The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

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TEMPERATURE CHAMELEON

You know the chameleon will change its colour according to the demands of the surroundings. But did you know that he can also register changes in temperature? How useful he would be for registering temperature changes in an engine under test. The problem of getting this little magician from Madagascar to sit still on a Rolls-Merlin engine would of course present its difficulties. The Ministry of Supply would hate the idea.

Fortunately, there is something else which will do this job much more effectively — heat sensitive paints. These paints are on the market but their full commercial development is yet to come.

Some heat sensitive paints contain iodine, an element which is playing an increasingly important part in our lives. New uses are constantly being found for iodine in medicine, agriculture and industry. Its field of application is so large that in 1938 the IODINE EDUCATIONAL BUREAU was set up in London to collate and distribute the mass of information on iodine which had accumulated in the last 100 years. The services of this bureau are available free to any institution or manufacturer with an iodine problem.

Iodine Educational Bureau

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The Chemical Age

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Scientific Publicity—and DDT

UNDERSTATEMENT is a natural British characteristic. This is all very well when the hearer is, or can be, placed in full possession of the facts, as in those circumstances understatement adds emphasis whereas overstatement detracts from the argument. Unfortunately, this habit often reacts against us as a nation; others, more volatile than ourselves, are prone to take statements and achievements at their face value. If country X develops several wonderful new inventions in engineering, in chemistry or in general science, and publishes the fact, whereas country Y works equally well, but behind closed doors, the world gives the whole credit to X without considering the matter very much farther. In this way X may get a very high reputation that may or may not be deserved, whereas the reputation of Y will be very low by comparison.

The scientific worker cares nothing for all this. Other scientific men consulting the original papers will be able to decide for themselves who has the credit of the original discovery irrespective of any beating of the big drum of publicity. The scientific worker therefore proceeds on his way unworried by plaudits bestowed on others and without caring very much what the popular Press says. Unfortunately, the industrialist and the business man get the repercussions, because the foreigner will tend to send his inquiries to country X and to place his orders with that country on the strength of a possibly spurious reputation created solely by a flair for publicity. Much of the success of Germany in chemicals and chemical engineering has arisen in this way. It is well to point out that as a nation we must adopt a different attitude towards publicity.

An instance of this, which concerns ourselves and America, has occurred in connection with the new insecticide DDT, as is evident from Professor Heilbron's paper on the subject to the Royal Society of Arts (*J. Roy. Soc. Arts*, *93*, 65). The chairman, Dr. E. F. Armstrong, said: "Those of us who know about these things are aware that the development of DDT is due to the work of a large team. It is rather hard to think that the credit has gone to America and will stay with America because of our policy of secrecy. It is very important to put on record here and now that the work started in this country and has gone on to a large extent

On Other Pages

here. There has been cordial co-operation with America and, of course, their opportunity and capacity for production is greater than ours. Nevertheless, a great deal of credit belongs to Professor Heilbron and the British team."

Most of the deadliest war-time diseases are carried by insects. The infestation of soldiers by insects during the last war is even yet a painful memory to many now alive. The ravages of insect diseases can, in fact, have a decisive effect on the outcome of a whole campaign and every possible care is taken to maintain the health of the troops. Consequently, one of the first steps to be taken was to provide ample quantities of materials toxic to mosquitoes and flies. Up to 1942 pyrethrum and rotenone were the most effective, but with the entry of Japan into the war supplies of both were cut off at a time when the total demands of the Allied nations were increasing very rapidly.

We will let Professor Heilbron take up the tale: "Immediate means of improving the serious and rapidly deteriorating position had to be found and, as one of the steps, a Research and Development Panel was set up during the winter of 1942 in the Ministry of Production. . . . One of the first actions taken by the Panel was an examination of the synthetic insecticide field which brought within its review the new insecticide known now as DDT. I mention these facts because of the unfortunate and quite erroneous impression, both here and in many parts of the Empire, that British science has lagged behind in the fundamental work leading to the development of this important material for service use. This has arisen from our own official reticence, together with the extensive publicity which DDT has received in the American lay and technical Press."

The insecticidal properties of DDT were discovered by Paul Muller, one of the chemists of J. R. Geigy, of Basle, Switzerland; but it was not until the Research and Development Panel set to work that its outstanding qualities were recognised. To quote Professor Heilbron again: "Its great potential importance as an army insecticide was first revealed in this country by work carried out in the Department of Entomology, London School of Hygiene and Tropical Medicine, which showed that it possessed a powerful lethal action on lice. In addition . . . . the Pest Infestation Laboratory of the D.S.I.R., the Department of Entomology at the Imperial College, the Army School of Hygiene, and the relevant research establishments of the Ministry of Supply have all co-operated with enthusiasm and realism in a wide range of investigations. It soon became evident that DDT was a unique substance, with properties immeasurably superior to those of any natural or synthetic insecticide yet discovered, against a wide variety of insects."

Obviously, an examination had to be made of the toxicity of DDT to animals and man and many other investigations connected with its use were necessary before it could be employed in the field. Many of these were carried out in the U.S.A., and Professor Heilbron stressed that, in all the exploratory work, close contact was maintained with our American colleagues."

Those who would make themselves more fully acquainted with the properties and uses of DDT are enjoined to consult Professor Heilbron's original paper, now reprinted in the *Journal of the Royal Society of Arts*. We are here concerned to point out that, just as many foreign producers of cinematograph films greatly outshine the average British producer in handling subjects that require a beating of the big drum, so do the popular scientific writers in the foreign lay Press outshine their opposite numbers in Britain. We have frequently read foreign articles within the last two or three years written about British discoveries in which the British discovery is dismissed in a sentence and the whole of the remainder of the article is devoted to the glorification of the (quite subsidiary) part played by the scientists of the foreign country in question. It is perhaps too much to expect writers in the popular Press to make sure of their facts, but we believe that the British Council is supposed to look after things of this sort. Is the British Council doing its work or is it being hampered by a reticence on the part of Government Departments which is not shared by those of other countries? In the interests of our own position after the war this problem of publicising discovery must be tackled in earnest.

