are being absorbed in good quantities, while a fair trade has been reported in hyposulphite of soda and the various grades of sulphide of soda. There is a good demand for permanganate of potash and a ready market for available supplies of most of the other potash products. In other sections of the market tartaric, citric, and oxalic acids are active items, while a steady demand is reported for arsenic, formaldehyde, and hydrogen peroxide. Conditions in the coal-tar products market show little change. Pitch is in good demand on both home and export account, while a steady inquiry is being made for creosote oil and crude and crystal carbolic acid.

MANCHESTER.—Shippers are maintaining a steady flow of inquiries on the Manchester chemical market and there has been no lack of offers of additional export business in both light and heavy products. Replacement buying on home trade account has also been on a fair scale and the alkalis, ammonia and magnesia compounds and the mineral acids are moving steadily into consumption against contracts to industrial consumers in the Lancashire area, including the textile bleaching, dyeing and finishing trades. The undertone of the market is steady to firm throughout, the features of actual movements being in the copper, lead and zinc products in sympathy with the sharp rises in the metals.

GLASGOW.—The demand for home and export in the Scottish heavy chemical market continued to be steady during the last week and as before it is not possible for supplies to keep pace with demand. Prices in certain instances have shown tendency to rise and increases have affected caustic soda, sodium carbonate, metasilicate of soda, zinc oxides, copper, lead and zinc. Considerable interest has been shown by the export market in zinc and copper sulphates, xylol, toluol and permanganate of potash.

Price Changes

Oxalic Acid.—Spot, £85 5s. per ton for ton lots in 5-cwt. casks d/d. Less than one ton would be dearer.

Inventions in the Chemical Industry

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

Applications for Patents

Liquid containers.—S. G. Darby. 8363.

Colouring materials.—E.I. Du Pont de Nemours & Co. (United States, March 14, '45.) 7839.

Carboxylic acids.—E.I. Du Pont de Nemours & Co. (United States, March 17, '45.) 8311, 8312.

Copolymers.—E.I. Du Pont de Nemours & Co. (United States, March 19, '45.) 8313.

Organo-siloxanes.—J. G. Fife. (Corning Glass Works.) 8392.

Nitrocellulose.—S. Fordham, and Imperial Chemical Industries, Ltd. 7968.

Gelatine blasting explosives.—S. Fordham, and Imperial Chemical Industries, Ltd. 7969.

Fabric production.—P. T. Gale, A. K. Simcox, and Imperial Chemical Industries, Ltd. 8127.

Sheet materials.—W. E. F. Gates, and Imperial Chemical Industries, Ltd. 8123.

Plastic compositions.—W. E. F. Gates, and Imperial Chemical Industries, Ltd. 8124.

Packaging materials.—W. E. F. Gates, and Imperial Chemical Industries, Ltd. 8125.

Drum closures, etc.—A. C. Giles, and A. C. Giles & Co., Ltd. 8205, 8206.

Refining tower trays.—H. C. Glitsch, and F. W. Glitsch. 7719.

Silica.—D. E. B. Greensmith, C. Shaw, and W. E. Smith. 8013.

Keratin-containing substances.—G. A. Hards. 8137.

Production of manures.—Heenan & Froude, Ltd., and A. E. W. James. 7950.

Filters.—Houdaille-Hershey Corporation. (United States, June 11, '45.) 7715.

Copper alloys.—International Smelting & Refining Co. (United States, July 11, '45.) 7731.

Calcium solutions.—N. V. Koninklijke Industrielle Maatschappij voorheen Noury & van der Lande. (Holland, Feb. 13, '45.) 8388.

Fluid supply systems.—Linde Air Products Co. (United States, April 11, '45.) 8374.

Flow meters.—Manchester Oil Refinery, Ltd., and F. Porges. 7992.

Treatment of castor seeds.—L. H. Manderstam. 7785.

Magnesium silicate.—Marine Magnesium Products Corporation. (United States, May 29, '45.) 7761.

Organo - silicon compounds.—A. E. Meadowcroft, C. Shaw, and W. E. Smith. 8012, 8014.

Complete Specifications Open to Public Inspection

Agents for colouring emulsions and dispersions, especially those of the oil in water type, and method for the production of such agents.—A/S Grindstedvaerket. June 2, 1942. 589/46.

N_1-disubstituted melamines.—American Cyanamid Co. Sept. 14, 1944. 24812/45.

Preparation of mono-substituted isomelamines.—American Cyanamid Co. Sept. 14, 1944. 24813/45.

Anthraquinone compounds.—British Celanese, Ltd. Sept. 13, 1944. 23306/45.

Production of cyclic acetals.—British Celanese, Ltd. Sept. 19, 1944. 23974/45.

Production of substituted butanones.—British Celanese, Ltd. Sept. 19, 1944. 23975/45.

Quaternary salts of basic esters.—Ciba, Ltd. Sept. 18, 1944. (Cognate application 21979/45.) 21978/45.

Acylated polyglycol ethers.—Ciba, Ltd. Sept. 13, 1944. (Cognate application 21982/45.) 21981/45.

Oxidation of hydrocarbons.—Clark Bros., Co. Inc. Oct. 24, 1942. 17390/43.

Vacuum distillation apparatus.—Distillation Products, Inc. Sept. 12, 1944. 23185/45.

Manufacture of organic compounds.—E.I. Du Pont de Nemours & Co. Sept. 14, 1944. 23745/45.

Production of polymers and copolymers comprising trifluorethylene.—E.I. Du Pont de Nemours & Co. Sept. 19, 1944. 24195/45.

Combustible material and process of producing same.—Ensign-Bickford Co. July 8, 1944. 19703/45.

Complete Specifications Accepted

Production of activated carbon and to its use for treating fuel gases.—W. C. Holmes & Co., Ltd., T. Nicklin, and F. C. Buckley. March 4, 1944. 576,044.

Production of synthetic resins.—Kodak, Ltd. (Eastman Kodak Co.), W. O. Kenyon, and J. H. Van Campen). June 4, 1943. 576,022, 576,023.

Synthetic materials.—Kodak, Ltd. (Eastman Kodak Co., W. O. Kenyon, and W. F. Fowler, jun.). June 4, 1943. (Cognate applications 9006/43, and 14141/43.) 576,021.

Drying of materials.—A. H. Manning, and O. Heller. Aug. 7, 1943. 576,056.

Precious metals and alloys thereof.—A. B Middleton. Oct. 28, 1943. 575,998.

Oxidation of hydrocarbons.—Shell Development Co. Oct. 2, 1942. 576,060.

Treatment of sludge. D. Taylor. Feb. 4, 1944. 575,942.

Transporting equipment for molten metal.—E. H. Whittaker. Dec. 10, 1943. 576,066.

EDUCATIONAL

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THE Proprietors of British Patent No. 534,609 for "Explosives," desire to enter into negotiations with a firm or firms for the sale of the patent, or for the grant of licences thereunder. Further particulars may be obtained from Marks & Clerk, 57 & 58, Lincoln's Inn Fields, London W.C.2.

THE Proprietors of the Patent No. 557,097 for "Process for making Dihydroxy Halogenated Diphenyl Methanes" are desirous of entering into arrangements, by way of licence and otherwise on reasonable terms, for the purpose of exploiting the same and ensuring its full development and practical working in this country. All communications should be addressed, in the first instance, to Haseltine Lake and Co., 28, Southampton Buildings, Chancery Lane, London, W.C.2.

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