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The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

VOL. LII
No. 1348

SATURDAY, APRIL 28, 1945
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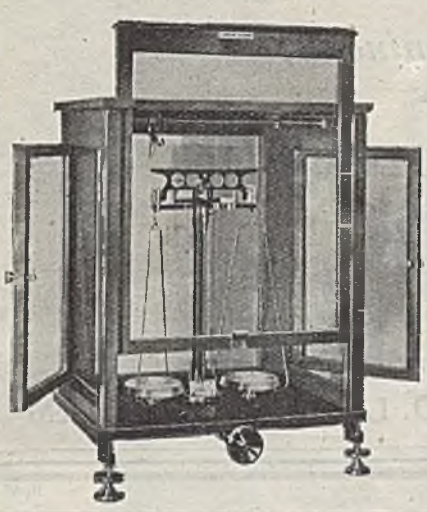

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The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

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THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers Limited

VOL. LII
No. 1348.

April 28, 1945

Annual Subscription 21s.
Overseas 26s.

British Instrument Manufacture

THE manufacture of instruments has long been an important industry, though perhaps never of such importance as it is to-day. Mechanised war is based on instruments. It is likely that the need for reliable and exact instruments for peace purposes will increase. As material for export, instruments are particularly valuable because they require great skill in design and in manufacture and they embody the maximum of man-hours with the minimum of material. Purely laboratory instruments, such as microscopes, balances, and polarimeters, represent one class of instrument in which precision is of more importance than robustness. There are, of course, many other laboratory instruments of this character.

There is an important range of instruments which are used on the works for recording or control. A boiler plant, for example, requires pressure gauges, draught gauges, CO_2 recorders or indicators, temperature recorders or indicators, coal weighing or measuring appliances, water meters and steam meters. All these instruments are required also in many other industrial processes and involve a reasonable degree of accuracy with sufficient strength to resist the manipulations of the unskilled and the normal handling they receive on the works. Many of these instruments are extremely accurate if they are properly handled and properly serviced. But there is still room for a good deal of inventive genius to prolong the period of time in which accuracy is retained under the ordinary conditions of service. The solution of the problem may be to train the user to maintain his instruments properly, or to set up an elaborate servicing organisation, but it is not to be ruled out that design of the instrument itself will have a bearing on its value in use.

Finally, there are instruments for the automatic control of industrial plant and process which are becoming more and more essential on the works. Works instruments have been the subject of discussions at the A.B.C.M./B.C.P.M.A. Fuel Economy meetings in London and Manchester and the conclusion left from those meetings is that British instruments are well made, are good in design, and generally speaking do their work satisfactorily. We believe that the products of the British instrument industry are in these respects equal to any in the world. Where failures occur

On Other Pages

they are generally the fault of the user.

Nevertheless, there are not wanting those who regard the future of instrument manufacture in this country with some trepidation. It cannot be doubted that the German instrument industry will arise again after the war and will be a powerful competitor. In certain instruments such as cameras, microscopes, and other optical work German instruments have a very high name. We do not think, however, that the British instrument industry would wish to see the disappearance of the German instrument industry. We must ensure, however, that it does not make the types of instrument that are required for aeroplanes and other warlike purposes.

Dr. R. S. Clay (*J. Sci. Instr.*, March, 1945) has pointed out that, good as our instrument industry may be, it will find it difficult to maintain itself with its present constitution in the face of the mass production methods of America. Our practice of manufacturing by many firms in small batches does not tend towards low prices, and if it is maintained our factories are likely to find instruments put on the market, one by one, at prices with which they cannot compete, and so they will gradually be put out of employment. In any event they would no longer be able to compete in the foreign market. Dr. Clay believes that the Government will not maintain the Safeguarding of Industries Act to protect the British instrument industry if the industry fails to organise itself properly to meet foreign competition.

The solution proposed by Dr. Clay is that only one firm should make any given type of instrument. He believes, for example, that only a large firm would be financially able to undertake the manufacture of complicated instruments by mass production methods and that smaller firms should be allotted the more simple instruments. Microscopes might be divided among a number of firms each making a different class of instrument such as petrological, metallurgical, and so forth. He goes on to say: "For the success of such a scheme it would seem that at least three things are necessary. First, all the firms engaged in the manufacture of each type of instrument—such as those making electric measuring, or navigating, or surveying instruments, or lecture apparatus, or microscopes—should form a group, and agree among themselves how the work should be divided between them. Secondly, each group should set up a selling agency which would accept the orders for the group and divide them among the members of the group. Thirdly, and of greatest importance, the design of the instruments must be good, necessitating the establishment of a competent design and research staff. The knowledge and experience of all the firms in the group (and outside it) should also be pooled for the benefit of all. This design staff would not only design the actual instruments, but also assist in the design of the tools and machines required for their manufacture." He believes, however, that a still better result could be obtained by complete amalgamation of the firms into groups such as a British Surveying Instrument Company, a British Electrical Instrument Company, and so on.

This set-up is also designed to provide greater facilities for research. The fact that we have been able to hold our own and compete successfully in spite of the immense research staffs of American and German firms, with which in the instrument industry Britain has had little to compare in the same field, speaks volumes for the resource and inventiveness of our nation; if we remove this handicap we should be able to do still better in the future. But, says Dr. Clay, so long as we remain a large number of small competing firms, we cannot afford to support an adequate research staff. The difficulty of maintaining adequate sales representation abroad—and if the representation is to be *adequate* the representatives must be technically trained—becomes insuperable for a collection of small, disunited, firms.

All this depends on the instrument makers themselves. It is for them to decide whether the problem is as real as Dr. Clay believes and whether this arrangement is that best likely to meet competition. The chemical industry and other industries concerned with changes of state or of composition of matter are primarily interested in securing a strong and efficient British instrument industry which can deliver the goods. But on no account must the export market be neglected.

NOTES AND COMMENTS

Chemical History

THOSE sections of the popular Press who were so ill-advised as to urge the nation to premature victory celebrations have received a condign rebuke from the Prime Minister. Nevertheless, it is clear that victory in Europe cannot be far off now, and we are justified at least in making preparations to take stock and assess the value of what we, in the chemical industry, have done towards preparing the triumph which now seems assured. At different times during the war years, this journal has requested the component companies and individuals who make up the chemical industry to keep some sort of a war diary, and we now hope that some of these documents may come into their own. The adventures and misadventures of the chemical industry during the war will make good reading, more especially as the very nature of the work concerned has necessitated a high degree of secrecy—justifiable secrecy in this case. We ask the chemical industry, therefore, to bring these, their war diaries, up to date and to get them ready for publication, as being documents of great historical value. When the great day approaches, our intention is to make a more individual application, in the hope that we may have the opportunity of publishing some of these records in the pages of THE CHEMICAL AGE. Meanwhile, we trust that the industry will be able to find time to look into its records with a view to completing them when the times comes for adding our own contribution to the glorious pages of victory.

Publicity for Science

BRITISH scientists are as good as any in the applied field, and British industrialists are as well able as any others to appreciate and to adopt rapidly ideas which may be new to them. This was the contention of Sir Edward Appleton, secretary to the D.S.I.R. and senior Government physicist, in a paper presented to the Royal Society of Arts last week, and it is a contention with which we heartily agree. Sir Edward's theme was the work of his department during the war; its members were, in fact, the "back-room boys" of popular phraseology. Their contribution to the war effort and to the completeness of the victory of the Allies is universally recognised throughout the chemical industry, but Sir Edward has performed a useful service in stressing it before a wider public. It is not for our function here to list the achievements of the D.S.I.R.; all the various research associations which are connected with it worked at full steam on the war effort, as we and our readers are well aware. What we wish to insist on is the need for continual reminders of this sort. Scientists are not publicists; for one thing, it is not in their character; for another, they are too busy. We wonder, indeed, whether some considerable persuasion was not necessary to induce Sir Edward to come forward and tell of the achievements of his department. At all events, he *has* done it, and British scientists and their industrial supporters should be properly grateful. Now that the European war is approaching its end, and the long-awaited chance to be once more easy-going is approaching, there is all the more need to beat the drum. We propose to continue unashamedly in upholding the unequalled qualities of the British chemical industry and of the men that make it.

German Instruments

EVENTS have been moving with incredible rapidity on the Continent during the past week. More chemical plants have been overrun, including most recently the I.G. factory at Bitterfeld, and we have heard an eye-witness's account of the mass of tangled pipes and shattered vessels which is all that the Allied air forces have left of Leuna. Matters seem to be somewhat different, however, in the German scientific-instrument industry. Jena and its factories are reported to be scarcely damaged, and the question of how to deal with them immediately arises. There seems to be no doubt that, however, much we may dislike it, these factories, and the skill which has kept them going, must be somehow utilised to the advantage of

humanity in general. No doubt their products will figure in the reparations budget, though it must be without prejudice to the instrument makers in Allied countries. Moreover, their output must be carefully regulated both as regards quantity and kind. We have by now surely become able to conclude that the motives which actuate the Germans are not those by which we are moved; even the much-abused "profit motive" acacquires a halo of virtue in comparison with the intentions which lay behind German ingenuity. Provided, therefore, that we are sufficiently imbued with a healthy suspicion, and provided that we can supply (and we do seem to be supplying) some sort of skilled staff to keep a watchful eye on the output, the sooner these German works can start making the sort of instruments we require from them, the better for all concerned.

Points from the Budget

As most people expected, the Budget, in its main provisions, makes no very striking changes in the financial policy of the nation. It is to be regarded mainly in the nature of an interim affair, which, as Sir John Anderson said, "may possibly have to be superseded before the year is out"—the position of the war in Europe being what it is. Apart from the very important provisions giving relief to small businesses and removing the anomaly of double income tax payable both in this country and the U.S.A., we have to be content for the time being with promises of future relief. But it is heartening to know that the Chancellor has admitted that the present rates of taxation are unduly burdensome, as well as stifling to enterprise. The chemical industry will be particularly interested to hear that the Chancellor proposes to implement the recommendations of the Hydrocarbon Oil Duties Committee, which were fully discussed in our last week's issue. This should be a real step towards the development of new branches in British industrial chemistry. Certain allowances payable to users and exporters of spirits are to be repealed, if the Chancellor's proposals are adopted, and this will mean a loss of some £900,000 a year to distillers of industrial alcohol. Restrictions which had been in force since 1880 were repealed during the war, in order not to impede the output of industrial alcohol, but it has been reported in a White Paper that the resultant allowance was excessive and that it has operated to some extent as a subsidy to the industries concerned. It is this "subsidy" which is now being removed.

The Chemical Society

General Secretary's Retirement

THE 104th annual meeting of the Chemical Society was held at Burlington House on April 19. The president, Professor W. N. Haworth, D.Sc., F.R.S., referred to a letter he had received from Academician N. Derzhavin, conveying greetings from fellow scientists in Latvia and drawing attention to the crimes committed by the German invaders on the Latvian people. He also agreed to convey the deep sympathy of the Council to the American Chemical Society on the loss of their great national leader, and to send greetings to the Belgian, French and Russian Chemical Societies, expressing our joy at the liberation of their countries.

The following resolution has been passed by the Council: "The Council has received with profound regret the news of the coming retirement of Mr. S. E. Carr from the office of general secretary. It desires to place on record its deep feeling of gratitude for the great services he has rendered to the Society over a period of 42 years." It was declared that Professor H. V. A. Briscoe had been elected honorary secretary; Professor A. J. Allmand, Professor J. W. Cook, and Professor I. M. Heilbron vice-presidents; and that Professor Wilson Baker, Mr. R. P. Bell, Professor H. T. S. Britton, Dr. D. H. Hey, Dr. B. Jones, Dr. R. J. W. Le Fevre, Professor J. M. Robertson, Dr. F. S. Spring, Dr. M. Stacey, and Professor A. R. Todd had been elected ordinary members of Council.

At the afternoon session the Longstaff Medal for 1945 was presented to Professor N. V. Sidgwick, primarily as a recognition of his outstanding work as an exponent of the electronic theory of valency, and of the leadership he had given in the generalisation of relations between electronic structure and chemical properties over the whole domain of chemistry. The Harrison Memorial Prize for 1944 was awarded to Dr. L. F. Wiggins, as being the chemist of not more than 30 years of age who, during the previous five years, has conducted the most meritorious and promising original investigation in chemistry and published the results of such work.

Viscosity Temperature Curves

Consideration of Selected Examples

by L. A. STEINER

THE analytic value of viscosity determinations is most appreciated when such liquids are under examination as appear to be identical by normal chemical methods. Indeed, chemically similar compounds have quite often large enough differences in viscosity to be identified or classified by their viscosities. The use of viscosity as a criterion has, in common with some of the other physical methods, the advantage that the sample under test is not destroyed and remains available for other tests. It is true that the interpretation of viscosity figures is not so simple as that of, say, concentration, particularly if readings are not independent of the instrument used, as is the case with the majority of arbitrary scale viscometers. Absolute units are, as a rule, a more reliable basis of comparison than merely arbitrary ones. Fortunately, the handling of viscometers capable of readings in absolute units is not more difficult than that of instruments using arbitrary methods. As to interpretation, once the viscosities of representative material are tabulated, reference to these figures will give valuable help otherwise not available in analytical chemistry.

Application of Viscometric Methods

A large amount of information has already been tabulated in books of reference, but applications to new products and processes usually require some sort of tabulation or classification in relation to previous history of sample and success of application. The ease of operation and the accuracy of results have encouraged the use of viscosity measurement in many fields where customary analytical methods are slow or imperfect and, without attempting to make a complete list, viscosity tests may be said to have one or more of the following purposes in view: (1) to serve as a means of identification; (2) to ascertain the value of a given substance for a given purpose; (3) for control of uniformity of production or of supply; (4) as an aid for production control during processing, refining, blending, or preparation; (5) as a criterion of quality or purity; (6) for diagnosis of causes of deterioration; (7) for scientific research such as determination of molecular weight.

Viscosity is often related to other properties which cannot be measured so easily, such as stability, brushing properties of paints, binding power of an adhesive, gel strength, assuming that the physical qualities causing these properties are similar to those on which viscosity depends.

Certain pitfalls, however, are encountered in viscometry and the correlation of viscosity with other properties. One of these is due to negation of variation of viscosity with temperature. Viscosity varies with temperature much more than, say, density and refractivity, and is comparable with the temperature variation of pressure of a gas at constant volume.

The viscosity of a material may vary, in its useful range, from that of gases to that of solids, and we have, at present, no reliable means of extrapolation, although the theory of viscosity has made appreciable advances during the past few years. Most materials are used in practice at other temperatures than at the temperature of test and the difference may be a decisive factor for successful application or processing.

So long as only pure liquids are considered, viscosity at any *one* temperature is sufficient to describe the viscosity temperature relation in the whole of the liquid range. If, however, impurities are present, the viscosity temperature curve depends on the impurity and its concentration and the difference between those two curves is indicative. Similarly, a viscosity test of a highly complex industrial material, *e.g.*, gun-cotton, polymers, or oils, when made at a single temperature, is far less indicative of composition than a viscosity temperature curve. It is not always reliable to assume that viscosity temperature curves are parallel, and complex liquids of different origin or produced by different methods may have at a selected temperature the same viscosity, but markedly different viscosity temperature curves.

Three Types of Curve

The viscosity temperature relation of liquids may be classified in three groups: (1) Those which exhibit reversible relation, *i.e.*, increase and subsequent decrease of temperature produces exactly the same curve. In this group belong almost all simple liquids, such as water or benzene, and more complex liquids in a limited temperature range, such as mineral oils and fatty acids, tar, etc., although when observed for very long intervals of time some decomposition and consequent change in viscosity may occur.

(2) Those of which the viscosity changes permanently when heated in consequence of decomposition or polymerisation, oxidation, etc. This group contains, *e.g.*, blown oils, a large number of plasics, and other liquids which change their chemical composition as a result of thermal treatment.

(3) Those of which the viscosity is con-

ditionally reversible (*i.e.*, exhibits a certain hysteresis), and of which the viscosity (true or apparent) depends on the duration and sequence of thermal treatment, in other words, liquids (or semi-liquids) which change their physical status without changing chemically. Most mixtures with no definite freezing or melting point belong to this group when near the transition region.

Emulsions, suspensions, and colloids often change their physical status according to thermal treatment. These liquids are, however, not necessarily truly viscous, but in an intermediate state between a true liquid and a solid, and their rheological behaviour is not yet fully explored.