NOTES AND COMMENTS

A Film of Steam

GOOD plant-management and a small outlay in piping are the prime essentials towards steam economy in process works, and great savings can be effected in all works throughout the country. These are the straightforward and simple lessons to be learnt from the Ministry of Fuel's film "Steam," which was shown to a select audience of specialists at the Ministry of Information on Monday. The Fuel Efficiency Drive had good results up to last autumn, but several factors have combined to neutralise its effects—such as the improving war situation and the deteriorating coal situation—and there is a very real need to step up the efforts towards efficient and economical use of fuel if we are not going to find ourselves in an extremely awkward situation before the worst of the winter is over. The film, which is to be generally released on February 1, should prove of great service in the cause; and steam-users should take the opportunity of seeing it. Mr. S. Duguid's running commentary keeps the ball rolling nicely, although he himself had declared that it was impossible to illustrate steam-economy by the cinema. The photographs and animated diagrams are self-explanatory and can scarcely fail to suggest some methods of economising steam, especially since, as Mr. Oliver Lyle told us, in a brief speech after the display, that he has only been inside one factory which was not using *more than twice as much steam* as was necessary. Some, indeed, are still using four times as much as needful. Considering that it is practicable to reduce the excess over the theoretical to as little as 40 or 50 per cent., there can be few steam-users to whom the presentation of this film will not be worth while.

The Broom as Weapon

DURING this war, the people of this country had to learn, and learn quickly, about a number of new weapons of war. We do not refer to the beastly perversions of science hurled across the Straits of Dover by the Germans; but rather to food, petroleum, and other essential raw materials which overnight became vital munitions of war. Last but not least, industrial scrap materials and their importance in creating "Wealth from Waste" receive due attention in an Industrial Salvage Exhibition arranged at the Carlton Hotel, London, by the Ministry of Supply. Since Industrial Salvage Groups were initiated in the late autum of 1942, some 300 of them, embracing about 10,000 firms, have been formed to utilise waste materials. Waste utilisation, we imagine, does not come as a new discovery to anybody connected with the chemical industry, for the efficient use of by-products and wastes has for long been part of its routine. Yet there were many branches of industrial activity where the collection and utilisation of waste materials was ignored before the war. While the broom was not unknown as a weapon in other lands, it really made its appearance in this island as a result of the war. Whether this was due to an over-generous attitude on the part of industrialists, or whether it was just the result of their desire "not to be bothered," we do not seek to inquire. Yet the economic use of imported raw materials will continue to be of paramount importance in future years as a result of the changes in this country's balances of trade and payment.

Salvage in Action

TO mention a few of the achievements exhibited: many uses have been found for sawdust, which is now employed in the production of phenolic plastics and resin board, of bricks and tiles and industrial alcohol, as well as for fuel. Leather scrap is now being reconstituted and many ingenious uses have been discovered for paper, including the making of nuts and bolts. While the cleansing of used lubricants is a well-known process, the production of high-grade bronze alloys from scrap melts, the utilisation of the components of expended torch batteries in the manufacture of insecticides, the recovery of silver from old films, and the re-use of cellulose, as well as interesting developments in the manufacture of foundry core compounds, represent examples of purely war-time salvage methods. It is unfortunate that the Ministry, in its commendable desire

to achieve something, for once, without form-filling, did not think it necessary to give a picture of the quantities salvaged, of the products derived, and of the monetary values saved. It seems that an opportunity was thus missed to collect data which would have been useful in putting this young industry on a firm footing after the war. We welcome the news, however, that a beginning has been made.

Paper Control

IT is not often that we feel bound to apologise to our readers; it is our perennial wish to give value for money, but on occasion this wish is thwarted through no fault of our own. We feel that the time has now come to utter a protest on behalf of the trade and technical Press, which is being subjected to unjust discrimination from the point of view of paper supply. It is only with the greatest difficulty that technical journals in this country are able to fulfil their duty to their readers. Early in the war, Mr. Lyttelton, then Minister of Supply, stated that he would make no distinction among journals as to the supply of paper; the same rules were to apply to all. Yet when it is realised that our readers have a right to demand some sort of précis of the mass of bureaucratic ukases that emerge from our masters' requisitioned rabbit-warrens, it can be quickly seen that the apparent fairness of this rule vanishes into smoke. Last week, for example, we had to expend half a precious page on publishing a long and complicated Government regulation; had we omitted it, some chemical trader might have become worse involved with forms and departments than he is already. With chemical news of the first importance coming in from all sides, we could ill afford the room; yet, with irritating complacency, Government departments take this expenditure of space for granted. For many months we have held our hand, but now we think it only just to record this protest, unavailing though it may be, on behalf of the trade and technical Press.

"Empire Planet," the first British vessel to enter Barcelona Harbour since the beginning of the war, is loading up with 7000 tons of potash supplied by the Unión Española de Explosivos.

Textile Chemistry

Leeds University Refresher Course

THE Department of Textile Industries of Leeds University proposes to give a refresher course in Textile Technology, planned to occupy three months and intended for Service men with previous training in textile technology. The lectures occupy ten hours per week, leaving twenty hours for practical work. It is hoped that, at the end of the course, Service men will be fully acquainted with war-time developments. The syllabus includes ten lectures on textile chemistry, to be given by Professor J. B. Speakman, who will deal with the chemistry of proteins, with reference to the properties of wool and silk, and the synthesis of fibres from proteins of milk, peanuts (Ardil) and soya beans. A precise interpretation of existing processes will be attempted, and the development of newer ways of making wool unshrinkable, etc., described. The chemistry of cellulose and its derivatives, with reference to mercerising and the production of synthetic fibres, is another important subject to be dealt with, to be followed by a description of the production, properties, and uses of seaweed rayons. Lastly, the chemistry of polymerisation and the formation of synthetic resins will lead the lecturer into the wide field of plastics.