Examples

Examples from the first and third groups will now be cited, the first example serving also as an illustration of the large viscosity temperature differences of otherwise similar material. The instrument used for the tests has been described previously.[1]

Fig. 1 shows the viscosity temperature curves of two insulating materials, used for the impregnation of paper for cables and for the filling of cables. The horizontal axis

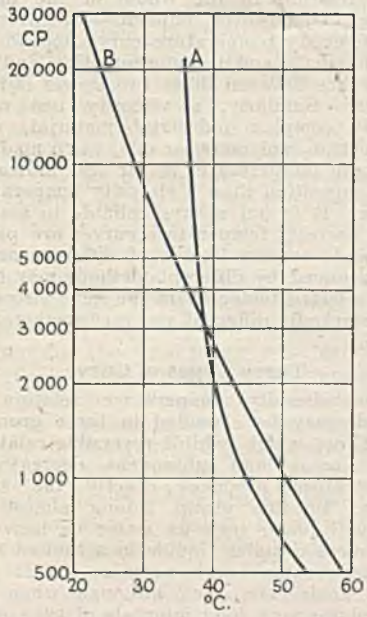


Fig. 1. Two reversible viscosity temperature curves belonging to apparently similar material. The curve serves as a means of identification.

represents temperature of test in °C., the vertical axis viscosity in centipoises on a logarithmic scale. Material *A* appeared at room temperature as a very thick paste and seemed to be superior to specimen *B*, which was quite fluid at 20°C. At 50°C. the position is reversed, specimen *B* being more viscous than specimen *A*. Further tests have shown that at 100°C. both specimens came to be almost identical. Subsequent investigation has located the reason of the difference in the type of resin used in specimen *A*; the viscosity temperature curves of both materials were accurately reversible. Several other viscosity temperature curves, running parallel, and crossing each other, have been reported elsewhere.[2 3]

Fig. 2 is an example of thermal hysteresis

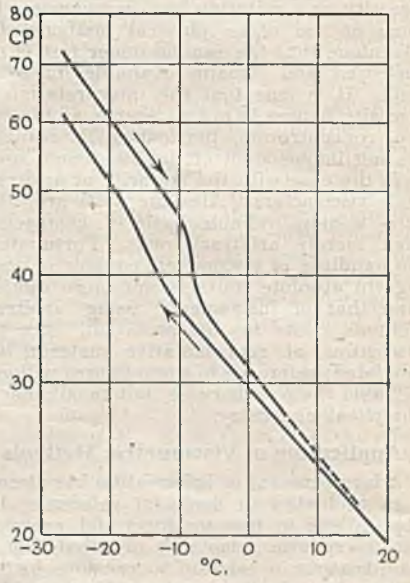


Fig. 2. Conditionally reversible viscosity temperature curves of the same material.

(group 3). The material is one of the hydraulic fluids used in the control mechanisms on aeroplanes and cars. The tubing carrying the fluid is often exposed to low temperatures for shorter or longer periods with subsequent return to normal, and also to high temperatures. It is customary to reduce the excessive viscosity at low temperatures by addition of solvents and in this instance the troublesome behaviour, *i.e.*, excessive power required to actuate controls after prolonged exposure to low temperatures, continued after the maximum permissible reduction of viscosity by solvents.

The viscosity temperature curve of this sample when tested during progressive cooling is represented by the lower curve in Fig. 2, the direction of arrow indicating the direction of temperature variation. After being kept at −30°C. for 48 hours the viscosity curve was measured at slowly increasing temperature and the top curve obtained.

At about 20° C. both curves meet, and when the material was quickly cooled the bottom curve was again obtained. Storage of the sample for less than 24 hours produced intermediate viscosity temperature curves. A repeated test after keeping the sample for 48 hours at −30° C. produced the same top curve as before. Within the margin of error (about ± 1 per cent.) both curves are reproducible. The liquid remained clear to the naked eye all the time.

Liquids which have no definite freezing or melting point exhibit, mostly well above the expected transition point, peculiar viscosity temperature curves. This is, obviously, one of the reasons why arbitrary methods for the determination of melting point, dropping point, setting point, or point of congelation have a relatively poor degree of reproducibility.

REFERENCES.

[1] STEINER, *Chemical Age*, 1944, *50*, 388.
[2] STEINER, *Engineering*, 1936, 659.
[3] STEINER, *Paint Manufacture*, 1941, *11*, 185

Constant Voltage Transformers

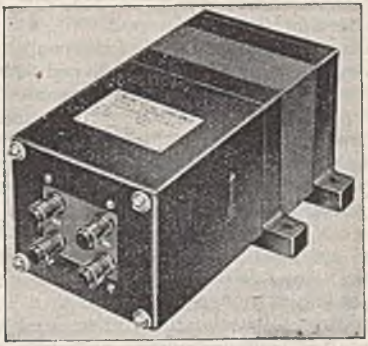
Advance Components, Ltd.

CONSTANT A.C. voltage is essential for the effective operation of many electrical devices. Instruments using light sources such as colour comparators, photometers, tintometers, and others using photocells cannot be employed for accurate measurements unless a highly stable voltage is available. Other instruments in daily use such as *p*H meters have a greatly improved performance when operated from constant voltage transformers.

Their design and manufacture in bulk has been successfully undertaken by Advance Components, Ltd., London, E.17. At present, standard sizes are available from 10 V.A. up to 150 V.A. and for operation on 50-cycle supplies only. Post-war models will include capacities up to at least 2 kVA and also three-phase transformers, and it is expected that a considerable reduction in size and weight will be possible.

The output voltage can be made to fall when the primary voltage rises. Generally, however, the essential requirement is that the voltage should remain constant at all times irrespective of changes in primary voltage or load. Part of the transformer operates at a high flux density, and this results in some distortion of the output voltage, the distortion being at a minimum when the primary voltage is low. For all ordinary purposes the wave-form distortion is unimportant.

It should be noted that the transformers are normally adjusted to give constant r.m.s. voltage, although they can be supplied to give constant average voltage if specially ordered. Owing to the distorted wave-form a voltmeter that is independent of frequency up to 500 cycles must be used to measure



"Advance" Voltage Transformer.

the output voltage. A thermal meter would be a suitable type.

The transformers are sensitive to the power factor of the load and for best results the load p.f. should be not less than 95 per cent. It is a simple matter to adjust this by the addition, when necessary, of a condenser of the appropriate value. They are also sensitive to changes in the supply frequency and hence cannot be operated from uncontrolled alternators. The output voltage changes roughly in the direction and proportion of the frequency shift for small variations about the nominal value. However, on the usual time-controlled supplies the performance is entirely satisfactory.

HULL CHEMISTS

The Hull Chemical and Engineering Society announces its intention to resume normal activities which were suspended at the outbreak of war. A general meeting will be held at the Church Institute, Albion Street, Hull, May 8, at 7.30 p.m. prompt, when a review of the present position of the Society and of its finances will be given; officers and committee will be elected for the session 1945-46. The committee recommend that meetings shall be held during the winter, on alternate Tuesdays, at 7.30 p.m. Accommodation has been provisionally reserved at the Church Institute, and a programme is in preparation. The first meeting will be held on October 2. A cordial invitation is extended to all engineers, chemists, engineers, and others interested in the study and practice of chemical and engineering science, to attend the general meeting.

High-Vacuum Pumping Unit

Large Selection of Towers Equipment

AMONG new apparatus recently produced by J. W. Towers & Co., Ltd., of Widnes, Manchester and Liverpool, is a high-vacuum pumping unit, designed to meet requirements of the modern organic and physical chemist (Fig. 1). The unit is a compact portable outfit incorporating a quartz three-stage mercury-vapour diffusion pump, a short form double McLeod gauge, two traps for cooling with solid CO_2 or liquid air, a drying vessel, a simple differential manometer, and the necessary high-vacuum stopcocks. It is mounted on a stainless steel framework, bolted to a heavy hard asbestos baseboard. When used with a suitable packing pump, and with the liquid air traps in use, the ultimate vacuum attainable is better than 10^{-6} mm. of mercury.

The Towers new portable laboratory hot-plate provides a small portable heat source which is both flame-proof and drip-proof. A difficulty in making electrically-heated hot-plates is the prevention of sparking in the three-heat switch; this is overcome by designing a novel switch three-pin plug

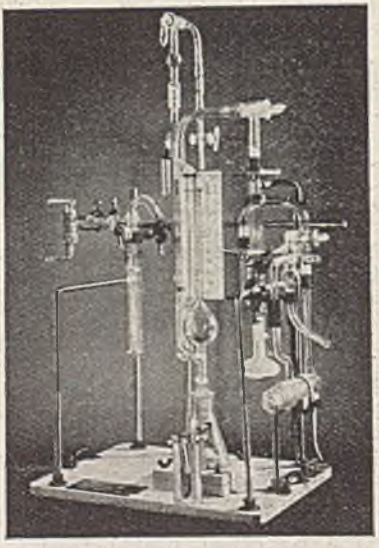


Fig. 1. Towers High-Vacuum Pumping Unit will produce a vacuum of a millionth of a millimetre of mercury.

unit, thus removing the three-heat switch some distance from the hot-plate itself. A polished heat reflector and non-conducting hard asbestos casing on the under-side give a high thermal efficiency with the result that a 400-watt element suffices for all general laboratory purposes.

The company's fractional distillation unit places an instrument at the disposal of the chemist which embodies the latest developments in distillation technique. It is designed for fractional distillation of liquids at atmospheric and reduced pressures.

Fig. 2. The Towers Fractional Distillation Unit.

Made entirely of Pyrex glass, it is fitted with standard interchangeable joints. The column has a high-efficiency packing of single-turn Pyrex glass helices, and is fitted with a double-walled glass heater jacket, wound with Nichrome tape, ensuring reasonable adiabatic conditions, and permitting full view of the column during operation. The still-head is of simple total condensation type, with variable take-off and reflux ratio control and measurements. The unit is supplied with all accessories and instructions (Fig. 2).

The sliding-weight type of balance has long been recognised as most convenient for rough weighing in the laboratory, and the introduction of Model No. 5 (Fig. 3) will

therefore be of interest to many chemists. It is a strongly built bench scale, sensitive to 1/10 g., and fitted with two scales and the appropriate rider weights. One scale reading 0-10 g. in 1/10 g., and the other 0-200 g. in 10 g. Weights are therefore unnecessary when weighing up to 210 g. Stainless steel pans (6 in. diameter) are fitted. Two sizes are available, one

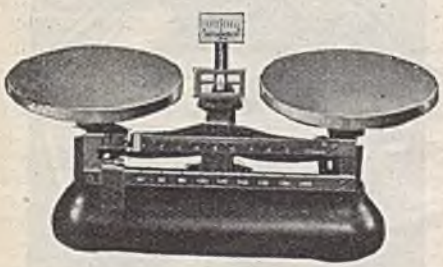


Fig. 3. Small weights are not needed with the Towers Sliding Weight Balance.

with a carrying capacity of 1 kg., and the other for weighing up to 2 kg.

A sensitive and reliable analytical balance is essential in every laboratory and the Towers Model 55 and 75 balances are being made in increased quantities to meet the large demand for the replacement of obsolete and worn-out balances.

The firm has recently resumed the publication of their *Towers' Laboratory News*, describing new and interesting laboratory equipment. A copy of No. 1 (new series) can be obtained on application to the company.

A Micro Balance

Oertling's Interesting Model

THE most interesting new product of L. Oertling, Ltd., London, is their Microchemical Balance No. 63 PB, giving readings to 0.001 mg. without estimation, the capacity being 10 g. Ease of reading is readily assured by an illuminated scale. It is much more independent of conditions than the continental types sometimes used hitherto in this country.

The case has a hinged back, for easy cleaning. The beam is 5 in. in length, made from nickel chromium sheet. It has a separate coplanar rider bar. The beam is protected from convection currents and dust by separating it from the rest of the balance chamber by a sheet of glass.

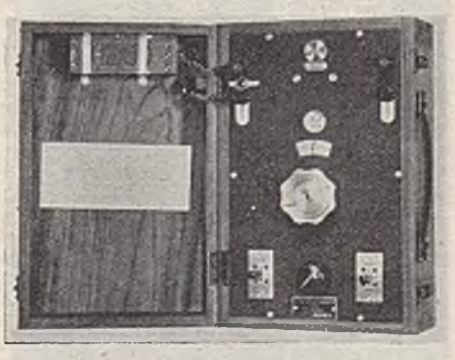
The Nottingham Thermometer Company

Wide Range of Apparatus

THE Nottingham Thermometer Co., Ltd., Nottingham, are established manufacturers of industrial thermometers, whether glass-in-metal, vapour-pressure dial types with rigid stems or flexible capillary, as well as electrical indicators and recorders.

Their pyrometers and recorders give a permanent temperature and time record and aid in determining the most desirable conditions in heating operations. It has a daily chart which is convenient for filing, and can be supplied with resistance thermometers for refrigeration and for recording temperatures of constant temperature baths. The company's indicating controller is used for the automatic control of gas-fired and electric muffle furnaces with suitable motorised valves and contactor gear, while their surface pyrometers play a large part in temperature measurement in the plastic industry.

For the precise measurement of temperature both in laboratory and in works, the potentiometric pyrometer is ideal. It reads true temperature and, while retaining the accuracy of a potentiometer, eliminates the need to refer to tables of constants and correcting for cold junction temperatures. It is simple to operate and of robust construction (*see* illustration below).



Single or Double Range Portable Potentiometric Pyrometer.

Other work is in connection with the national milk scheme, and the company have designed up-to-date models of incubators, hot-air sterilising ovens, autoclaves, steamers, and Gerber machines.

New Scientific Glassware

Two Pyrex Models

THE makers of the well-known "Pyrex" scientific glassware, Messrs. A. Jobling & Co., Ltd., Sunderland, have supplied many special types of assembly apparatus for certain specific processes. A typical example is a recently constructed reflux distillation apparatus which has been used in the production of a valuable chemical. It is supplied in batteries of four (with an additional unit as reserve) and is made up partly from standard fittings and partly from specially fabricated fittings (*see* illustration).

Pyrex Reflux Distillation Apparatus.

A particular new form of glass laboratory vessel is the company's spheroid-shaped desiccator which has been designed in collaboration with the B.L.W.A. to replace the older type of flat-shaped vessel, which was liable to collapse under conditions of high vacuum. As the illustration shows, it has

Pyrex Desiccator.

a specially designed stopcock, which can be easily turned under high vacuum, while an arrow indicates "open" position.

O.C.C.A. London Section

Annual Meeting

AT the annual meeting of the London section of the Oil and Colour Chemists' Association, held at Manson House, 26 Portland Place, London, W.1, on April 20, MR. R. J. LEDWITH was unanimously and with acclamation elected as chairman of the section for the ensuing year in succession to Mr. N. A. Bennett, and high tributes were paid both to his professional and human qualities. The following officials were re-elected: 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. MESSRS. A. G. COLLINGS, J. L. HAWKEY, and C. MONTAGUE SMITH were elected to the committee.

There followed a lengthy discussion on the reconstitution of the Association's Council, sections having been asked to vote upon a resolution, in order to give the Council guidance. Ultimately, the meeting passed a resolution that the Association shall be governed by a Council consisting of the president, not more than five vice-presidents, the chairman of each local section, six members elected by the association, the hon. treasurer, the hon. secretary, the hon. auditor, the research and development officer, and the immediate past-president.

Determination of Sulphur in Steel

New Apparatus by Griffin and Tatlock

METALLURGISTS will be specially interested to read about a new apparatus for the rapid determination, by combustion, in about four minutes, of sulphur in iron, steel, and ferrous and non-ferrous alloys, produced by Griffin and Tatlock, Ltd., London, W.C.2.

The gravimetric method, in which the sulphur is precipitated as $BaSO_4$, and weighed after ignition, gives satisfactory results in the hands of competent chemists. However, adsorption errors may occur and the procedure is frequently complicated by the presence of alloying elements such as titanium and phosphorus. Where rapid results are required the many hours necessary for a determination make the method unsuited for routine work.

Volumetric and Combustion Methods

In the volumetric (evolution) method the sample is treated with HCl, and the sulphur is liberated as H_2S, which is bubbled through a solution of a cadmium salt to yield a precipitate of cadmium sulphide. Iodine is then added and the excess titrated with sodium thiosulphate. This method has been widely used on account of its greater speed; but results on cast irons and alloy steels are usually low, and some steels, particularly those high in carbon or sulphur, may not yield all their sulphur as H_2S on distillation. While some improvement may be obtained by annealing the drillings at 700-800° C. before analysis, this procedure is of doubtful value and the results generally remain below the true sulphur content of the material. The present trend, both in this country and in America, in view of its still greater speed and far higher accuracy, is for the evolution method to be superseded by the combustion method.

The combustion method has recently been improved and is confidently recommended as an accurate method which is the most rapid available at the present time. It is particularly valuable for use with alloy steels. The drillings are introduced, in a special porcelain combustion boat, into a tube furnace maintained at 1250-1350° C., and are burnt in oxygen at a rate of flow regulated between prescribed limits. Titration has so far presented the main difficulty in this method. This is, however, completely overcome in the G. & T. Sulphur-in-Steel apparatus by the application of a potentiometric finish to the titration, using an auxiliary electrode and a galvanometer having an illuminated spot clearly visible in all lights. The end-point thus does not rely on the colour determination of the observer but on the movement across a scale of a hair-line shadow on a bright, circular spot. A sharp and unmistakable end-point is obtained and the determination can now confidently be carried out by junior staff after some instruction. Indeed, a complete sulphur determination by this method requires about four minutes. These conveniences well justify the use of rather more complex apparatus.

The apparatus is assembled on a tubular welded metal stand of modern design eminently suited for the works laboratory. It accommodates a galvanometer, a reversible sand glass for timing the combustion, a H_2O_2 bubbler connected by a salt bridge with sintered glass discs to an auxiliary electrode, a microburette with automatic zero and reservoir, and a special stopcock with four arms and two pairs of 90 deg. bores for ease in sending the oxygen either through the combustion tube or directly (for stirring) into the absorption vessel. Combustion covers are now available, to prevent molten oxides, spattered by the vigorous reaction, from reaching the walls of the combustion tube and so reducing its effective diameter. The apparatus has been successfully applied to the determination of sulphur in iron, steel and ferro-alloys over the range 0.008 to 0.4 per cent. with an accuracy about ± 5 per cent. It has also been used for the estimation of sulphur in sulphide- and sulphate-containing ores such as magnetite, micaceous iron ore, manganese ores, etc., and may be suitable for materials such as coal, coke and oils. By adoption of a combustion technique recently described by Holler and Yeager in *Foundry* (1944, *72*, 83) the apparatus will probably be found applicable to the determination of sulphur in brass, bronze, cupro-nickel, Monel metal, and other non-ferrous metals.

Novel Vibratory Ball Mill

The G. & T. Vibratory Ball Mill represents a new design for use in rapid grinding to a fine powder and will be a welcome addition to the small selection available of grinding apparatus specially designed for laboratory use. Ball mills normally rumble on their own axis so that the balls "cascade." The balls, by friction between themselves, and by falling under the action of gravity, eventually reduce the material in the interstices to powder.

In the new design the pot does not rotate on its axis. Its distinguishing feature is the suspension of the pot cradle on stout steel springs, and the provision, inside the cradle housing, of an adjustable out-of-balance weight coupled, through a flexible bearing, to the motor shaft. By the com-

bination of rotary and vibratory motion, the axis of the mill is caused to trace out a cylindrical path, so that every point on the circumference of the pot moves in a small circle, whose centre is the position of the point when the pot is at rest. The balls then execute, not only the customary cascading motion, but, as the frequency of vibration is high (1425 r.p.m.), balls near the surface of the tumbling heap are projected, and, moving with some velocity, strike the opposite face of the pot. Disintegration of the larger particles at the point of impact takes place, while the general grinding action proceeds among the cascading balls. The effect may be visualised as giving power assistance to the falling balls, which increases the force of impact and brings about more rapid and complete disintegration. Depending upon the hardness of the material and the time of grinding, the product may be reduced to 300-mesh or finer. The amount of material for a charge depends on the density of the solid and may be up to about 250 g. The mill has been successfully applied to the reduction of tungsten ores, rutile, ilmenite, coke, coal, boiler scale, slag, etc.

Determination of Benzol and Toluene

The importance of strategically valuable materials, such as toluene, benzol and phenol, has led to the development of rapid and convenient methods for their estimation by the manufacturing industries. For the determination of these substances, fractional distillation and cryoscopic apparatus, particularly for use in the gas, coke-oven and plastics industries, has also been designed by Griffin & Tatlock.

Toluene in benzol, controlled to a maximum of 2 per cent., is estimated by accurate fractional distillation, followed by a determination of toluene in the toluol fraction. The separation can be made in a number of fractionating columns. The G.L.1 (Government Laboratory) column, statutorily prescribed for the purpose, is designed for the examination of these low gravity spirits, which contain substantial proportions of paraffins and smaller amounts of olefines. This apparatus incorporates a continuous wire spiral packing in a tube provided with a reflux head, the column being surrounded by an air jacket.

The G.L.C.C.3 (Gas Light & Coke Co.) column, a more robust apparatus, is fitted with a Dufton type spiral and is equal to 3 or 4 theoretical plates. Three types of condenser are available for either water cooling, or simple air cooling, or water cooling with facilities for gas collection.

The toluene content of the fraction distilling over between 97.6° C. and 126.7° C., which is kept separate, is obtained from specific-gravity and/or refractive-index measurements by reference to tables. An inexpensive portable refractometer has been developed for this purpose. For many purposes the result thus obtained is sufficiently accurate, but where a greater degree of accuracy is required, the toluene fraction is nitrated in a Manning-Shepherd apparatus and the trinitrotoluene is extracted and weighed.

The G.L.2 Column

Phenol and metacresol in mixtures of phenol with cresols and/or xylenols, with or without water, pitch and other impurities as met with in commercial products, are determined by distillation in an apparatus known as the G.L.2 column, utilising a continuous wire spiral packing in a tube radiation-shielded with aluminium foil, and surrounded by an air jacket lagged with asbestos string. A draught screen surrounds the flask, the heat input to which is precisely regulated by a gas governor with graduated fine-control cock.

Benzol in gas is estimated in an improved form of the St. Clair Deville apparatus by measuring the condensate obtained by passing the gas through a vessel immersed in a freezing mixture of solid carbon dioxide and acetone. This apparatus is normally supplied in a light wooden frame, but a convenient transportable case is available, holding two sets of apparatus and designed for use in any part of the works where a test may be required. Lastly, tar-fog determinations are required more frequently at the present time in connection with the causes of sludging of benzol-absorbing oils at both gas works and coke ovens.

TEXTILE EQUIPMENT

Testing equipment, made by Reynolds & Branson, Ltd., Leeds, chiefly for industrial laboratories of textile manufacturers, can also advantageously be applied to other manufactured goods such as foodstuffs, tobacco, paper, leather, etc., and any industry in which the production of hygroscopic material is concerned.

The Wool Industries Research Association are the designers of the humidity control, rapid regain apparatus, *p*H meter and projection microscope, and with their approval improvements gained from experience under actual industrial use have been incorporated in the present models.

The United States Office of Marketing Services, War Food Administration, Washington, has compiled a 353-page mimeographed book entitled "Selected References on Yeast," edited by C. D. Stephany and Harry W. von Loesecke. The publication contains a subject index and a list of journals.

New X-Ray Diffraction Apparatus

An Integral Unit by Philips

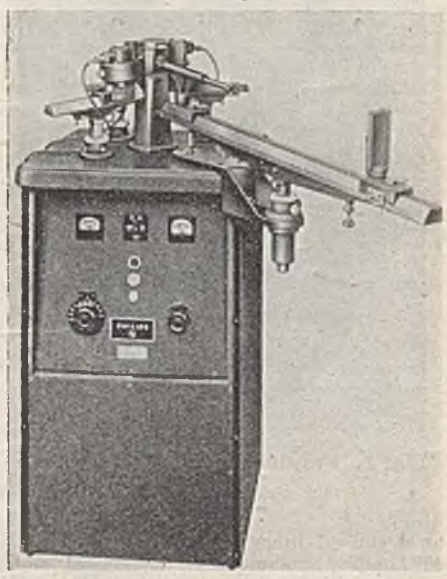
THIS apparatus (type 41D), has been developed so that it may meet the requirements of both university and industrial laboratories. As the illustration shows, the various components form an integral, self-contained unit. In the base of the cabinet is housed the high tension generator (including the tube filament transformer), from which full-wave rectified high tension is fed to the cathode of the X-ray tube, a circuit consisting of a centre earthed transformer and two oil-immersed rectifying valves being employed.

The control panel, mounted on the front of the cabinet, conveniently sloped, and indirectly illuminated, allows stepless variation, from 10 to 60 kVp, of the high tension, the value of the latter being read directly. The filament current, which is stabilised, is governed by a control permitting accurate regulation of the tube current, read on a 0-5 mA. meter. In addition, the control table incorporates a main switch, overload circuit breaker, press-button H.T. switch, pilot light and an hour meter (10,000 hours and reading to 1/10 hour) for recording exposures and tube life.

Convenient Tube Housing

The top of the cabinet is formed from an accurately machined iron casting, which provides a flat instrument surface right up to the tube housing. The latter is constructed from a beaded bronze casting, providing complete X-ray protection, and accurately machined, so that every tube inserted takes up precisely the same position. This means (since the tubes themselves are also accurately constructed) that the necessity for realignment of cameras is eliminated. The four window faces are machined to an angle of 6 deg. to the vertical (to correspond with the angle of emergence of the maximum X-ray beam) and provided with four tapped holes so that, if desired, special devices, *e.g.*, monochromators, can be semi-permanently and rigidly accommodated. A rotatable disc carrying the necessary filters is built into each window housing so that the appropriate filter can be immediately brought into position. The main tube support and the window housings are water-cooled to avoid any drift of the X-ray beam due to thermal variations during long exposures.

The X-ray tubes have four windows of Lindemann glass, the thickness of which is kept to a close tolerance, thus ensuring maximum and constant output. The focus, which is located very precisely with respect to the tube housing, is 12 × 1.2 mm. so that by taking off at an angle of 6 deg (*see* above) the effective focus is 1.2 mm². The internal construction of the cathode assembly ensures that the radiation is uncontaminated. Target materials of W, Mo, Cu, Fe, Co, and Cr are available. The maximum continuous ratings are 1000 watts for W, Mo, and Cu, and 600 watts for Fe, Co, and Cr. The tubes are inserted in the housing and secured by four screws, the water and electrical connections being automatically made; tubes can be changed in a matter of minutes. The water-cooling



system for the tube, window housings, and H.T. generator, is automatically switched on and off, and a protective relay shuts off the apparatus the moment the water pressures gets too low or too high.

A wide selection of accessory equipment is also available. Precision optical type camera tracks of various lengths, complete with all necessary adjustments and locking devices, can be fixed to the instrument table. These tracks will accommodate the following cameras: powder cameras of either 57.3 or 114.59 mm. effective diameter; flat-film camera, which can be adapted for recording either "transmission" or "back-reflection" photographs; low-angle camera, with which X-ray reflections at angles to within five minutes of the direct beam can be recorded; precision "back-reflection" focussing camera, and a Weissenberg camera of diameter 57.3 mm. fitted with all necessary movements and attachments, including a goniometer head. Four power sockets conveniently located on the cabinet are provided for driving the motors, etc.

Equipment for Laboratory and Industry

Baird and Tatlock's New Models

NEW types of centrifuge, designed by Baird & Tatlock (London), Ltd., include an angle centrifuge with a maximum speed of 5000 to 6000 r.p.m. The model (XDC.1133) has a head of spun brass, nickel plated and holds either 4 cylindrical

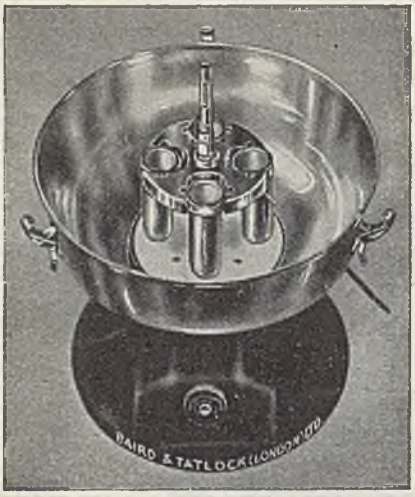


Fig. 1. Empire Universal Centrifuge Mark II.

or 4 conical tubes to work at an angle of 48° or 28°, mounted on a vertical motor with a built-in rheostat with "off" position. The large base is fitted with vibration-absorbing rubber feet, making for stability and vibrationless running.

The company's Empire Universal Centrifuge, Mark II, which was originally designed some years ago as a universal machine suitable for use with interchangeable heads and buckets, has now been completely redesigned (Fig. 1). The accurately tapered spindle which ensures correct alignment of heads has been retained and additions have been made to the range of heads and buckets. The machine now consists of an exceptionally heavy cast-iron base of large diameter which houses the motor and controlling rheostat. The bowl and lift-off domed lid are of nickel-plated copper, the lid being secured by three toggle-type clips. The motor, specially designed and built for this centrifuge, is of the highest grade and equipped with three grease-packed radial and thrust ball bearings. The rheostat, controlled by a knob accessibly situated in the front, is of the rotary type and incorporates a toggle switch which is actuated in the "off" position.

Humidity Conditioning Ovens

A considerable number of the B.T.L. humidity conditioning ovens are now in use in research and industrial laboratories. They operate on the principle described originally by J. Obermuller (*Z. Physikal Chem.*, 1923, *109*, 145), that is, air circulation over the saturated solution of a particular salt, and high or low humidity figures from room temperature up to nearly 100°C., can thus be readily obtained.

The improved apparatus, illustrated in Fig. 2, does not differ greatly in essential features from the original model, but the disposition of the heaters and the thermo-regulator has been rearranged to give optimum control, and the outer casing carrying the electrical wiring and switches has been redesigned, all extraneous projections being eliminated, and the controls grouped together on a single flat panel. This not only leads to greater ease and efficiency in working, but also allows a smooth exterior finish ensuring the maximum freedom from dust deposits. A further minor improvement is the swinging of the door from the left-hand side; thus material held in the right hand can be more conveniently introduced into the oven.

A utility still, shown in Fig. 3, has been constructed by B.T.L. to meet the war-time demand for economy in materials and workmanship; at the same time, the model lacks nothing of the necessary refinements to turn

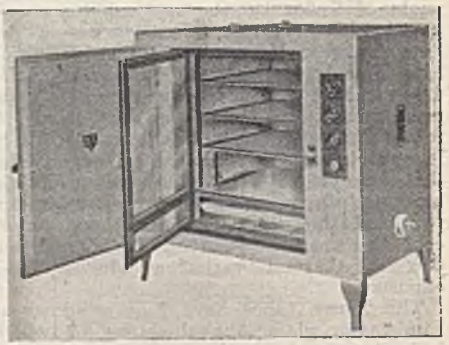


Fig. 2. Humidity Conditioning Oven.

out as good a quality of distilled water as may be obtained from a still of tinned copper construction. Originally designed for use on a Primus or Monitor burner, it may

be heated by any convenient ring burner or a $\frac{5}{8}$ in. Bunsen; it may also be fitted with an electric immersion heater of 1000 watts capacity. The output is up to 2 litres per hour on gas or 1.5 litres with the electric heater; a simple but efficient baffle is incorporated and the distillate is free from chloride and has a *p*H value of 5.5. A flat lid is provided which may be used as a hot-plate while the still is in operation, and a set of rings up to 7-in. diameter is available for using the boiler as a water bath, when the lid carrying the condenser has been removed.

With regard to balances produced by this concern, reference should be made to their heavy capacity balance, which has been modified to meet the special requirement of glass-graduating and standards departments. The pillar has been lengthened to give sufficient head space above the scale pans (56.5 cm.) to accommodate any vessel up to the height of a 2-litre cylinder. The maximum load for this balance is approximately 3 kilograms and the accuracy is at least equal to that of the standard model.

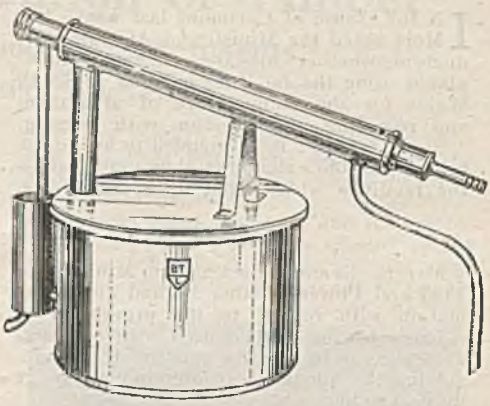


Fig. 3. Utility Still.