STEAM RAISING IN INDUSTRY

As a means of improving the performance of industrial steam-raising plant, and particularly to obtain more information about the performance of Shell-type boilers and their firing equipment, a committee has been formed by the British Coal Utilisation Research Association, in co-operation with the Fuel Efficiency Committee, to investigate and report upon methods of improving the performance of industrial boilers. This committee is under the chairmanship of Mr. W. L. Boon, its vice-chairman is Dr. E. S. Grumell, and its members are representative of the coal industry, the Shell Boilermakers' Association, the Stokers' and Furnace Makers' Association, and the Ministry of Fuel and Power. The committee has drawn up a comprehensive programme of research which is being conducted at the Royal Arsenal, Woolwich, and in institutions and industrial plants throughout the country. A great deal of valuable information is likely to be accumulated in the carrying-out of the work which will have an important bearing upon future design and performance.

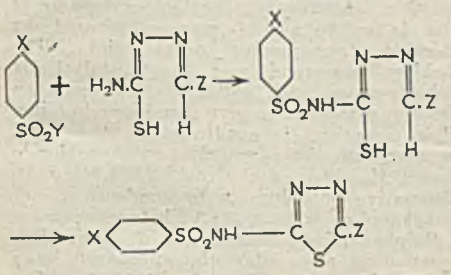
A programme of the work of the committee—officially entitled the R/16 Committee—can be obtained on application to the B.C.U.R.A., Rickett Street, London, S.W.6.

Progress in Drugs, Fine Chemicals and Biological Products in 1944—II

by G. COLMAN GREEN, B.Sc., F.R.I.C., A.M.I.Chem.E.

(*Continued from* THE CHEMICAL AGE, *January* 13, 1945, *p.* 57)

IN B.P. 564,092 Kinberg claims a method for preparing substituted benzenesulphonamido-1:3:4-thiodiazole. The parent substance is normally prepared by the condensation of a halogeno-thiodiazole with a suitable *p*-substituted benzenesulphonamide, or, alternatively, by the condensation of an amino-substituted thiodiazole and a suitably *p*-substituted benzenesulphonhalide. Kinberg, however, condenses the suitably *p*-substituted benzenesulphonhalide with the thiosemicarbazone of an aliphatic aldehyde, the thiosemicarbazone group being subsequently oxidised to the thiodiazole group:—



The 5-alkyl derivatives of the sulphathiodiazole compound are said to be especially effective in coccal infections, and they lend themselves to solubilisation by complex formation with ammonia and aliphatic amines (B.P. 563,936). These salt-like compounds are capable of forming concentrated aqueous solutions, are neutral in reaction, and cause no irritation to tissues when injected parenterally; both *p*H and concentration can be adjusted to give solutions of equivalent *p*H and isotonicity with body fluids. These substances are reported to be sufficiently soluble to be easily absorbed from salves, or they can be dissolved in the continuous phase of an oil-in-water emulsion (B.P. 563,961).

De Laszlo and Banmeyer (B.P. 561,223) state that, in the usual method of preparing sulphapyridine, the use of excess acid acceptor in the condensation stage promotes the formation of gummy substances which make isolation difficult. They claim that the formation of these gummy substances may be avoided by the use of an inert diluent such as benzene or toluene, and, particularly, by an aliphatic ketone such as acetone or methylethylketone, good yields being maintained.

B.P. 560,601 applies to the combination of sulphanilamide with a phenol having at least an alkyl or alkoxy substituent. The condensation follows the classical lines and in one example 2-methoxy-4-aminophenol is used. Butler *et al.* (B.P. 559,775) claim sulphanilamide derivatives carrying naphthols with substituents in the 2-position, as, for example, 4-(*p*-aminobenzenesulphonamido)-2-allyl-1-naphthol and the anologous naphthoic acid compound (*i.e.*, with a carboxyl group in the 2-position).

B.P. 562,763 claims N^4-carboxy-acyl substituents in sulphanilamide derivatives. The preparation of both the N^4-succinyl- and N^4-phthalyl- derivatives is discussed in this patent, by, for example, heating the carboxylic acid (or its anhydride or ester) with *p*-aminobenzenesulphonamidothiazole in an inert reaction medium. The succinyl-derivative, sulphasuxidine, has been in use for some time, with sulphaguanidine, to combat infection in the lower digestive tract and in abdominal surgery. Their characteristics are lack of bacteriostatic activity *in vitro*, but satisfactory activity in the lower bowel where hydrolysis occurs. Poth and Ross have described the efficacy of sulphaphthalidine (phthalylsulphathiazole) which they find to have two to four times the bacteriostatic activity, in the bowel, of the corresponding succinyl compound, and the enhanced effect is ascribed to the greater hydrolysis *in situ* of the former compound. The blood levels attained by the two drugs remain about the same, indicating that neither is likely to have advantage over the other so far as renal complications are concerned.

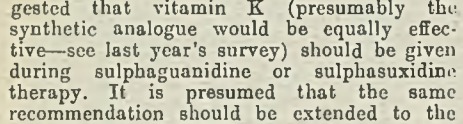
Contrary to the general view, Scadding (*Lancet*, 1944) finds no difference between sulphanilamide, sulphapyridine, and sulphaguanidine in the treatment of *mild* bacillary dysentery. The main advantage in the use of the last compound is the almost complete absence of side-reactions; whereas the need for a large fluid intake with sulphapyridine to avoid renal complications is an undesirable additional load in a dehydrating disease. The author considers that sulphanilamide has been neglected in the treatment of this disease.

Sulphonamides and Vitamin K

Barling has pointed out that, in experimental animals, the use of highly insoluble sulphonamides used in bacteriostasis in the lower bowel (*e.g.*, sulphasuxidine, sulphaguanidine) causes the clotting time of blood to be increased and a reduction in the growth

rate of the animal. This is ascribed to the fact that vitamin K is produced by the intestinal flora, the development of which is inhibited by the sulphonamides. The effects were negatived by the administration of *p*-aminobenzoic acid or liver extract, while the hypothrombinæmia was corrected by administration of vitamin K. It is suggested that vitamin K (presumably the synthetic analogue would be equally effective—see last year's survey) should be given during sulphaguanidine or sulphasuxidine therapy. It is presumed that the same recommendation should be extended to the use of sulphaphthalidine.