J.M.C. Developments

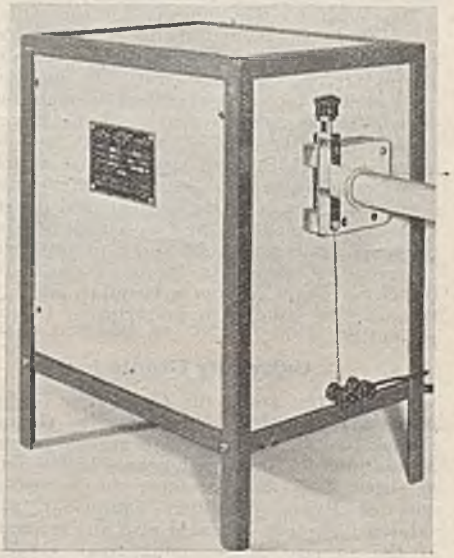
Laboratory Furnaces

TUBULAR laboratory furnaces with precious metal heating elements (produced by Johnson, Matthey & Co., Ltd., London), are being widely used for a variety of purposes. The range of standard sizes of tubes is from 9 in. to 20 in. in length and up to 2 in. diameter, the temperatures of operation being up to 1500°C. Surrounding the precious metal element is an efficiently lagged heat-insulating case which is carried by a vitreous enamelled steel frame (*see* illustration).

A new departure is the provision, on all standard tubular furnaces, of terminals for the ready connection of a butt-welded thermocouple, while all furnaces for determinations of sulphur and carbon in steels are now fitted with a combustion-tube clamp to facilitate the insertion or removal of the end stopper while the tube is hot. A further development is the introduction of modifications to the 2-in. diameter standard furnace, in the shape of gas attachments, inspection window and a special high duty element, to make it suitable for determinations of the fusion point of ash.

All furnaces have heavy-gauge low-voltage windings of a platinum alloy and there is now a complete range of control units for every type of application. These control units are arranged for either bench or wall mounting, and are entirely self-contained, incorporating a transformer, temperature regulator, relay, temperature indicator, main switch, fuses and pilot lamps. Temperature is controlled by the rotation of a single knob and all units are supplied ready for direct connection to the supply.

Platinum gauze electrodes used in electrochemical analysis suffer more from accidental damage and misuse than from their proper employment, and there has been a continuous effort on the part of manufacturers to obtain the greatest possible strength and rigidity while keeping the weight of platinum at a reasonably low figure.



J.M.C. Tubular Furnace.

Parliamentary Topics

Light Alloys Manufacture

In the House of Commons last week, Mr. Mort asked the Minister of Aircraft Production whether his Department contemplated using the facilities existing in South Wales for the manufacture of aluminium and re-rolling in connection with housing.

Sir S. Cripps: It is intended to use to the fullest possible extent for aluminium houses the facilities which exist in South Wales.

Silicosis

Mr. E. Granville asked the Minister of Fuel and Power whether he had any information with regard to the prevention of silicosis by the method used with considerable success in Canada and the U.S.A. involving the inhalation of aluminium powder by coal miners.

Major Lloyd George said the method was being considered by the Medical Research Council and by his medical advisers.

Penicillin

Colonel Lyons asked the Minister of Health to what extent penicillin was now procurable at the direction of a medical practitioner; and what facilities exist for its immediate availability when prescribed.

Mr. Willink: The scheme for the wider distribution of penicillin, to which I referred on March 8 (*see* The Chemical Age, March 17), is now in operation. Supplies of penicillin have been issued through the distributing centres to nearly all the larger hospitals in the country, and may be obtained, on request, by any hospital which has a suitable case. I regret that supplies do not yet permit of the unrestricted distribution of penicillin through chemists and the usual trade channels, and a practitioner who requires penicillin for a patient must therefore obtain it from a hospital, and not through the issue of a prescription to the patient.

University Grants

Mr. Harvey asked the Chancellor of the Exchequor whether the University Grants Committee, in making their recent recommendations for increased grants to the universities, took into account the increased cost of living, building, equipment and salaries; whether he could give any estimate of the anticipated percentage real increase in university grants after allowing for such factors; and to what extent such increase would permit expansion of university activities as opposed to meeting increased expenditure due only to the above-mentioned causes.

Sir J. Anderson: There are many factors of uncertainty which make it impossible to estimate with any accuracy what will be the financial needs of the universities during the transitional period between war and peace. It appeared to the University Grants Committee that it would be inadvisable to determine the amount of Exchequer grant for more than a short period ahead; and the amounts which the Government propose to devote to university purposes during the transitional period are not to be regarded as directly related to the cost of a long-term expansion. The grant may have to be further and substantially increased during the later part of the decade covered by the committee's review.

Potash Supplies

Mr. Jackson asked the Minister of Agriculture whether he would make supplies of continental potash available, in the near future, to British farmers.

Mr. Hudson: The position regarding supplies of potash from France is being investigated by the Minister of Supply, and it is expected that an appreciable quantity will be available as soon as transport conditions permit.

Scientific and Technical Appointments

Mr. R. Morgan asked the Minister of Labour what were the restrictions at present in force on the publication of advertisements for men and women possessing qualifications in various branches of science and technology; and whether, in view of the difficulties which they create for those who want to engage such staff, he would arrange for their early amendment.

Mr. Bevin: As stated in a White Paper (Cmd. 6568), it is proposed after the end of the war in Europe to replace existing control of engagement provisions by a single Control of Engagement Order. The details of this Order are still under consideration, but it will clearly be necessary to have control over advertisements addressed to persons within the scope of the Order.

In reply to a supplementary question, Mr. Bevin asked the House to remember that in the early days of the war industry was nearly brought to chaos by firms competing with each other with advertisements, the total result of which did not increase the national effort by a single unit of production.

Tasmania's mineral output in the year ended June 30, 1944, was £3,125,779 (£3,434,822). There were sharp falls in the production of copper, lead, scheelite, tin and zinc, but the output of wolfram increased, and important development programmes should result in an early increase in scheelite and tin. Production of coal reached a new high level with 146,409 tons, and resources of coal for domestic and steam purposes could be increased and maintained at a much higher level.

Chemical Preservation of Timber

The Control of Wood-Boring Insects

by RONALD C. FISHER, B.Sc., Ph.D.*

IN the past, little attention has been given in this country to the preservative treatment of timber for the express purpose of preventing infestation by wood-boring insects either in structural woodwork or in furniture. Various preparations have been developed, chiefly for application to timber already attacked, but simple and cheap preservative treatments have seldom been applied as preventives, no doubt because they did not appear necessary. Prevention is, however, always better than cure and, in the control of wood-boring insects, is usually by far the simpler task. In the following notes a brief outline is given of some of the problems involved, and of recent developments in the use of chemicals for preventing or dealing with infestations.

Different kinds of insects—beetles[1,2] are chiefly concerned—attack timber at various stages in its history: some infest standing trees, others the bark and wood of newly-felled logs, particularly in the tropics; others again breed in cut lumber on timber storage yards or in manufacturers' premises, attacking recently or partially dried stocks. There are still other species which do not make their appearance in timber until it has been in use for many years, built into some structure, or incorporated in furniture. The problems of preservative treatment are, therefore, concerned not only with green, *i.e.*, unseasoned, timber, but also with well-matured, dry wood, and they are further complicated by differing habits of the insects and differing modes of attack. It will be evident that as complete a knowledge as possible of the life-history and general biology of the various wood-borers is an essential preliminary to the successful application of any method of control whether by the use of chemicals or by other means. This is where the biological investigations of the entomologist provide the fundamental knowledge upon which the development of new methods must depend. These points can best be illustrated by dealing in turn with some of the principal insect pests of timber and the materials now being used for their destruction and control.

Pinhole Borers

These beetles (*Platypodidæ* and *Scolytidæ*) are particularly important in tropical countries, where their borings cause extensive degrade of many timbers. They attack newly-felled logs—some timbers being more susceptible to infestation than others—boring their way through the bark to the sapwood and sometimes penetrating deeply into the heartwood. Although the insects die when the logs are converted and the timber dries, the appearance of the wood and its use for certain purposes are seriously affected by the numerous holes which remain and are often associated with extensive staining (Fig. 1).

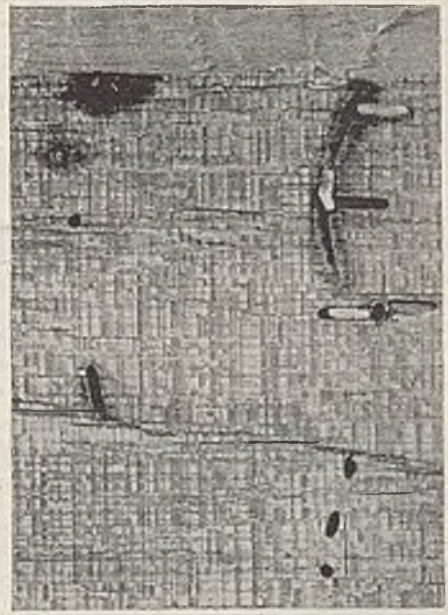


Fig. 1. Pinhole borer damage in a tropical hardwood (nat. size).

The problem here is to find a cheap chemical treatment which can be applied easily to the surface of the logs immediately after felling to prevent the entry of the insects. These do not necessarily feed as they bore their way into the wood, so that a contact poison or repellent which will remain sufficiently long on the surface of the logs offers the only possibility of control by chemical means. After many years of experiment, Craighead[3] of the U.S. Bureau of Entomology failed to find any satisfactory repellent and concluded that a good grade of coal-tar creosote thoroughly sprayed on the bark to reach all crevices was as satisfactory as any chemical investigated, but even such a treatment was ineffective when the beetles were very abundant and the weather very wet. The problem has been reinvestigated recently

* Officer-in-charge, Entomology Section, Forest Products Research Laboratory, Department of Scientific and Industrial Research.

in the United States by Christian[9] who, after testing a long series of substances, found only the following three which offered some prospect of success and were worthy of further trial for the prevention of pinhole borer attack and at the same time were effective against sap-staining fungi:—

p-tert-butylphenoxyethanol	25 per cent.
kerosene	75 per cent.
p-chlorphenoxyethyl chloride	25 per cent.
kerosene	75 per cent.
o-nitrodiphenyl	25 per cent.
benzol	75 per cent.

Other materials have since been suggested, and a recent U.S. patent[5] concerns the use of an alkoxypolychlorobenzene, such as butoxypentachlorobenzene, used suitably in solution or as an aqueous emulsion for treating green logs and green lumber. So far as is known, however, a practical solution of the problem which would have a wide application in the tropics by the use of an easily available cheap product, adequately tested for its efficiency, has not yet been found.

Powder-Post Beetles

Insects belonging to this group (*Bostrychidæ* and *Lyctidæ*) are among the most important wood-borers attacking the sapwood of partly and recently-seasoned stocks of timber, chiefly hardwoods in this country, (Fig. 2); stores of partly manufactured products such as implement handles or tent pins, veneers, furniture, and other goods made of susceptible timbers or bamboo. Damage is widespread and occurs in temperate as well

Fig. 2. Damage by *Lyctus* powder-post beetles in the sapwood of oak (½ nat. size).

as tropical countries. The well-known *Lyctus* powder-post beetles are included in this group and, together with related species, are at present particularly important as liable to cause serious deterioration of stores of military equipment in India and the Far East, unless control measures are applied.

Considerable attention has been given in different countries to chemical treatments for preventing infestation. Two methods of approach have been tried; one, by the treatment of green timber with a water-soluble salt immediately after cutting from the log, in order to protect the wood from subsequent infestation during seasoning, conversion, and manufacture; the other, by the treatment of seasoned stock or finished goods at the time of manufacture with a preservative usually of the oil-soluble type. The former is the better procedure and its application has been developed successfully on a commercial scale in Australia for the prevention of damage by *Lyctus* spp. in timbers with a wide zone of sapwood which in the past had to be discarded because of its susceptibility to infestation by these insects. By the use of hot diffusion treatments of green timber in aqueous solutions of boric acid at concentrations varying from 2 to 16 per cent., veneers[11] and solid timber[15] can be impregnated with the preservative in sufficient strength (0.14 to 0.2 per cent. based on moisture-free weight of wood) to render the timber immune from attack. Schedules of treatment, including the times necessary to give adequate penetration of boric acid in the required concentration, according to different strengths of solution and for timbers of varying densities, have been published[15]: the process for the treatment of veneers is covered by an Australian patent. This type of treatment is of special value in countries producing timbers suitable for veneers and plywood, but with a high proportion of sapwood liable to severe damage by powder-post beetles. The treatment is not recommended for wood to be exposed to conditions under which the water-soluble salt would be removed by leaching through exposure to rain or by contact with the soil.

A similar, but less elaborate type of treatment is applicable for the prevention of *Lyctus* attack in this and other countries where the amount of sapwood in native timbers and the demand for protection against risk of attack have not so far justified the expense of complete impregnation. Experiments at the Forest Products Research Laboratory, Princes Risborough, have shown that a one-minute dipping treatment of green oak and elm straight from the saw in a 5 per cent. solution at 180° F., will effectively prevent *Lyctus* infestation during subsequent drying and storage. The penetration of the preservative obtained by such a short treatment is only superficial and is removed by planing and working, but it is sufficient to protect the timber on storage premises where much of the *Lyctus* trouble originates. This treatment is also recommended in the U.S., where it is regarded as one of the cheapest and simplest remedies against *Lyctus* and has the additional advantage of being an effective sap-stain preventive.[10]

Where superficial discoloration of rough wood is immaterial, a mixture of creosote and fuel oil in equal proportions, or one part of creosote in four parts of fuel oil; or, alternatively, a coating of lime wash, have recently been found effective in India[11] as giving at least temporary protection against powder-post beetles. These treatments have been tried out and proved satisfactory for replacing standard methods of preservation for which plant and materials are not at present available. It is recommended that such treatments be given within as short a period as possible after felling and sawing, as they are intended to prevent attack and are not effective for eradicating infestation already present.

The preservative treatment of seasoned timber is not so simple. Superficial applications of water-soluble salts are not sufficient, and the more costly impregnation

Fig. 3. Death-watch beetles on the surface of an infected oak beam (approx. nat. size).

processes are required if these materials are to be used.[4] Preservatives of the solvent type are more effective when applied superficially, but their use on a large scale is usually restricted by their cost. A mixture recommended in the U.S. for the prevention of *Lyctus* attack in seasoned timber consists of a 3 per cent. solution of pentachlorphenol[9], [16] in 98 per cent. light fuel oil

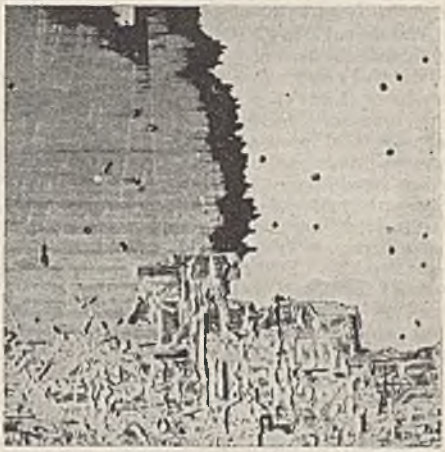


Fig. 4. Birch plywood infested by the common furniture beetle; extent of attack revealed by removal of surface coating of paint.

of the kerosene type. A ten-second dipping treatment in this preservative at ordinary temperatures of about 20° C. is stated to be effective. Other materials, such as chlorinated naphthalenes, metallic naphthenates, or colourless creosote derivatives can be used to give a clean treatment not affecting the appearance of the timber, but these materials are generally too costly for application on a large scale to rough timber in storage yards.

Apart from the use of toxic or repellent chemicals to make timber distasteful to *Lyctus*, damage can be prevented, particularly in manufactured goods, by any treatment or type of finish which will fill up the wood pores within which the insect lays its eggs and starts infestation.