Extending this class of sulphonamide drug, the Geigy Colour Company (B.P. 563,621) describe sulphonamide compounds with a guanidine residue attached directly to an aromatic ring system. These compounds are claimed to have valuable bactericidal properties. The sulphanilamide derivative with an unsubstituted *p*-amino group is, in general, condensed with cyanogen bromide. Special consideration is given to the diphenyl-4 : 4′-disulphonamides containing the sulphapyridine, sulphathiazole and sulphaguanidine residues.

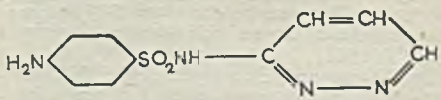


A simple method of preparing sulphanilyl guanidine from readily available, relatively cheap starting material has been protected (B.P. 563,766). It consists principally and preferably in heating the calcium salt of acylsulphanilyl cyanamide with an ammonia-yielding substance, such as ammonium nitrate or urea, at such a temperature that ammonia is liberated but no decomposition of the cyanamide compound occurs. Suitable temperatures are in the region of 200° C., and the time of heating is as short as 10 to 15 minutes.

Roblin *et al.* in 1940 found 4-(*p*-aminobenzenesulphonamido)-pyrimidine to be inert; but substitution of the sulphanilyl group in the 4-position of the pyrimidine group with or without methylation of the pyrimidine group in the 4-position gave bacteriostatic compounds of good activity. B.P. 560,345 discloses the finding of polyalkyl pyrimidine derivatives to be superior in activity and well tolerated. For example, 2 - (*p* - aminobenzenesulphonamido)-3 : 6-dimethyl-pyrimidine and 6-*p*-aminobenzenesulphonamido)-2 : 4-dimethylpyrimidine are stated to be much more active than hitherto known sulphonamido-pyrimidines. It is to be noted that the 4 : 6-dimethyl-pyrimidine compound was available, under the name "sulphamezathine," for clinical use in this country, and was referred to by the writer of these notes last year. First synthesised in U.S.A. in 1941, it was tested clinically in this country and reported upon by Macartney *et al.* in 1942. The corresponding 4-methyl derivative synthesised by Roblin and co-workers in U.S.A. in 1940, and extensively explored there both clinically and pharmacologically during 1942-43, was available in this country in 1943 under the name of "sulphamerazine." Clinical application of this compound was deferred pending pharmacological exploration, in view of its possession of the methyl group. It was feared that by analogy with uleron (4-(4′-aminobenzenesulphonamido) - benzenesulphondimethylamide) and sulphamethylthiazole, methylation might lead to peripheral neuritis when the drug was administered to man; but fears on this score were dissipated. The route used by Roblin in the preparation of these compounds was to prepare formylacetic acid from malic acid and to condense it with guanidine sulphate in fuming sulphuric acid to yield isocytosine. The hydroxyl group of the latter compound was substituted by chlorine (phosphorous oxychloride). The 4-chloro compound was then catalytically dehalogenated with palladium hydroxide on calcium carbonate to give 2-aminopyrimidine. This compound is condensed in the usual manner with the appropriate sulphonchloride (*see* B.P. 559,455 and U.S.P. 2,224,811). An alternative procedure is to condense a sulphaguanidine with a -1 : 3-diketone.

Sulphonamido derivatives of pyrimidine compounds are, *inter alia*, prepared by a route described in B.P. 557,055. For example, *p*-nitro-benzene-sulphonyl chloride is condensed with 2-aminopyrimidine in ether to give 2-(*p*-nitro-sulphonamido)-pyrimidine which may be oxidised by alkaline permanganate to the corresponding sulphonamide. Polyalkyl-pyrimidine derivatives, such as -4 : 6-dimethyl-, may also be prepared in this fashion.

The preparation of sulphanilamido-pyridazine is described in B.P. 563,629. Members of this series are stated to show considerable chemotherapeutic activity. The condensation follows the usual lines.

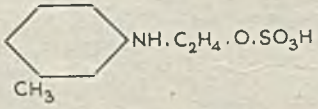


3(p-*aminobenzene-sulphonamido*)-*pyridazine.*

A simple test for the detection of sulphonamides in urine depends upon a colour reaction between the arylamine group in the drug and crude cellulose. Newspaper is moistened with the urine and a small drop of 1 : 4 hydrochloric acid is placed in the centre. The immediate appearance of an orange colour indicates the presence of sulphonamide. The test appears to be specific so far as the normal range of drugs likely to be

administered is concerned. The value of so rough a test is to help with patients where evidence of previous medication is unsatisfactory.

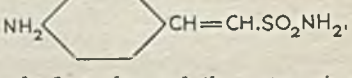
The methods available for estimation of sulphonamides in body fluids were collected in Appendix No. 1 of War Memorandum No. 10 ("The Medical Use of Sulphonamides," 1943) referred to by the present writer last year. The most satisfactory method to date was the colorimetric method of Bratten and Marshall in which the sulphonamide is diazotised and coupled with N^4-(1-naphthyl)-ethylenediamine to give a red colour. Scudo and Julinek claim that the sensitivity of the method may be increased by from five to ten times by extracting the colour with butanol, thus extending the application of the method to lower ranges of concentration. The method was complicated by the necessity for removing excess of nitrite by addition of ammonium carbamate or urea. This operation is avoided in a method devised by Rose and Bevan (*Biochem. J.*, 1944). These authors examined a large number of dyestuffs intermediates to find one that gave a freely soluble colour with sparingly soluble drugs. The coupling component that they recommend, which has already been made available to hospitals and which has the further advantage over the Bratten and Marshall reagent that it does not form coloured compounds with nitrite, is N-β-sulphato-ethyl-*m*-toluidine.



Before diazotising in the colorimetric method for estimating sulphonamides in body fluids, it is necessary to clear the fluid under examination of cellular material and proteins by treatment with trichloracetic acid. The question arises as to the amount of the drug so removed on account of its being bound to the protein. Bell and Roblin (1942) found that the drug so bound was not bacteriostatically active. Davis (*J. Clin. Invest.*, 1943) found the drug was bound by plasma albumin but not by globulins or lipoid complexes, and suggested that the drug was bound electrostatically to positively-charged areas on the surface of the protein molecule. The proportion of drug so bound varies directly with the protein content of the plasma and inversely with the concentration of the drug. Davis finds the following amounts of drug bound to protein when the concentration of the drug in the plasma amounts to 10 mg. per 100 ml.: sulphanilamide 5 per cent.; sulphapyridine, 10 per cent.; sulphadiazine, 21 per cent.; sulphathiazole, 55 per cent. Davis suggests that there is a relationship between anionic dissociation at the *p*H of the body fluids and relative antibacterial activity, and thus concludes that, possibly, only the anionic form is the active form.

In this last connection Klotz (*J.A.C.S.*, 1944) believes that the simple assumption that a sulpha-drug is active only in the anionic form is sufficient to explain the mode of action without developing a more elaborate hypothesis. He demonstrates that the combination between the anion and an enzyme can be shown mathematically to account quantitatively for the known aspects of bacteriostasis, including the antagonism by *p*-aminobenzoic acid. Klotz claims that the application of the law of mass action is comprehensive but emphasises that the equations derived by him describe a necessary condition and not a sufficient one; metanilide, for example, satisfies the condition but is inactive. He concludes that there is probably in addition, therefore, some structural factor.

Kimber and Daniels earlier suggested that the resonating form of the *p*-amino group with a separation of charge is a fundamental factor in the bacteriostatic activity of the sulphanilamide-like compounds. Such a correlation has also been attempted in the aminoacridine group, when Albert *et al.* (*J.C.S.*, 1943) showed that the high degree of ionisation due to the greater degree of resonance in the ion than in the unionised base was paralleled by biological activity, the maximum effect being attained within this group by 5-aminoacridine. Bell, Bone and Roblin, however, produce arguments against the application of the hypothesis within the sulphonamide group of drugs (*J.A.C.S.*, 1944), while Badwell and Klotz contest the theory by finding a vinylog, 2-(*p*-aminophenyl)-ethene-1-sulphonamide, to be inactive *in vitro*.



Woods first observed the antagonism between sulphanilamide and *p*-aminobenzoic acid which led to the explanation of the mechanism of the action of sulpha-drugs along the lines that *p*-aminobenzoic acid is an essential metabolite with which sulphanilamide competes for a substrate. In the meantime a number of compounds have been found which antagonise the bacteriostatic action of the sulpha-drugs, but which are unrelated to *p*-aminobenzoic acid. Mention has been made of *dl*-methionine, adenine, guanine, and hypoxanthin, and more recently (*Nature*, 1944, 3916) of 2-aminopyrimidine-5-carboxylic acid. The degree of antagonism exhibited by these compounds varies with the conditions and the test organism. Domagk throws further

doubt on this substrate-competition theory. He points out that marfanil (*vide supra*) is not inhibited by *p*-aminobenzoic acid, either *in vitro* or *in vivo* (mice) and that sulphapyridine-resistant pneumococci are not resistant to marfanil. Moreover, he claims further support from the fact that the therapeutic action of sulphonamides in cases of gonorrhœa was not affected by the administration of large quantities of *p*-aminobenzoic acid. It is becoming increasingly clear that the mechanism of the action of antibacterial substances is more complex than was at first thought.

Sulphonamide-Sensitivity

Sulphonamide-sensitivity is necessarily receiving increased attention. Local application of these drugs may produce epidermal sensitisation such that subsequent administration in effective does may be precluded on account of allergic reactions. Taste and Kler (*Lancet*, 1944) regard the risks of sensitisation as being so serious and the difficulties in the way of certain and permanent desensitisation as being so great that they take the view that topical application in skin diseases and for minor injuries is unjustifiable. Park (*B.M.J.*, 1944) finds that sensitisation may occur from either internal or external application, and describes the syndrome. He found that in 60 per cent. of the cases he examined the allergy was confined to one sulphonamide drug; 40 per cent. were allergic to more than one sulphonamide drug and to sulphanilic acid. Moreover, in the latter group about half the allergy was due to the sulphonamide radical (NH_2-$C_6H_4SO_2$-) whereas the rest were allergic to the amino-phenyl radical ($NH_2C_6H_4$-). Reactions in the latter group also occurred with procaine ($NH_2C_6H_4$·$COOCH_2CH_2$-$N(C_2H_5)_2$).

Skin tests for determining latent sensitivity towards sulphonamides being unreliable, Leftwich (*Bull. Johns Hopkins Hosp.*, 1944) has proposed an intradermal test which, it is claimed, is successful in 93 per cent. of sensitised cases. The theory is that the sulphonamide combines with plasma protein (albumin?; *vide supra*) to form an antigen, the attached sulphonamide functioning as a specific hapten. Intradermal injection of the hapten would give an allergic skin reaction if the subject were hypersensitive. Blood is collected from patients who have been receiving sulphonamides for five days and who have a blood level of 2 to 25 mgm. per 100 ml. The serum is injected (with adequate control) and a weal develops with an intense, rapidly-extending, erythema reaching a maximum in 15 min. and fading in 1½ hours when the subject is hypersensitive. The test is stated to be highly specific, and few patients known to be sensitive to one sulphonamide drug react to another. Jackson (*Lancet*, 1944, 6317), however, has been unable to confirm Leftwich's work and it seems that further exploration of the technique of the test is necessary.

Tate and Klorfajn summarise the sensitisation and desensitisation mechanism, by the use of the Law of Mass Action. A is the allergen (sulphonamide), contact with which causes the production of antibody, B, which is fixed in the epidermal tissues. Desensitisation may be brought about by oral administration of the drug to which the subject is sensitised by stepping up doses over 8 or 9 days (*Lancet*, 1944, *1*, 406). After absorption during this desensitisation it is presumed that the drug (allergen) reacts with the antibody to produce substances C and D which are slowly excreted.