Furniture Beetles

The common furniture beetle, *Anobium punctatum*, which infests the sapwood of structural timbers as well as furniture and plywood, and the death-watch beetle, *Xestobium rufovillosum*, well known for its ravages in roofing timbers, chiefly oak (Fig. 3), of old buildings, are the two most important wood-borers in this group (*Anobiidæ*) but they do not usually cause trouble until the timber has been in use for many years. It is understandable that preservative treatment of timber for prevention of attack by these insects has hitherto rarely been carried out, no doubt partly because the appearance of worm holes in old wood or furniture was regarded as inevitable, and indeed desirable as proof of antiquity. Infestation by the

death-watch beetle can, to a great extent, be prevented by structural precautions to avoid the risk of fungal decay with which attack by this insect is closely associated. Moreover, provided that sapwood is eliminated, preservative treatment of oak is unnecessary.

The damage to softwood structural timbers from which sapwood cannot be completely eliminated, and the serious disintegration of plywood (Fig. 4) and panelling, caused by the common furniture beetle warrant consideration of preventive treatments. At the present time no such treatments are being given nor have the most suitable and cheapest materials for the purpose been determined, although attention has recently been given to this matter by workers in Germany[17]. For rough structural timbers where discoloration is of little importance, creosote or creosote derivatives are suitable, even applied superficially, but for permanent protection impregnation methods of application are desirable. For the treatment of decorative woodwork, including plywood and panelling, impregnation with water-soluble salts such as borax, zinc chloride, or sodium fluoride at the time of manufacture is suitable. Records of damage by *Anobium* in plywood made up with different types of adhesive suggest, although not yet proved by experiment, that the presence of glues of animal origin favours the rapid development of the insect. Incorporation of a toxic chemical, possibly in very small amounts, is worthy of consideration as a means of counteracting any special nutritive value of these types of adhesive for the insect, as well as of preventing deterioration of the glue line by the action of micro organisms.

Treatment of Infested Woodwork

In the preceding remarks, stress has been laid on methods of preventing attack as the most satisfactory means of dealing with infestation by wood-borers, but remedial measures—how to eradicate insects already present—may often be of more immediate importance. The destruction of insects working at depths within timber, by means of surface applications of insecticides, is a difficult and slow process, involving repeated treatments often over a period of years. There are many chemicals which will destroy insects once they can be reached, but penetration of such substances into wood presents the main difficulty. Some materials which are good insecticides possess properties which restrict their use—a strong and persistent smell, for example, or they may be in some respect harmful to man. Amongst the most effective chemicals with good penetrating powers is *o*-dichlorobenzene which has in the past been used alone or in combination with other materials for the treatment of insect-attacked wood in buildings and furniture. Being highly volatile, however, its preservative value is slight, but in combination with more permanent substances, pentachlorphenol, for example, it would give a type of mixture effective not only as an insecticide, but also as a preservative, provided that precautions are taken during its application, particularly in confined spaces, to protect operators from the toxic effects of the fumes of *o*-dichlorobenzene. Metallic naphthenates have been used extensively in this connection, and there are, in addition, numerous proprietary preparations on the market which are suitable for general use; but little information is available as to how long any of these materials retain their efficacy when applied superficially to infested woodwork by brush or spray.

The use of a liquid insecticide may sometimes be impracticable because of the risk of causing damage to the article to be treated —a violin, for instance, or a valuable painted panel. In such cases, fumigation is the only alternative. Hydrocyanic acid gas has been used successfully for this purpose, not only in the treatment of furniture in a specially constructed fumigation chamber, but also for the destruction of the common furniture beetle in panelling in buildings, and of *Lyctus* powder-post beetles in packing cases on storage premises. When conditions are suitable—and this is not always the case so far as buildings are concerned—this method of control is more reliable than insecticide treatment and, properly carried out, it can be completely effective in a single dosage. It has the disadvantage, however, that reinfestation is not prevented and that it can be applied only by experts accustomed to handling this extremely poisonous gas. In spite of these drawbacks, fumigation with HCN or other fumigant as a means of dealing with infestation by wood-boring insects is likely to have an extended use in the future.

Prevention of Termite Attack

A problem which is of particular interest at the present time concerns the treatment[18] of service equipment, including wooden materials, to prevent deterioration from mould, decay, and termite attack in the tropics; it is also of general interest to manufacturers in this country making furniture or other goods for export after the war to countries in which termites (white ants) are serious pests. While a great deal can be done by proper construction of buildings to protect them and their contents from infestation by subterranean species, which constitute the most important and widely distributed group of these insects, timber treated with wood preservatives may sometimes be essential, particularly in countries where dry wood termites cause serious damage. The type of preservative suitable for the prevention of termite attack, and the methods of application, depend to a large extent upon the situations in which the timber is likely to be used. For wood which

will be in contact with the ground—in the foundations of buildings, sleepers, telegraph poles, fence posts, etc.—tests in different parts of the world have shown that coal-tar creosote applied under pressure is the most effective preservative. When creosote is unsuitable, other materials which have been recommended as alternatives include preservatives containing arsenic, and solutions of chlorinated phenols in light fuel oils, recently shown from work in the U.S.[18] to be effective even under outdoor conditions. Metallic naphthenates[5], in particular copper naphthenate, are being increasingly used for the prevention of termite damage to timber and textiles and for the preservation of cellulose materials in general, against deterioration through fungal decay and micro-organisms[6]. Whatever preservative is used, complete protection against termite attack over a period of years is unlikely to be obtained unless applied by impregnation methods, preferably under pressure. Non-pressure treatments—dipping, brushing, or spraying—give temporary protection only.

For timber which is not to be in contact with the ground, for interior woodwork and furniture, the choice of suitable preservatives is wider. Arsenicals are again among the most effective, but their use may sometimes be inadvisable, particularly where there is danger of contaminating food or under moist conditions in buildings where there is risk of mould growth on treated timber giving rise to toxic gases. Pentachlorphenol applied by non-pressure methods in a light petroleum oil is specially suitable for indoor use; the wood is left clean after treatment and can be painted or finished as desired. Recent work[19] in the West Indies has demonstrated the toxic and repellent value of even brush applications of aqueous solutions of inorganic salts, such as copper sulphate, and zinc or barium chloride, for the protection of interior woodwork against attack by the dry wood termite, *Cryptotermes brevis*. Impregnation under pressure with 2 to 5 per cent. solutions of zinc chloride or sodium fluoride has long been recommended as a suitable treatment for indoor use.

Plywood and Composition Boards

Plywood can be protected by treatment with the same types of preservative as solid wood, impregnation under pressure being necessary if immunity is to be guaranteed. Soaking the plies or assembled plywood in aqueous solutions of water-soluble salts has been recommended as a suitable, but less effective alternative to pressure treatment, but it can be given only to material made up with water-resistant glues. No published information is available on the powers of resistance of plywoods with adhesives of phenolic resins, but there is some evidence to suggest that these substances may be distasteful to termites or act as a barrier, preventing or delaying their passage through the plies. Information on this is required from experiment, and also upon the reaction of termites to timber impregnated or superficially treated with synthetic resins.

Untreated fibre and other types of composition board made from cellulose materials are liable to attack by termites. Tests in the U.S. have shown that where boards or other structural products contain cellulose held together with a plaster binder of fine cement, these materials are resistant to attack. Integral treatments, applied during manufacture, of other types of cellulose board with arsenicals or pentachlorphenol will render them immune from subsequent infestation. A preventive treatment avoiding the use of arsenicals, recently found effective in India[3] for the preservation of bagasse boards, consisted of impregnation with a mixture of 5 per cent. sodium pentachlorphenate, 5 per cent. copper sulphate, plus 4 per cent. rosin.

Other Treatments

In the course of this brief outline of some of the problems involved in dealing with damage by wood-boring insects by means of wood preservatives and insecticides, it has not been possible in the space available to cover the subject completely; there have necessarily been omissions which will at once be apparent. No mention has been made, for instance, of recent American work[8] on tree-injection methods of impregnating the wood of standing or freshly-felled trees with aqueous solutions of inorganic salts to preserve it for use after they have been cut up. Such treatments have been developed, after considerable experimental work, for the protection of poles, posts or rustic work on farms in the U.S., but have little general application in this country. Again, while the need for the development of cheap deterrents to attack has been stressed, the possibility has not been discussed of using chemicals as attractants to wood-boring insects for the treatment of trap samples in which the pests of structural timbers in buildings might prefer to lay their eggs. This method of approach has been investigated within recent years by Becker[1], in relation to the control of the house longhorn beetle, *Hylotrupes bajulus*, of comparatively rare occurrence in this country, when it was found that the bicyclic terpenes (*e.g.*, pinene), phellandrene and coal-tar oil, boiling at 150°-200° C., were particularly effective. As to the newer insecticides, such as DDT and gammexane (666), effective in other fields of applied entomology, little information is yet available on their value in some form or other for the control of wood-borers; experiments are obviously required in this connection.

In the past, more attention has been given to the use of preservatives for the protection of timber from fungal decay than from insect

attack, and it is only within comparatively recent years that increasing knowledge of the biology of wood-boring insects, and a greater realisation of the damage and losses they cause, have shown that even in this country there is room for new developments in cheap and effective materials devoid of the disadvantages of some of the substances now in use.

ACKNOWLEDGMENTS

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Plastics Federation

Tenth Anniversary Luncheon

SPEAKING at the tenth annual meeting and luncheon of the British Plastics Federation, which was held at the Savoy Hotel, London, on April 18, the chairman, Mr. H. W. Graesser-Thomas, of the Yorkshire Tar Distillers, Ltd., spoke of the progress of the Federation in 1944, noting that membership had increased during the year from 220 to 250, and was still on the increase. Fifty technical and other committees were now in active session, and 200 meetings had been held at the Federation's offices during the period.

"Hall Mark" Scheme

They were co-operating with the British Standards Institution in the preparation of new standards for the processes of the plastics industry, and the Federation had appointed a member to a number of the Institution's technical committees. The "Hall Mark" scheme had now been brought into being. With the assistance of the British Standards Institution, licences had been granted to a number of powder manufacturers who might apply a mark, registered by the Institution with the Board of Trade, to certain moulding powders which were thereby guaranteed to comply with the high standards set in the relevant British Standard Specification. They were now considering how this mark could best be applied to the finished article.

Having acknowledged the valuable help given him by his colleagues on the committee and by the staff, Mr. Graesser-Thomas extended a special welcome to the Federation's guests, notably their friends in Government departments, and the chairman of parallel associations, including Dr. P. C. C. Isherwood, of the A.B.C.M., and Mr. S. Billbrough, of the Association of Tar Distillers. In proposing the toast of the guests, the chairman coupled with it the name of the principal guest, Mr. Ernest Bevin, P.C., M.P., Minister of Labour and National Service.

Mr. Bevin's Speech

In his reply, Mr. Bevin affirmed that he would not be a party to using war-time controls "as an indirect means of achieving a political objective." The policy of the Government was to make controls in a rational and orderly way for post-war industry. "You cannot," he said, "ask for manpower control unless the capitalist side is also under an element of control. . .You must have a sense of justice in this matter." He severely criticised certain sections of the press for their attacks on controls, which were causing dissatisfaction among the troops. He and Mr. Dalton were trying so to direct redundant labour that every essential post-war industry could restart. "If the industrialists do not make their voices heard and if they let it go by default, all my plans," he said, "are going to be broken by a stupid press run by a few people in Fleet Street."

He appealed to industry, which would otherwise descend into chaos, to stand up for those who want to put our industries on a proper footing. If he wanted to be popular he could say to-morrow "All these controls have gone," but he would rather go out of office for many years to come than sacrifice the nation. "If industry and the trade unions work together during the vital transition," he concluded, "then I have no fear that Britain will not only get out of this terrible struggle, but will assure her future for 100 years."

The director-general of statistics, Argentina, records a 25 per cent. increase in exports of tartaric acid for the first 10 months of 1944, as compared with the same period in 1943.

X-Ray Analysis in Industry

Group Meets in London

THIS year's conference of the X-Ray Analysis Group of the Institute of Physics was held at the Royal Institution, by kind permission of the Managers, on April 12 and 13. The Thursday morning was devoted to a number of short contributions on new and improved methods, while in the afternoon there was a symposium on the Equipment of X-ray Laboratories. Dr. R. F. Hanstock, of High Duty Alloys, Ltd., dwelt specially on equipment for determining residual stresses in metals; Mr. H. S. Peiser, of I.C.I., described a number of types of X-ray apparatus of wide applicability; and Dr. W. A. Wooster, of the Department of Mineralogy and Petrology at Cambridge, described chiefly the accessory crystallographic equipment that is necessary in addition to the X-ray apparatus. Later in the evening, Professor J. D. Bernal gave an interesting and suggestive talk on the Future of X-ray Analysis. He foresaw great developments in automatic and semi-automatic apparatus to cut down the labour of crystallographic analysis, and that applications of X-ray analysis would overshadow interest in it for its own sake. X-ray diffraction outfits would become obligatory in all industrial, biological, and chemical laboratories of any size. Friday was devoted to a discussion on the application of optical principles to the interpretation of X-ray diffraction photographs.

At the annual meeting of the Group, held on April 12, Professor Sir Lawrence Bragg, O.B.E., F.R.S., was re-elected chairman, and Mr. F. A. Bannister, of the Minerals Department, British Museum, was elected honorary secretary of the Group. The committee was re-elected to serve for 1945.

An Efficacious Insecticide

Sodium Antimony Lactophenate

AN economical and effective insecticide, known as "Salp," has been developed in the laboratories of the Apex Chemical Co., Inc., at 200 South First Street, Elizabeth, New Jersey, U.S.A. This insecticide has proved highly successful for destroying thrips, leaf-rollers, and other chewing insects infesting ornamental garden flowers, and vegetables of all kinds where the underground portion of the plant is eaten. Flea beetles are not controlled by Salp. Tests on thrips and leaf-rollers carried out at Ohio State University, Columbus, Ohio, were 89-98 per cent. effective; on tent caterpillars, 100 per cent.

Salp, or sodium antimony lactophenate, the use of which in America was indicated in THE CHEMICAL AGE last August (*51*, 1310, p. 141), has as its active ingredients antimony and phenol. While it is poisonous and toxic, it will not affect water-soluble chlorophyll and is suitable for indoor or outdoor use. It offers the following additional advantages. (1) Being in liquid form, it is easily handled and dissolves readily without heating, an improvement as compared with tartar emetic, paris green and lead arsenate. (2) It does not injure plants when directions and precautions are duly observed. (3) It does not discolour foliage. (4) It is completely effective during hot, dry periods. (5) It can be stored for long periods without losing effectiveness.

The usual spray solution consists of two quarts of Salp with 4 lb. sugar to 100 gal. water. If a sticker is required, especially on glabrous or smooth foliage, add 5 lb. of flour to the 100 gal. spray solution. If molasses, etc., is substituted for sugar, use at the rate of 3 lb. per 100 gal. Best results are obtained with a power sprayer; but a compressed-air knapsack sprayer can be used if pumped often enough to maintain nearly maximum pressure. Vegetation can be treated by two forms of spray: one a fine mist to settle upon the plants, and the other complete coverage of all surfaces of the plant according to needs. Plants should be sprayed at 10-day intervals and after each rain or overhead irrigation.

The possibility of injury to soft growth by desiccation should not be overlooked. Sugar in the spray often causes soft foliage to dry up and burn when the plants are sprayed immediately before a hot period when the humidity is low. Wilted plants should never be sprayed. While Salp is completely effective on leafy vegetables, the danger of toxicity is always present in spite of the fact that the insecticide is water-soluble.

Alumina from Clay

U.S. Sulphuric Acid Process

ALUMINA has been made from clay on pilot-plant scale by a sulphuric acid process. Metallic aluminium derived from it compares favourably with that made from Bayer process alumina. While interest in the process has chiefly centred on the resulting alumina, several of the operations that were developed should find other industrial applications, among which are the production of iron-free aluminium sulphate and of sulphuric acid from gases of relatively low sulphur dioxide content, state Messrs. T. H. Walthall, Philip Moller, and M. N. Striplin, Jr., of the T.V.A., in a paper read before the American Institute of Chemical Engineers in November last.

The process consists of treating calcined clay with sulphuric acid to form aluminium sulphate; the iron and silica impurities are

removed from the solution, and the solution is evaporated to dryness. The aluminium sulphate is dehydrated and then decomposed to form oxides of sulphur, which are recovered as acid for re-use in the process, and the alumina from which impurities are removed by leaching.