Allergen + antibody (fixed in the epidermis) → slowly excreted products of the reaction.

$$A + B \rightarrow C + D.$$

The hypothesis is that the application of A to the skin at a greater rate than that at which C and D are excreted causes greater sensitisation; but continued administration of A *per os* in small quantities, to displace the reaction to the right, causes ultimate elimination of the antibody, and desensitisation. The product of the reaction due to this desensitisation process requires about 14 days to be excreted, and this is approximately the period of the desensitisation treatment. Clinical evidence is produced in support of the theory. Desensitisation by administration of the allergen is not, of course, a universally applicable technique. It could not be applied, for example, in contact dermatitis due to morphine, a form recently discussed by Dore, Prosser Thomas, and the author of these notes (*Br. J. Derm. and Syph.*, 1944, *56*, 177), on account of the obvious consequences of administering this and such like drugs.

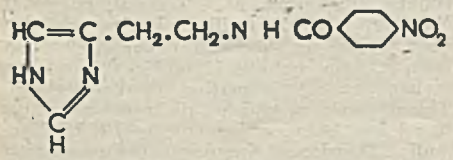
Immunological aspects of sulphonamide hypersensitivity have been discussed above and Harrington ("The Contribution of Chemistry to Immunology"; *Chem. and Ind.*, March 4, 1944, 87) discusses hypersensitivity of individuals to relatively simple substances like "tetryl" (2 : 4 : 6-trinitrophenylmethylnitramine), formaldehyde, and diazomethane. These substances all have the property of being able to react with amino groups and thus to couple with a protein molecule to produce a substance which is foreign to the body and acts as an antigen. The antibodies are not necessarily confined to the blood-stream but may be confined in particular tissues. In the guinea-pig, for example, the main site of attachment is in the bronchial musculature, while in man the site of fixation of antibodies in tetryl sensitisation is

in the skin. In the latter case it is reasonable to suppose that the antibodies are produced by combination between tetryl and skin proteins. In this Jubilee Memorial Lecture, which will repay careful study, Harrington also summarises the chemical, structural, and biological aspects of natural and artificial antigens, especially those features which confer specificity.

The Chemistry of "Shock"

"Shock" is a complex phenomenon which is likely to be brought about by a number of causes in differing degrees and varying forms and there is no satisfactory explanation. There is a very large body of evidence in support of the theory that histamine (4-β-iminazolyethylamine; formed by decarboxylation of the amino acid histidine) is a factor in the chain of events leading to the manifestations of "shock." Like acetylcholine, histamine is normally locked in the form of some complex within the tissue cells but is released when one form or another of damage is suffered by the cells. One form of damage, for example, is caused by the antigen-antibody reactions discussed above which may take place within the tissue cells and cause the release of histamine. Free histamine causes contraction of plain muscle, causes dilatation of the capillaries, with consequences to be discussed later, and is likely to cause distressing anaphylactic and allergic responses.

To combat such responses there has been made available in this country during the past year a histamine-azoprotein complex (Lertigon) prepared by coupling *p*-aminobenzoyl histamine with a non-sensitising protein. Injection produces artificial immunity to histamine and combats those allergic conditions in which it is believed histamine released from tissue cells plays the important part. Allergic forms of asthma, contact dermatitis, eczema. urticaria, and vasomotor rhinitis are conditions in which this therapy may be indicated. B.P. 562,169 describes, *inter alia*, a method of preparing a histamine-azoprotein antigen. Histamine is condensed with *p*-nitro benzoyl chloride in hot chloroform-ether solution to give imidazolylethyl-*p*-nitrobenzamide:



This nitro derivative is reduced to the corresponding amino compound which is then diazotised. The diazonium salt is added to the protein selected (*e.g.*, horse serum globulin or egg albumin) at *p*H 8.1-8.2 in an ice-bath. The antigenic complex is precipitated by acid, separated, purified, and ampouled at a *p*H of about 7.6. This patent also mentions, as an example, an antigen containing a sulphanilamide grouping in which *m*-nitrobenzene sulphonchloride is used in place of the *p*-nitrobenzoyl chloride quoted above.

One of the symptoms of secondary shock which follows some five hours after wounding is the decreased volume of blood in circulation even where no hæmorrhage has occurred. This is considered to be due to histamine, released from tissue cells, causing dilatation and increased permeability of the capillaries which permits plasma to leak into the extravenous tissues. Up to half of the plasma in circulation (which is not more than 4 litres) may be lost in this way. It is important that blood volume should be restored as early as possible and a number of methods are available.

The principal method is the infusion of plasma collected from healthy individuals. There may be considerations involved other than mere restoration of blood volume, *e.g.*, the restoration of the oxygen-carrying capacity of the blood, the provision of clotting factors, leucocytes, antibodies, etc. But for restoration of volume alone, especially where excessive dehydration has occurred, isotonic solutions of sodium chloride, with or without dextrose, have long been used. They have, however, the disadvantage of rapid secretion, whereas it is desirable that the fluid supplied should be well retained. It is also an advantage for the fluid to contain metabolic materials such as protein hydrolysates to assist tissue repair.

Treatment of Burns

Rosenthal in the U.S. has explored the use of isotonic sodium lactate, and this salt, when administered to 35 patients of whom 20 were suffering from third-degree burns (*i.e.*, burns of such severity that partial destruction of the true skin has taken place with exposure of nerve endings), resulted in no deaths although no plasma was given. Parkins has found gelatin solution effective with dogs with standardised experimental burns; but plasma-infused dogs survived longer. He suggests there may be a factor in plasma which, if it could be isolated, could be added to the gelatin solution to make it equally as effective as plasma in maintaining the blood pressure. Isinglass has also been found effective in Canada and Britain and to be without toxic effect as well as having some metabolic value. Both gelatin and isinglass are, of course, readily available. Ox-blood is likewise obtainable from the slaughterhouses, and the use of this is being explored as the supply is virtually unlimited. Unfortunately, bovine serum is not wholly

innocuous to man, and Edwards (*B.M.J.*, 1944) is working on "despeciated" bovine serum. Cohn seeks to eliminate the complication of handling the bulk of the fluid by isolating a crystalline albumin fraction which is effective in a volume of 25 ml., fluid, of course, being supplied additionally at the time of administration.