Techniques were developed to overcome the previously recognised difficulties of acid processes for production of alumina. Iron was removed from the aluminium sulphate solution by treatment with manganese sulphate and ozone, and alternately by electrolysis. The corrosive solutions were concentrated by submerged combustion. Silica was removed from the partially concentrated solution by treatment with clay residue. The sulphur trioxide was hydrated and recovered as acid by electrostatic precipitation; the sulphur dioxide was absorbed in weak sulphuric acid and oxidised to sulphuric acid by aeration in the presence of a catalyst.

Sufficient data regarding these developments and other unit operations in the process were given by the authors to demonstrate that the process is operable and that the production of alumina suitable for reduction to aluminium is technically feasible. They also gave data and other information from which an economic evaluation of the process could be made.

No process utilising clay has been employed on a commercial scale in the United States, partly because of the difficulty of competing with processes utilising high-grade bauxite and partly because of the many technical difficulties in preparing alumina of sufficient purity for use in the manufacture of aluminium.

Oil Company Finance

Some Comparisons and Post-War Prospects

by S. HOWARD WITHEY, F.Comm.A., M.I.Ec.E., etc.

A LONG-STANDING policy has permitted oil companies either to capitalise drilling expenditures or to charge them as operating expenses against income in the year incurred. Consequently, the decision of the New Orleans Circuit Court of Appeal that expenses incident and necessary to the drilling of oil wells cannot be deducted for purposes of income tax, means that substantially higher taxes will have to be borne by many companies which have spent considerable sums on their drilling activities. The situation thus presented promises to result in a serious decline in the number of wells drilled. Recently, however, a Bill was introduced in the House of Representatives allowing as deductions for tax purposes oil expenses and drilling costs, so that it is not likely that the Court's decision will be sustained.

To a great extent the oil share market has discounted future prospects, and the qualities of preference shares have received recognition based on the position of the leading companies and the cover provided. With requirements of war still dominating the scene, it is not easy to hazard any guesses at the prospects for the current year, but, given the conditions which have prevailed up to date, the financial results are not likely to be lower than those presented in the last published accounts of the leading companies.

(*Apex, Trinidad*)	Gross Profit £	Written Off Wells £
1939–40	598,926	197,593
1940–41	583,754	235,112
1941–42	676,746	242,084
1942–43	648,085	240,664
1943–44	544,669	237,065

During the five years to September last, about 521,000 ft. have been drilled by *Apex* (*Trinidad*), and the production amounted to over 20,000,000 barrels of crude oil and 17,000,000 gallons of casing head gasolene. The average annual production during that period exceeded the record of any pre-war year, and since the field started substantial production in 1921, the output of oil has totalled 69,000,000 barrels, the greater part having been obtained from an area of some 1200 acres. It is evident that, unless reserves of oil are replaced, output on the scale of the last five years cannot be maintained, but substantial resources for operations are available, and recently a drilling programme was drawn up to determine the extent to which the proven acreage can be extended.

In 1943-44, gross profit was £544,669, and after reducing the book value of the wells by £237,065, the balance of net profit was returned at £293,516. To this was added the sum of £144,483 brought in from the previous year, giving a disposable balance of £437,999, and enabling the rate of dividend to be maintained at 30 per cent. Up to date, 96 per cent. of the original cost of the wells has been amortised, and these assets now have a balance-sheet value of £142,435. Some comparative figures for the past five years are shown below.

Net Profit £	Taxes, &c. £	Forward Balance £	Dividend %
393,617	198,250	131,073	30
335,467	139,250	132,290	30
419,128	213,250	143,168	30
394,565	228,250	144,483	30
293,516	123,250	144,749	30

In December last, the 5s. shares were quoted at 32s. 6d., giving a net yield of 4.6 per cent. or a return of 6.9 per cent. when grossed up to the extent of 10s. in the £. Early in January, however, there was a decline to 30s. 6d., and although this was regarded in some quarters as excessive, the shares have continued dull for some time. The highest and lowest prices for the past five years are given below.

	1940	1941	1942	1943	1944
Highest ...	27/7½	30/3	34/6	37/1½	36/9
Lowest ...	14/6	24/3	27/–	32/–	32/3

Production during the year to September 30, 1944, was approximately 3,760,000 barrels of crude oil and 3,127,000 gallons of casing head gasolene, and was obtained from 267 wells, and although the price received by the company showed some increase in relation to pre-war prices, this increase was not proportionate to the higher cost of materials and labour. It is estimated that for the twelve months ending September 30, 1945, the production will amount to 3,380,000 barrels.

A controversy between the Iran and Soviet Governments regarding the granting of oil concessions in the northern part of the country caused a decline in *Anglo-Iranian* stock, the ordinary £1 units being quoted at 108s. on December 31 last, compared with 115s. at the close of the preceding year. The company's last balance sheet showed net liquid assets at £11,971,118, and scientific research is being applied to ensure the greatest possible range of products. On a market poorly supplied with stock, the ordinary units strengthened to 115s. in February last, and later improved to 117s., but moderate realisations caused the price to drop to 112s. in March, and sellers soon forced the quotation down to 110s. The report submitted in October last disclosed that after allowing for all management expenses and depreciation, royalty and taxation payments, E.P.T. and contingencies, the profit for 1943 totalled £8,446,303, including other income amounting to £284,925, the balance of net profit being shown at £5,639,122 after charging income tax, interest and fees, etc. The following table gives some comparative figures for the past four years.

(*Anglo-Iranian*)	Profit	Other Income
	£	£
1940	5,747,440	78,751
1941	6,032,347	189,828
1942	12,418,616	299,012
1943	8,161,378	284,925

After allowing for depreciation on a liberal scale, the refineries and tank installations, etc., are shown on the balance sheet at £5,656,171, as compared with £6,349,002 at December, 1942. Owing to the repayment of advances, the investments in subsidiary companies have declined to £13,517,889, while investments in allied and other concerns are lower at £6,560,628. On the other hand, British Government and other securities, tax reserve certificates and cash total £30,048,038, representing an increase of £9,062,995, and the current assets give a working surplus of £15,528,119 over the current liabilities, as against £10,975,068 previously.

	1940	1941	1942	1943	1944
Highest ...	60/4	49/5	80/8	5⅞	6⅛
Lowest ...	23/2	24/9	34/5	78/2	5 13/32

The Peruvian producing subsidiary of *Lobitos Oilfields* will embark on a large and energetic drilling programme as soon as hostilities have ceased, and this will be facilitated by the strong financial position of the parent company. The company owns interests in Anglo-Ecuadorian Oilfields, also shares in first-class insurance and industrial companies, and the dividend of 12½ per cent. has been maintained, the total profit for 1943 being shown at £373,405, representing an increase of £68,071 over the previous year. After providing £196,500 for British taxation, as against £116,063 in 1942, the balance of net profit was £14,730 lower at £155,884, so that the allocation to the general reserve was reduced from £35,000 to £20,000, and an increased balance carried forward to the next account. Some of the main items in the last four accounts are tabled below.

(*Lobitos Oilfields*)	Total Profit	Net Profit	Reserve Allocations	Forward Balance	Dividend
	£	£	£	£	%
1940	308,791	217,083	100,000	279,484	10
1941	262,113	141,700	25,000	288,255	10
1942	305,334	170,614	35,000	289,163	12½
1943	373,405	155,884	20,000	289,454	12½

The balance sheet shows a liquid surplus of £1,668,067, and, in addition to £50,000 for income tax, other reserves total £2,286,618. The capital of £1,000,000 is in the form of ordinary £1 units which have recently improved from 54s. to 55s., at which price the actual return is more than 4½ per cent. Highest and lowest market prices during the past five years are shown in the appended table.

	1940	1941	1942	1943	1944
Highest ...	40/3	41/3	42/–	53/6	59/6
Lowest ...	22/9	25/–	33/6	39/4½	47/3

	Net Profit	Income Tax	Forward Balance	Dividend
	£	£	£	%
1940	2,841,909	2,975,156	1,101,351	5
1941	3,292,315	2,920,682	1,187,119	7½
1942	7,790,282	4,917,846	1,378,667	20
1943	5,639,122	2,798,764	1,419,055	20

Personal Notes

AIR CHIEF MARSHAL SIR WILFRID R. FREEMAN has been appointed to the board of Courtaulds, Ltd.

MR. H. W. ROWELL retires this week from the chairmanship of the Birmingham section, British Association of Chemists, but remains a member of the section's committee.

COLONEL HARRY M. VAUGHAN, newly-appointed military aide to President Truman, was trained as a chemist, and has acted as sales representative for several firms in St. Louis.

PROFESSOR W. D. TREADWELL, who occupies the chair of inorganic and analytical chemistry at the Federal Technical Institute at Zurich, recently celebrated his 60th birthday. He is well known as a pioneer in electrometric titration and for his studies of light metals.

MR. A. K. BUTLER, manager of the B.H.P. Steel Works, Newcastle, Australia; PROFESSOR C. E. FAWSITT, who is to retire soon from the chair of Chemistry at Sydney University; and DR. R. K. MURPHY, head of the Science Department at the Sydney Technical College, have been awarded the Fellowship of the Australian Chemical Institute.

COUNCILLOR A. G. JEACOCK, chief analyst at the I.C.I.'s Pilkington-Sullivan Works, Widnes, has been elected chairman of the Runcorn Urban District Council, Cheshire. He has been associated with the chemical industry for 46 years, having entered the Wigg Works, Runcorn, in 1899. He has been at the Pilkington-Sullivan Works since 1931, and during the war he served as Gas Identification Officer for the Runcorn Division. Mrs. Jeacock also has close connections with the Merseyside chemical industry, having been on the staff of the Muspratt and the Pilkington-Sullivan Works, while her father, the late Mr. T. F. Gregory, put in 50 years of service in the same industry.

Obituary

DR. CHARLES F. BURGESS, who died on February 13, was president of the Burgess Battery Company and formerly professor of applied electrochemistry and chemical engineering in the University of Wisconsin. Dr. Burgess was Perkin medallist in 1932.

DR. KURT SIEGFRIED-SENN, whose death, at the age of 72, is announced from Zofingen, Switzerland, was head of the A. G. Chemische Fabrik, vorm. B. Siegfried, in that town, and also a member of the Council of the Swiss Society of Chemical Industry.

MR. H. R. J. CONACHER, who died at Newtonmore, Inverness, on April 15, was a well-known authority on Scottish shale oil industry and on oil boring. He accompanied Sir William Fraser, managing director of Scottish Oils, Ltd., to the U.S.A. in the last war and assisted him in his mission of organising petroleum supplies for the Allies. He had done much research on oil-yielding minerals and on the origin of oil shale, and was a regular contributor to the leading Scottish oil trade reviews.

The death at Sidmouth, Devon, on April 18, of SIR AMBROSE FLEMING, D.Sc., F.R.S., robs the scientific world of one of its outstanding figures. Sir Ambrose, who was in his 96th year, had witnessed and taken part in greater developments in electrical science and its applications than perhaps any of mankind before him. It is interesting to record that his first paper (in 1874) on "the contact theory of the galvanic cell," was also the first paper ever presented to the Physical Society, while 65 years later, in his 90th year, he read a paper to the same Society on a method of generating high-tension electricity which depended on allowing powdered silica to fall through a tube on to a perforated zinc plate. Fleming was a native of Lancaster, and it is appropriate that he should have studied at the Royal College of Chemistry under that notable Lancastrian, Frankland. In the course of his career at the Universities of London and Cambridge, the details of which belong to electrical and engineering science, he won many high honours, and he was a medallist of at least seven learned societies. He was elected F.R.S. in 1892.

AMERICAN NEWSLETTER

We have just received a copy of the *Anglo-American Industrial Newsletter*, a 10-page résumé of American industrial developments, issued monthly at an annual subscription of 40s. (payable to the British Office at Digswell, Welwyn Garden City, Herts). The *Newsletter* catalogues new products and processes developed in the U.S.A., includes a list each month of bulletins, etc., offered without charge by American manufacturers, and lists the titles of significant articles in the American trade and technical Press, as well as important U.S. patents, with a brief description of those selected.

British manufacturers are invited to send short announcements of any new products to the Editorial Office at 8 West 40th Street, New York 18, N.Y., for inclusion, without charge, in the American, Australian, and Swedish editions. Advertising in the *Newsletter* is limited to firms desiring to establish agency representation or to obtain license to manufacture products at present made overseas.

General News

From Week to Week

The British Council's expenditure in 1943-44 amounted to about £1,635,000.

The D.S.I.R. has just published abstracts Nos. 293 to 418 of the summary of current literature on water pollution research (H.M.S.O., 2s.).

The largest possible number of incapacitated Welsh miners, especially those suffering from silicosis, will be employed by Pullman Spring-Filled Co. at Ammanford.

A list of goods which may now be imported into French North Africa through commercial channels is contained in the *Board of Trade Journal* of March 21. An announcement is also made regarding the export of lead oxides to Sweden.

The British Aluminium Company, Ltd., announces that its Manchester office is located temporarily at Chancery Chambers, 55 Brown Street, Manchester, 2. Telephone No.: Blackfriars 8913. Telegrams: "Aluminium, Manchester." The branch manager is Mr. J. R. Whitelegg.

The group of nine French industrialists who will visit this country on May 2, as already announced in this column last week, includes M. Ricard, vice-president of the General Syndicate of Smelters, M. Lente, president of the Industrial Union of Metallurgy and Mining, and M. Meunier, president of the Federation of Metal Working.

A hundred new names of persons and firms in neutral countries, with whom dealings of any kind are unlawful, are contained in the Trading with the Enemy (Specified Persons) (Amendment) (No. 5) Order, 1945 (S. R. & O., 1945, No. 387), notably Laboratorios Crisol, Madrid, and Refinerias e Industrias Metalúrgicas C.A., Barcelona. Over 200 names have been deleted from the list.

The Control of Iron and Steel (No. 41) Order, 1945 (S. R. & O., 1945, No. 408), which came into force on April 23, 1945, has been made by the Minister of Supply. It provides that high-speed steel, for which a licence from the Iron and Steel Control has hitherto been required, may now be obtained by Departmental authorisation (M. form). The Order also frees iron powder from control.

The administration of penicillin by the inhalation of a finely-divided mist of small particles of the drug has been reported on in the *Lancet*. The watery solution employed remains potent for some time, and a relatively small amount of the drug is needed. Experiments have shown that the drug is quickly absorbed into the system by this method and that bacteria are attacked at distances up to 30 ft.

The Merchant Navy Comforts Service has received a donation of £3 from the employees of I.C.I. (General Chemicals), Ltd., Chance and Hunt Works, Oldbury, Birmingham.

Workers in Royal Ordnance factories in England and Wales have contributed £20,000 to the Red Cross Penny-a-Week Fund.

Foreign News

"Bakelite Resin Baking Finishes" is the title of a booklet published by the Union Carbide and Carbon Corporation, 30 East 42nd Street, New York 17, N.Y. These baking finishes are phenolic resin solutions which form insoluble, infusible, dense, glass-like organic finishes. Their acid, solvent, and general chemical resistance is higher than that obtained by the use of air-drying finishes. The booklet describes types of surface which can be coated, methods of industrial application, and the necessary equipment.

A scientific consultative committee, to advise on questions of policy related to research, has been constituted by the Government of India, under the chairmanship of the Member for Planning and Development. Its members are: Sir C. V. Raman, Sir Jnan Ghosh, Professor M. N. Saha, Col. Sir R. Chopra, Dr. N. Ahmad, the Master-General of Ordnance, the Vice-Chairman of the Imperial Council of Agricultural Research, the Director-General I.M.S., and the Directors of the Geological Survey and of Scientific and Industrial Research.

The Hercules Powder Company has just published, for special distribution to European customers, a collection of articles on the protective coatings industry. The symposium, called "New Developments in the Paint, Varnish and Lacquer Industry," contains, *inter alia*, a reproduction of an article from THE CHEMICAL AGE ("Synthetics in the Varnish Industry"), this being the only article taken from a European journal. Copies may be had on application to the company's Division of Industrial Economics, 247 Park Avenue, New York 17. N.Y., U.S.A.

African Explosives and Chemical Industries (controlled by de Beers and I.C.I., Ltd.) announce that the capacity of their superphosphate plants is to be increased to cover the Union's requirements, which are at present estimated at roundly 500,000 tons per annum. Taking working capital into consideration, approximately £1,000,000 will be required, and arrangements have been concluded for a short-term loan for this amount from de Beers Industrial Corporation.

The West Edmonton field, Oklahoma, a relatively new discovery, is producing approximately 42,000 barrels of oil daily from over 300 wells.

An investigation of the German synthetic rubber industry is being made by the U.S. Government, says the *Journal of Commerce*. In order to examine plants and to interrogate technicians, rubber, oil, chemical and other experts have been sent to Germany.

Forthcoming Events

April 28. The Institution of Chemical Engineers (North-Western Branch). The College of Technology, Manchester, 3 p.m. Messrs. W. S. Norman and C. H. G. Hands: "The Dehydration of Ethyl and Allyl Alcohols by Azeotropic Distillation."

April 28. The Institution of Factory Managers. Midland Hotel, Manchester, 11.30 a.m.: Council meeting; 3 p.m., North-Western branch meeting. Dr. A. Roberts: "Training for Industrial Administration."

April 28. The Institute of Physics and the Institute's Midland Branch. Birmingham University, Edmund Street, 2.30 p.m. Dr. H. Kuhn: "Atomic and Molecular Beams."

April 28. The Institution of Chemical Engineers (North-Western Branch). Reynolds Hall, College of Technology, Manchester, 3 p.m. Mr. W. S. Norman: "Vapour-Liquid Equilibrium Data for the System Ethanol-Benzene-Water."

April 29. Association of Austrian Engineers, Chemists and Scientific Workers in Great Britain. Austrian Centre, 69 Eton Avenue, London, N.W.3, 11.30 a.m. Dr. B. Burztyn: "On Recent Applications of Thermo-setting Resins on Paper and Textiles."

April 30. Royal Society of Arts. John Adam Street, Adelphi, W.C.2, 1.45 p.m. Cantor Lecture. Sir Frank Smith: "Synthetic Chemicals from Petroleum.—III."

May 1. Electrodepositors' Technical Society (Birmingham Section). James Watt Memorial Institute, Great Charles Street, Birmingham, 3, 6 p.m. Film display: "Power in Store" and "Electrodeposition."

May 2. Textile Institute. Midland Hotel, Manchester. Annual general meeting, and Dr. C. J. T. Cronshaw: "Pattern for Industry" (Mather Lecture).

May 2. A.B.C.M. Fuel Efficiency Technical Discussions. Reynolds Hall, College of Technology, Manchester, 3 p.m. Mr. W. Murray: "Inhibition of Corrosion of Metals in Hot and Cold Water Systems and Water and Steam Phases."

May 2. Society of Public Analysts Chemical Society's Rooms, Burlington House, London, W.1, 5 p.m. Mr. G. W. Osborn: "A Rapid and Simple Method for the Determination of Calcium in Presence of Strontium and Barium"; Mr. W. B. Wragge: "'Lead Printing' of Ferrous and Non-ferrous Metals"; Mr. E. Collins: "Reaction of Diazotised *p*-Nitraniline with Phenols: Detection of Tricresyl Phosphate in Edible Oil"; and Dr. A. J. Henry: "A Simple Apparatus for Handling Standard Solutions of Bromine in Potassium Bromide."

May 3. Society of Public Analysts (Physical Methods Group). Chemical Society's Rooms, Burlington House, 3 p.m. Dr. H. W. Thompson: "Infra-red Spectrography in Relation to Chemical Analysis."

May 7. Society of Chemical Industry (London Section). Rooms of the Chemical Society, Burlington House, Piccadilly, London, W.1, 2.30 p.m. Annual general meeting, followed by Mr. S. Barratt: "Phosphoric Acid and the Phosphates."

May 8. Hull Chemical and Engineering Society. Church Institute, Albion Street, Hull, 7.30 p.m. General meeting.

May 8. Institution of Chemical Engineers and Chemical Engineering Group, S.C.I. Rooms of the Geological Society, Burlington House, Piccadilly, London, W.1, 2.30 p.m. Mr. L. W. Needham and Mr. S. Lynch: "The Use of Suspensions as Heavy Liquids."

May 9. The British Association of Chemists. Chemical Society's Rooms, Burlington House, Piccadilly, London, W.1, 6.30 p.m. Annual meeting.

May 9. Society of Chemical Industry (Newcastle-on-Tyne Section). Chemistry Lecture Theatre, King's College, 6 p.m. Annual general meeting; 6.30 p.m., Mr. H. N. Wilson: "Colorimetric Analysis—Modern Views and Technique."

May 11. Chemical Society and Royal Institute of Chemistry. The University, Western Bank, Sheffield, 6 p.m. Dr. A. E. Dunstan: "Recent Developments in Petroleum Technology."

May 11. Royal Institution of Great Britain. 21 Albemarle Street, London, W.1, 5 p.m. Sir Lawrence Bragg, F.R.S.: "X-ray Analysis: Past, Present and Future."

Company News

British Lead Mills, Ltd., report a net profit, for the year to October 31, of £12,131. The dividend is again 10 per cent.

British Benzol and Coal Distillation, Ltd., has declared an interim of 5 per cent. (same) for year ended October 31, 1945.

The Swiss Explosives Company, Dottikon, has reduced its dividend from 22.47 per cent. to 20 per cent.

The Minerals Separation Co., Ltd., reports a profit for last year of £86,257 (£88,102). The dividend is again 20 per cent.

The Shell Company of Venezuela has increased its nominal capital to £1,000,000 by the addition of £990,000 in £1 ordinary shares.

Copper Pass and Son, Bristol, announce an increase of the nominal capital by £100,000 to £653,000 by the addition of 7500 £10 ordinaries and 25,000 £1 preference shares.

American Smelting and Refining Corporation reports a net income for last year of $8,627,000 ($11,750,000). The dividend on common shares is reduced from $2.50 to $2.25.

The Distillers Company, Ltd., has called an extraordinary general meeting for May 17 to extend the objects clause of the memorandum of association by bringing the company's present activities clearly within its scope.

The United Molasses Co., Ltd., has made a consolidated trading profit, for the year 1944, of £960,163 (£834,781). Net profit is £444,793 (£344,952). The payment of a final of 15 per cent. (12½ per cent.), bringing the total up to 22½ per cent. (20 per cent.). The tax-free bonus remains at 2½ per cent.

The **Gesellschaft fuer Chemische Industrie,** Basle, reports a net profit, for last year, amounting to 8.06 (7.67) million francs. Net dividends of 112 frs. on bearer stock and of 22.40 frs. on registered shares were declared. A proposal will be made at the general meeting to alter the concern's name to "Ciba A.G."

Chemical and Allied Stocks and Shares

ALTHOUGH, prior to the Budget, business in stock markets has been reduced, the general undertone, particularly in British Funds and Industrials, has remained firm, and elsewhere, yield considerations drew some attention to Home Rails, which showed a small rally. Imperial Chemical, which remained under the influence of the increased income shown by the preliminary figures, moved up to 40s. 3d., while the preference units strengthened to 36s.

The units of the Distillers Co. were a prominent feature, rising several shillings to 119s. 6d., and easing later to 118s. 3d. The big rise was variously attributed to hopes of a further improvement of the forthcoming dividend to pre-war levels, to post-war prospects, and to the possibility, on this occasion, of the publication of consolidated accounts covering the whole group. The Distillers Co. has widespread and varied interests, and consequently post-war scope for expansion is considered promising. The rise in the price of the shares was partly due to the fact that a big selling order, recently overhanging the market, has now been completed.

Dunlop Rubber have been active at slightly over 50s., while Lever & Unilever strengthened to 48s. 9d., and Lever N.V. to 48s. 6d. United Molasses firmed up to 39s., and elsewhere, Birmid Industries rose further to 96s. on prevailing views of post-war prospects. Borax Consolidated at 39s. 3d. were also higher on balance, and Amalgamated Metal showed firmness at 20s. 3d. xd, with Imperial Smelting firmer at 14s. 9d. Earlier activity was not maintained in rayon shares, Courtaulds easing slightly at 57s. 6d., with British Celanese 34s. 7½d., but Calico Printers at 20s. 6d. showed a good rise on balance.

Yield considerations drew a little more attention to iron and steel shares. Hadfields, in particular, moved up to 33s. Stewarts & Lloyds deferred firmed up to 58s. Whitehead Iron were 90s., and Clarke Chapman 50s. 9d., while Babcock & Wilcox strengthened to 56s., and Colvilles to 24s. 7½d. Turner & Newall have been steady at 86s. Radiation moved higher at 63s., and paint shares were generally firm, with Lewis Berger higher at 112s. 9d., awaiting the interim dividend, and Pinchin Johnson 41s. In other directions, Barry & Staines were maintained at 54s., with Nairn & Greenwich 77s. 6d., and Wall Paper Manufacturers deferred 44s. 6d. British Plaster Board were 39s., and Associated Cements slightly easier at 62s. awaiting the results. Crittall Manufacturing moved higher at 35s. 6d. xd. on the interim dividend.

De La Rue were £11 3/16, British Industrial Plastics 2s. shares changed hands around 7s., and Erinoid around 12s. 3d., while British Xylonite 5 per cent. preference marked 24s. 9d. at one time. In other directions, Greeff-Chemicals Holdings 5s. ordinary were dealt in around 9s. 6d. Lawes Chemical 10s. shares marked 12s. 3d., Valor ordinary 58s., and Fisons around 49s. 6d. Goodlass Wall 10s. ordinary have been more active up to 21s., following declaration of a higher dividend by a subsidiary company. Johnson Matthey 5 per cent. preference were dealt in at 24s. at one time, Burt Boulton at 27s., and British Glues & Chemicals 4s. ordinary at slightly over 10s. British Drug Houses were 30s. 9d., awaiting the results, and B. Laporte 87s. 6d.

Boots Drug at 55s. 6d. were little changed on balance, with Sangers 31s. 9d., Timothy Whites 41s. 6d., and Beechams deferred 19s. 9d. Oil shares became more prominent, Shell rising to 86s. 3d., and Burmah Oil to 90s., while Attock Oil also improved to 72s., the two last-named being aided by the war news from the Far East.

Prices of British Chemical Products

ACTIVITY in the London general chemicals market during the past week has been fairly widespread and nearly all sections report strong price conditions. Although the deliveries against contracts continue along substantial lines, immediate offers are restricted in many cases by the supply position. In the soda products section both grades of hyposulphite of soda are in steady demand, while there has been no change in the position of yellow prussiate of soda and chlorate of soda, offers of both items being scarce. Industrial refined nitrate of soda is a good market, and acetate of soda is in good call. Among the potash products, permanganate and bichromate of potash are none too plentiful, and pressure for deliveries of yellow prussiate of potash are reported. Acid phosphate of potash is steady. In other directions the demand for formaldehyde is well maintained, while an active trade is passing in arsenic. There is no change to report in the acid section. In the coal-tar products section there is a continued good demand for cresylic acid, and in other directions the demand is steady. Fair quantities of pitch are being consumed in the home market, while creosote oil and carbolic acid are in active demand. A quiet trade is passing in the xylols and naphthas, and a good inquiry is reported for the toluols and benzols.

MANCHESTER.—Fresh business in heavy chemicals on the Manchester market during the past week has been no more than moderate, but for the most part contract deliveries to the leading industrial outlets are going forward satisfactorily, specifications covering the general run of alkali products, as well as carbonate and bicarbonate of ammonia, alum, the magnesia compounds, and sulphuric, hydrochloric, and oxalic acids. The price position generally is on a steady to firm basis. There is a heavy consumption of most of the fertilisers and steady deliveries of these are being absorbed. In the tar products moderate new buying interest is being displayed, with a brisk movement of supplies of crude tar, creosote and anthracene oils, carbolic acid, and most of the light distillates reported here.

GLASGOW.—In the Scottish heavy chemical trade there is no change during the past week either in home business or the export business. Prices remain very firm with no actual changes to report.

Price Changes

Rises: Antimony oxide; lactic acid.

Falls: Aluminium sulphate; borax; boric acid.

General Chemicals

Acetic Acid.—Maximum prices per ton: 80% technical, 1 ton £39 10s.; 10 cwt./ 1 ton, £40 10s., 4/10 cwt., £41 10s.; 80% pure, 1 ton, £41 10s.; 10 cwt./1 ton, £42 10s.; 4/10 cwt., £43 10s.; commercial glacial, 1 ton, £49; 10 cwt./1 ton, £50; 4/10 cwt., £51; delivered buyers' premises in returnable barrels, £4 10s. per ton extra if packed and delivered in glass.

Acetone.—Maximum prices per ton, 50 tons and over, £65; 10/50 tons, £65 10s.; 5/10 tons, £66; 1/5 tons, £66 10s.; single drums, £67 10s.; delivered buyers' premises in returnable drums or other containers having a capacity of not less than 45 gallons each. For delivery in non-returnable containers of 40/50 gallons, the maximum prices are £3 per ton higher. Deliveries of less than 10 gallons free from price control.

Alum.—Loose lump, £16 per ton, f.o.r.

Aluminium Sulphate.—Ex works, £11 5s. per ton d/d.

Ammonia, Anhydrous.—1s. 9d. to 2s. 3d. per lb.

Ammonium Carbonate.—£37 10s. to £38 per ton d/d in 5 cwt. casks.

Ammonium Chloride.—Grey galvanising, £22 10s. per ton, in casks, ex wharf. Fine white 98%, £19 10s. per ton. See also Salammoniac.

Antimony Oxide.—£111 to £117 per ton.

Arsenic.—99/100%, under 1 ton, £62; 1 ton, £61; white 98/99%, £59; grey 96/97%, £54; grey 95/96%, £49; crude, £35 per ton.

Barium Carbonate.—Precip., 4-ton lots, £19 per ton d/d; 2-ton lots, £19 5s. per ton, bag packing, ex works.

Barium Chloride.—98/100% prime white crystals, 4-ton lots, £19 10s. per ton, bag packing, ex works.

Barium Sulphate (Dry Blanc Fixe).—Precip., 4-ton lots, £18 15s. per ton d/d; 2-ton lots, £19 10s. per ton.

Bleaching Powder.—Spot, 35/37%, £11 to £11 10s. per ton in casks, special terms for contract.

Borax.—Per ton for ton lots, in free 1-cwt. bags, carriage paid: Commercial, granulated, £30; crystals, £31; powdered, £31 10s.; extra fine powder, £32 10s. B.P., crystals, £39; powdered, £39 10s.; extra fine, £40 10s. Borax glass, per ton in free 1-cwt. waterproof paper-lined bags, for home trade only, carriage paid: lump, £77; powdered, £78.

Boric Acid.—Per ton for ton lots in free 1-cwt. bags, carriage paid: Commercial, granulated, £52; crystals, £53; powdered, £54; extra fine powder, £56. B.P., crystals, £61; powder, £62; extra fine, £64.

Calcium Bisulphide.—£6 10s. to £7 10s. per ton f.o.r. London.

Calcium Chloride.—70/72% solid, £5 15s. per ton, ex store.

Charcoal, Lump.—£15 to £16 per ton, ex wharf. Granulated, supplies scarce.

Chlorine, Liquid.—£23 per ton, d/d in 16/17 cwt. drums (3-drum lots).

Chrometan.—Crystals, 5½d. per lb.

Chromic Acid.—1s. 5d. per lb., less 2½%, d/d U.K.

Citric Acid.—Controlled prices per lb., d/d buyers' premises. For 5 cwt. or over, anhydrous, 1s. 6¾d., other, 1s. 5d.; 1 to 5 cwt., anhydrous, 1s. 9d., other, 1s. 7d. Higher prices for smaller quantities.

Copper Oxide.—Black, powdered, about £100 per ton.

Copper Sulphate.—£32 5s. per ton, f.o.b., less 2%, in 2 cwt. bags.

Cream of Tartar.—100 per cent., per cwt., for 10 cwt., or more, £14 11s. 6d.; 5 to 10 cwt., £14 12s. 6d.; 2 to 5 cwt., £14 13s. 6d.; 1 to 2 cwt., £14 14s. 6d., d/d in sellers' returnable casks. Less than 1 cwt., 2s. 8d. to 2s. 10d. per lb. d/d. Maximum controlled prices.

Formaldehyde.—£26 to £27 15s. per ton in casks, according to quantity, d/d.

Formic Acid.—85%, £47 per ton for ton lots, carriage paid; smaller parcels quoted up to 50s. per cwt., ex store.