For better retention of saline, acacia gum may be added, and such a preparation is given in the B.P. The use of gum acacia or gum arabic for this purpose was introduced by Bayliss, and the preparation has long been known to give variable results. Maas has found that when calcium was replaced by sodium in an otherwise satisfactory preparation the saline became as lethal as the unsatisfactory solutions, an effect which could be corrected by the injection of calcium chloride. Consequently, Maas developed the use of pure calcium arabonate.

Standard Needed for Plasma

The main difficulty in using human blood and plasma is the huge and cumbersome organisation required to collect, store, and deliver to the patient. In a thousand-bed hospital 1000 pints of blood per annum may be required with an additional 1000 to 2000 pints for the preparation of stable blood substitutes such as plasma and albumin. Methods have been devised for returning to blood-donors the blood-cells after withdrawal of plasma. In avoiding depletion of these elements the donor may be bled more often. While monographs exist in the British Pharmacopœia relating to various antitoxic sera, no monograph yet lays down standards for plasma. Todd and Milne (*Pharm. J.*, 1944) suggest the omission should be rectified and recommend appropriate tests for identity, purity, and methods of storage.

However, when all the difficulties are considered, the administration of human venous fluids remains the most satisfactory method at present, and much work has been done to reduce the volume of the blood by desiccation. Ordinary evaporation methods are inapplicable owing to aggregation and denaturation of the protein in the fluid. The only possible technique is so-called "freeze-evaporation," involving freezing of the fluid and sublimation of the ice. For optimum results the evaporation must be conducted rapidly below the eutectic point of the material. The technique and apparatus have been reviewed by Greaves (*Nature*, 1944) who describes a method he has devised. This consists of "freeze-evaporating" while spinning the fluid in a vessel set off-centre, an arrangement that prevents bubble-formation and frothing, and at the same time permits the maximum surface for evaporation.

(*To be continued*)

East African Industries

Local Raw Materials Developed

THE East African Industrial Research Board, Nairobi, has recently published its first annual report, a 35-page brochure, describing how factories for the manufacture of caustic soda, pottery, firebricks, and many other products, came into being. The report outlines the utilisation of animal and vegetable products, the processing of castor oil, linseed oil, soap, glycerine, and fish and vegetable oils of many kinds. Research work on drugs and vitamin products included investigations of a wheat-germ by-product of a Nairobi flour mill. The discovery was made that this wheat germ has a vitamin-B content not much inferior to that of certain imported proprietary foods, and the local wheat food is now being sold widely over East Africa.

Vegetable insecticides, vegetable fuels, leather and its by-products, and improvised malt from local barley, have all entered into the Board's research activities. The manufacture of caustic soda out of soda ash from Lake Magadi, and the making of local pottery, bricks and tiles from East African clay, have proved successful. A great deal of work has been devoted to the manufacture of lime by railing rock coral from the coast, to be burned at the Nairobi factory in locally-improvised kilns. A black paint has been made from a mixture of ground charcoal and local graphite schist.

Through its Inventions Committee, the Board has advised on some 40 inventions received from the East African public, and has arranged to send on those which show any promise to the proper authorities in the United Kingdom.

RUBBER MEMORANDUM

"Sundry Synthetic Rubbers" is the title of Manufacturers' Memorandum No. M.13, issued by The Services Rubber Investigations on behalf of the Ministries of Supply and of Aircraft Production and the Admiralty. The purpose of the memorandum is to describe other synthetic rubbers than Buna S and Neoprene. A section is devoted to a detailed description of the new synthetic rubber Vulcaprene A. Thiokol, polyvinyl chloride, and rubber-like plastics are also dealt with in separate chapters. The memorandum contains 17 tables, the last one giving physical properties of thermoplasts. The research on which this memorandum is based has been carried out by I.C.I., Dyestuffs Division. Inquiries in connection with the memorandum should be addressed to the Ministry of Supply, Advisory Service on Plastics and Rubber, Berkeley Court, Glentworth Street, London. N.W.1, or to Dr. J. S. Naunton, Hexagon House, Manchester, 9.

Scotland's Natural Resources

Movement for their Full Utilisation

THERE is a healthy tendency observable throughout Britain towards taking steps to make sure that we shall not, after this war, find ourselves in a slough of depression similar to that with which we were afflicted in the 1930's. Good progress has been made in Cumberland and the North-East, and alert minds in Scotland are now laying plans for the establishment of sound principles for post-war employment there also.

In a recent article in *Discovery*, Mr. R. H. S. Robertson, Research and Scientific Adviser to the Scottish Co-operative Wholesale Society, Ltd., has something of interest to say concerning both the past and the future of Scottish industry and of the possibilities (and actualities) of scientific research. He draws attention, for example, to the remarkable changes of fortune of the Scottish chemical industry.

Scottish Chemical Industry

Scotland, he points out, once possessed at Prestonpans the largest sulphuric acid works, and later at St. Rollox the largest chemical works in the world. Many old-established chemical firms failed to keep pace with the times by doing research and development work; they were all too often bought up and closed by their bigger and more progressive southern competitors. Attention to research has enabled a few chemical firms to survive in Scotland; alkaloids and chrome salts come to mind. On the other hand, a good example of Scottish research and enterprise, the Cassel Cyanide Co., which, even as late as 1922, was the largest producer of cyanide, was closed down under a rationalising scheme and its activities transferred to England. I.C.I., however, has two large chemical research groups in Scotland. At Grangemouth, research into dyestuffs continues the work so splendidly begun by Morton; here it was that the famous Monastral Blue and related pigments were discovered and first made. Extensive research is now being done there on drugs. At Stevenston, the research has always been mainly applied to explosives, though other products have received attention. The general picture, then, is that the chemical industry in Scotland shows too high a degree of specialisation, and is on too small a scale.