Glycerine.—Chemically pure, double distilled 1260 s.g., in tins, £4 to £5 per cwt., according to quantity; in drums, £3 19s. 6d. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

Hexamine.—Technical grade for commercial purposes, about 1s. 4d. per lb.; free-running crystals are quoted at 2s. 1d. to 2s. 3d. per lb.; carriage paid for bulk lots.

Hydrochloric Acid.—Spot, 7s. 6d. to 8s. 9d. per carboy d/d, according to purity, strength and locality.

Hydrofluoric Acid.—59/60%, about 1s. to 1s. 2d. per lb.

Iodine.—Resublimed B.P., 10s. 4d. to 14s. 6d. per lb., according to quantity.

Lactic Acid.—Pale tech., £60 per ton; dark tech., £52 per ton ex works; barrels returnable.

Lead Acetate.—White, 50s. 6d. to 52s. 6d. per cwt. MANCHESTER: £51 to £54 per ton.

Lead Nitrate.—About £47 per ton d/d in casks.

Lead, Red.—English, 5/10 cwt., £45 per ton; 10 cwt. to 1 ton, £44 15s.; 1/2 tons, £44 10s.; 2/5 tons, £44; 5/20 tons, £43 10s.; 20/100 tons, £43; over 100 tons, £42 10s. per ton, less 2½%, carriage paid. Non-setting red lead, 10s. per ton dearer in each case.

Lead, White.—Dry English, in 8-cwt. casks, £55 per ton. Ground in oil, English, in 5-cwt. casks, £67 per ton.

Litharge.—1 to 2 tons, £44 10s. per ton.

Lithium Carbonate.—7s. 9d. per lb. net.

Magnesite.—Calcined, in bags, ex works, £18 15s. to £22 15s. per ton.

Magnesium Chloride—Solid (ex wharf), £22 per ton.

Magnesium Sulphate.—£12 to £14 per ton.

Mercury Products.—Controlled price for 1-cwt. quantities: Bichloride powder, 15s. 8d.; bichloride lump, 16s. 3d.; mercury oxide, red cryst., 20s. 9d.; red levig., 20s. 3d.; red tech., 19s. 11d.; yellow levig., 20s. 2d.; yellow tech., 19s. 7d.; sulphide, red, 17s. 9d.

Methylated Spirit.—Industrial 66° O.P. 100 gals., 2s. 4d. per gal.; pyridinised 64° O.P. 100 gals., 2s. 5d. per gal.

Nitric Acid.—£24 to £26 per ton, ex works.

Oxalic Acid.—£60 to £65 per ton for ton lots, carriage paid, in 5-cwt. casks; smaller parcels would be dearer; deliveries slow.

Paraffin Wax.—Nominal.

Potash, Caustic.—Solid, £65 10s. per ton for 1-ton lots; flake, £73 per ton for 1-ton lots. Liquid, d/d, nominal.

Potassium Bichromate. — Crystals and granular, 7⅞d. per lb.; ground, 8⅛d. per lb., for not less than 6 cwt.; 1-cwt. lots, ½d. per lb. extra.

Potassium Carbonate.—Calcined, 98/100%, £67 5s. per ton ex store; hydrated, £61 10s. per ton.

Potassium Chlorate.—Imported powder and crystals, nominal.

Potassium Iodide.—B.P., 8s. 8d. to 12s. per lb., according to quantity.

Potassium Nitrate.—Small granular crystals, 76s. per cwt. ex store, according to quantity.

Potassium Permanganate.—B.P., 1s. 8½d. per lb. for 1-cwt. lots; for 3 cwt. and upwards, 1s. 8d. per lb.; technical, £7 12s. to £8 6s. 3d. per cwt., according to quantity d/d.

Potassium Prussiate.—Yellow, nominal.

Salammoniac.—First lump, spot, £48 per ton; dog-tooth crystals, £50 per ton; medium, £48 10s. per ton; fine white crystals, £19 10s. per ton, in casks, ex store.

Soda, Caustic. — Solid 76/77%; spot, £16 7s. 6d. per ton d/d station.

Sodium Acetate.—£42 per ton, ex wharf.

Sodium Bicarbonate.—Refined, spot, £11 per ton, in bags.

Sodium Bichromate.—Crystals, cake and powder, 6½d. per lb.; anhydrous, 6½d. per lb., net, d/d U.K.

Sodium Bisulphite. — Powder, 60/62%, £19 10s. per ton d/d in 2-ton lots for home trade.

Sodium Carbonate Monohydrate.—£21 per ton d/d in minimum ton lots in 2 cwt. free bags.

Sodium Chlorate.—£36 to £45 per ton, nominal.

Sodium Hyposulphite.—Pea crystals, £21 10s. per ton for 2-ton lots; commercial, £15 per ton.

Sodium Iodide.—B.P., for not less than 28 lb., 9s. 11d. per lb., for not less than 7 lb., 13s. 1d. per lb.

Sodium Metasilicate.—£16 10s. per ton, d/d U.K. in ton lots.

Sodium Nitrite.—£20 to £23 10s. per ton.

Sodium Percarbonate.—21½% available oxygen, £7 per cwt.

Sodium Phosphate.—Di-sodium, £26 10s. per ton d/d for ton lots. Tri-sodium, £27 10s. per ton d/d for ton lots.

Sodium Prussiate.—9d. to 9½d. per lb. ex store.

Sodium Silicate.—£6 to £11 per ton.

Sodium Sulphate (Glauber Salt).—£4 10s. per ton d/d.

Sodium Sulphate (Salt Cake).—Unground. Spot £4 11s. per ton d/d station in bulk. MANCHESTER: £4 15s. per ton d/d station.

Sodium Sulphide. — Solid, 60/62%, spot, £18 5s. per ton, d/d, in drums; crystals, 30/32%, £12 7s. 6d. per ton, d/d, in casks.

Sodium Sulphite.—Anhydrous, £29 10s. per ton; pea crystals, £20 10s. per ton d/d station in kegs; commercial, £12 to £14 per ton d/d station in bags.

Sulphur.—Per ton, ground, £15-£16.

Sulphuric Acid.—168° Tw., £6 10s. to £7 10s. per ton; 140° Tw., arsenic-free, £4 11s. per ton; 140° Tw., arsenious, £4 3s. 6d. per ton. Quotations naked at sellers' works.

Tartaric Acid.—Per cwt., for 10 cwt. or more, £19 12s.; 5 to 10 cwt., £19 13s. 6d.; 2 to 5 cwt., £19 15s.; 1 to 2 cwt., £19 17s. Less than 1 cwt., 3s. 7d. to 3s. 9d. per lb. d/d, according to quantity. Maximum controlled prices.

Tin Oxide.—Nominal.

Zinc Oxide.—Maximum prices per ton for 2-ton lots, d/d; white seal, £34; green seal, £33; red seal, £31 10s.

Zinc Sulphate.—Tech., £20-£21 per ton, carriage paid, casks free.

Rubber Chemicals

Antimony Sulphide.—Golden, 1s. 2d. to 2s. 1½d. per lb. Crimson, 2s. 2d. to 2s. 6d. per lb.

Arsenic Sulphide.—Yellow, 1s. 9d. per lb.

Barytes.—Best white bleached, £8 3s. 6d. per ton.

Cadmium Sulphide.—6s. to 6s. 6d. per lb.

Carbon Bisulphide.—£34 to £39 per ton, according to quality, in free returnable drums.

Carbon Black.—6d. to 8d. per lb., according to packing.

Carbon Tetrachloride.—£44 to £49 per ton, according to quantity.

Chromium Oxide.—Green, 2s ped lb.

India-rubber Substitutes.—White, 6 3/16d to 10½d. per lb.; dark, 6 3/16d. to 6 15/16d. per lb.

Lithopone.—30%, £25 per ton; 60%, £31 to £32 per ton. Imported material would be dearer.

Mineral Black.—£7 10s. to £10 per ton.

Mineral Rubber, "Rupron."—£20 per ton.

Sulphur Chloride.—7d. per lb.

Vegetable Lamp Black.—£49 per ton.

Vermilion.—Pale or deep, 15s. 6d. per lb. for 7-lb. lots.

Plus 5% War Charge.

Nitrogen Fertilisers

Ammonium Phosphate.—Imported material, 11% nitrogen, 48% phosphoric acid, per ton d/d farmer's nearest station, in February, £20 12s. 6d., in March-June, £20 15s.

Ammonium Sulphate.—Per ton in 6-ton lots, d/d farmer's nearest station, in February, £9 19s.; in March-June, £10 0s. 6d.

Calcium Cyanamide.—Nominal; supplies very scanty.

Concentrated Fertilisers.—Per ton d/d farmer's nearest station, in February: I.C.I. type "Special No. 1," £15 9s., in March-June, £15 11s. 6d.

"Nitro Chalk."—£9 14s. per ton in 6-ton lots, d/d farmer's nearest station.

Sodium Nitrate.—Chilean super-refined for 6-ton lots d/d nearest station, £15 5s. per ton; granulated, over 98%, £14 10s. per ton.

Coal Tar Products

Benzol.—90's, 2s. 2d.; nitration grade, 2s. 6d. per gal., ex works.

Carbolic Acid.—Crystals, 11½d. per lb. Crude, 60's, 4s. 3d. MANCHESTER: Crystals, 9¾d. to 11½d. per lb., d/d; crude, 4s. to 4s. 6d., naked, at works.

Creosote.—Home trade, 6½d. to 7d. per gal., f.o.r. maker's works. MANCHESTER, 6½d. to 9¾d. per gal.

Cresylic Acid.—Pale, 97%, 3s. 6d. per gal.; 99%, 4s. 2d.; 99.5/100%, 4s. 4d. American, duty free, 4s. 2d., naked at works. MANCHESTER: Pale, 99/100%, 4s. 6d. per gal.

Naphtha.—Solvent, 90/160°, 2s. 8d. per gal. for 1000-gal. lots; heavy, 90/190°, 2s. 2d. per gal. for 1000-gal. lots, d/d. Drums extra; higher prices for smaller lots. Controlled prices.

Naphthalene.—Crude, ton lots, in sellers' bags, £7 4s. to £10 13s. per ton, according to m.p.; hot-pressed, £12 9s. to £12 14s. per ton, in bulk ex works; purified crystals, £20 15s. to £36 15s. per ton. Controlled prices.

Pitch.—Medium, soft, 50s. to 55s. per ton, f.o.b. MANCHESTER: 60s. to 62s. per ton f.o.b

Pyridine.—90/140°, 17s. to 17s. 6d. per gal.; 90/160°, 13s.—MANCHESTER, 13s. 6d. to 18s. per gal.

Toluol.—Pure, 2s. 7d. per gal.; 90's, 1s. 11d. per gal. MANCHESTER: Pure, 2s. 7½d. per gal. naked.

Xylol.—For 1000-gal. lots, 3s. 1½d. to 3s. 4d. per gal., according to grade, d/d. Drums extra; higher prices for smaller lots. Controlled prices.

Wood Distillation Products

Calcium Acetate.—Brown, £21 per ton; grey, £24. MANCHESTER: Grey, £24 to £25 per ton.

Methyl Acetone.—40/50%, £56 per ton.

Wood Creosote.—Unrefined, about 2s. per gal., according to boiling range.

Wood Naphtha, Miscible.—4s. 6d. to 5s. 6d. per gal.; solvent, 5s. 6d. per gal.

Wood Tar.—£5 per ton.

Intermediates and Dyes (Prices Nominal)

m-**Cresol** 98/100%.—Nominal.

o-**Cresol** 30/31° C.—Nominal.

p-**Cresol** 34/35° C.—Nominal.

Dichloraniline.—2s. 8½d. per lb.

Dinitrobenzene.—8½d. per lb.

Dinitrotoluene.—48/50° C., 9½d. per lb; 66/68° C., 1s.

p-**Nitraniline.**—2s. 5d. per lb.

Nitrobenzene.—Spot, 5½d. per lb. in 90-gal. drums, drums extra, 1-ton lots d/d buyer's works.

Nitronaphthalene.—1s. 2d. per lb.; P.G., 1s. 0½d. per lb.

o-**Toluidine.**—1s. per lb., in 8/10 cwt. drums, drums extra.

p-**Toluidine.**—2s. 2d. per lb., in casks.

m-**Xylidine Acetate.**—4s. 5d. per lb., 100%

Latest Oil Prices

LONDON.—April 25.—For the period ending May 5 (May 26 for refined oils), per ton, naked, ex mill, works or refinery, and subject to additional charges according to package: LINSEED OIL, crude, £62. RAPESEED OIL, crude, £88. COTTONSEED OIL, crude, £52 2s. 6d.; washed, £55 5s.; refined edible, £57; refined deodorised, £58. COCONUT OIL, crude, £49; refined deodorised, £49; refined hardened deodorised, £53. PALM KERNEL OIL, crude, £48 10s.; refined deodorised, £49; refined hardened deodorised, £53. PALM OIL, refined deodorised, £55; refined hardened deodorised, £58. GROUNDNUT OIL, crude, £56 10s.; refined deodorised, £58; refined hardened deodorised, £62 to £63. WHALE OIL, crude hardened, 42 deg., £51 10s.; refined hardened, 46/48 deg., £52. ACID OILS: Groundnut, £40; soya, £38; coconut and palm-kernel, £43 10s. ROSIN, 30s. 6d. to 45s. per cwt., ex store, according to grade. TURPENTINE, American, 87s. per cwt. in drums or barrels, as imported (controlled price).

SITUATION VACANT

None of the advertisements below relates to a woman between 18 *and* 41 *unless such a woman* (a) *has living with her a child of hers under the age of* 14, *or* (b) *is registered under the Blind Persons Acts, or* (c) *has a Ministry of Labour permit to allow her to obtain employment by individual effort.*

WANTED Analytical and Research Chemist by manufacturers of chemical preparations for the boot and shoe trade. Apply stating qualifications, experience and salary required to F. H. & H. S. Pochin, Ltd., Spinney Hill Road, Leicester.

SITUATIONS VACANT

ASSISTANT BUYER-STOREKEEPER for Chemical Research and Development Department near London (S.W.). Applicants must have chemical knowledge (Inter. B.Sc. standard preferred), and some commercial and engineering experience if possible. Good prospects for right man. Commencing salary about £400 p.a. State age, experience, qualifications, etc., and when disengaged. Box No. 2215, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

LIVE representatives wanted by old established firm of Insecticide manufacturers. Only those with connection among Chemists, Ironmongers, Furnishers, Stores, Co-ops, Seedsmen, and capable of earning a minimum of £10 per week, whole or part time, need apply. Write, giving full particulars of territory covered, goods handled, etc., to Box No. 2211, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

WANTED—Senior Research Officer for new overseas organisation investigating the field of the industrial diamond. Preferably Ph.D. with industrial research experience, capable of investigating the Chemical, Physical and other properties of industrial diamonds. A knowledge of Metallurgy or Powder Metallurgy would be an asset. Submit application, complete with details of training and experience with references to Box No. 2204, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

WANTED

WANTED regularly, Residues, Sludge, Slag, etc., containing Antimony, Cadmium, Copper, Lead, Nickel and Zinc. Oakland Metal Company Ltd., Willington, Derby.

WANTED—a second-hand laboratory autoclave for 25 atmospheres or over, with stirring. Must be in good condition. State price and give full details. Box No. 2214, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

WORKING NOTICE

THE Proprietors of British Patents No. 440,416 for "METHODS OF PREPARING HIGHER LACTONES CONTAINING AT LEAST 11 CARBON ATOMS IN THE LACTONE RING," and Nos. 452,242 and 452,272 both for "IMPROVEMENTS IN OR RELATING TO METHODS OF PREPARING HIGHER LACTONES CONTAINING AT LEAST 11 CARBON ATOMS IN THE LACTONE RING," desire to enter into negotiations with a Firm or Firms for the sale of the Patents, or for the grant of licences thereunder. Further particulars may be obtained from MARKS & CLERK, 57 and 58, Lincoln's Inn Fields, London, W.C.2.

The fact that goods made of raw materials in short supply owing to war conditions are advertised in this paper should not be taken as an indication that they are necessarily available for export.

Printed in Great Britain by THE PRESS AT COOMBELANDS, London and Addlestone, and published by BENN BROTHERS, LTD., at Bouverie House, 154, Fleet Street, E.C.4, April 28th, 1945. Entered as Second Class Matter at the New York, U.S.A., Post Office.