Scotland's proportion of the gross industrial production of Great Britain fell from 9.9 per cent. in 1924 to 8.2 per cent. in 1935; this decline is even more apparent when it is realised that between 1932 and 1937, 3217 factories were opened in England and Wales, but only 127 were opened in Scotland. In the same period 133 Scottish factories closed down.

For some years before the war attempts were made to improve matters by building trading estates in the hope of "attracting" industry to Scotland, but the results were disappointing. To-day, the Government's policy of dispersal has resulted in the starting up of branch factories of many light industrial firms in Scotland; since 1942 some 5000 new industrial enterprises or extensions or adaptations of existing factories, plant or production have been authorised in Scotland. About £11,000,000 have been spent by the Supply Departments on buildings and plant in Scotland.

The Research Position

As regards research, although there are many world-famous research institutions in Scotland, and although research into the use of new products is going on (as has been recorded in our columns), many of the raw materials in which Scotland is relatively rich are not usually given the attention which their importance or potentialities should command. Forestry research, for example, needs greatly strengthening in Scotland, while the hydro-electric resources of Scotland would warrant a Hydro-Electric Research Institute. Mr. Robertson mentions the electrical de-watering of peat and diatomite, the dialytic extraction of potassium from felspar, the electrostatic separation of talc, chromite, and other minerals, and the development of mineral industries which might use electricity for normal or fine grinding, and so on. The eradication of bracken by means of calcium cyanamide and manganese sulphate is worth a full-scale trial. An example of failure to make use of the results of applied scientific research is the fact that no firm in Scotland regenerates used lubricating oil.

Happily, there are some Scotsmen who are beginning to realise that they have to stand on their feet and to co-operate. Recently, the Scottish Seaweed Research Association was formed, in addition to a Scottish Slate Quarries' Association and an association of limestone quarry owners in the West of Scotland. A new branch of the Institute of Fuel had very successful meetings last winter, and a branch of the Institute of Physics has been formed. An association of Dairy Chemists is in process of formation. On a larger scale, Glasgow Corporation's post-war planning committee is considering the formation of a municipal department of industrial research to attract industry to the district.

The Scottish Council on Industry is

making investigations into the use of such natural resources as felspar, flagstones, dolomite, silica, limestone, seaweed, and slates, but the fruits of these investigations will be very disappointing unless they are continuously experimented on in a well-equipped and well-financed laboratory. If this research laboratory were set up it could be part of a larger institution in which all kinds of inventions could be investigated, and in which some of the 26 trade research associations could, if they desired, maintain a Scottish branch fairly economically. In Mr. Robertson's opinion it might help to develop a pioneering spirit of enterprise in Scotland, now sadly lacking, and a spirit of co-operation and social purpose.

Development of the Highlands

Mr. Robertson has gone even farther than this. In an address to the Glasgow branch of the Highland Development League, in which he deprecated the fashion of describing the mineral resources of the Highlands as negligible, he advocated that the Government should initiate a vigorous policy of research and development, for it was only vaguely realised that the Highlands had some rich mineral and agricultural raw material resources. It was satisfactory, he said, that the new seaweed industry was based not only on agricultural applications but also on the uses of alginates and the possible extraction of iodine, potassium salts, and mannitol. Peat also might be a source of many products.

Study circles and popular meetings could be the means of spreading a knowledge of the chemical resources of the Highlands and creating a demand for their utilisation; and he pleaded for a university located in the Highlands, with a department for scientific and industrial research.

Non-Ferrous Metals

The need for a wiser policy in the development and exploitation of Scottish mineral resources was also emphasised by Dr. T. Robertson, Geological Survey of Great Britain, in a recent lecture on "Scottish Mineral Deposits" before the Scottish section of the Institute of Metals in Glasgow.

Although metal mining had never been an industry of the first importance in Scotland, the Leadhills district was, nevertheless, an example of steady exploitation extending over a period of 300 years, yielding an estimated total of half a million tons of lead concentrates. Other areas in Scotland which had yielded considerable amounts of lead ore included Western Kirkcudbrightshire, Islay, Tyndrum, and Strontian.

The chief occurrences of lead, zinc, copper, and barytes in Scotland lay in three N.W-S.E. zones, and it was there that further investigation should be carried out.

In addition to metalliferous veins, Scotland had valuable bedded deposits of minerals extensively used in the metal and allied industries. These included the fireclays of Lanarkshire and Ayrshire, which were of higher quality than those found elsewhere in Great Britain, the crystalline limestones of the Central Highlands and of Banffshire, and the thick beds of dolomite and of silica rock in the N.W. Highlands.

Research in India

A Valuable Journal

THE September issue of the *Journal of Scientific and Industrial Research*, published by the Council of Scientific and Industrial Research, Delhi, has just reached this country. Since its foundation only two years ago, this monthly has become a first-class forum for the discussion of scientific developments, pure and applied.

The current number contains a reprint of a highly interesting lecture, delivered under the auspices of the Institution of Engineers (India), by Sir Shanti S. Bhatnagar—who visited this country recently as a member of a group of leading Indian scientists—on the subject: "Some Scientific Factors in the Post-War Industrial Development of India."

Another article deals with the development of electro-chemical industries in India, while the future of natural rubber is being discussed by Messrs. G. T. Verghese and M. A. Govinda Rau. The nitration of chlorobenzene, the influence of certain factors on the magnetic properties of electric steel sheets, and the manufacture of soluble barium salts from barytes are three important subjects dealt with in signed articles. The number is rounded off by notes and news and by reports from states and provinces, as well as by a list of Indian patents. Those interested in the advancement of science in general, and in its progress in India in particular, will surely find the journal of permanent value.

CHEESE-MELTING SALTS

In an examination of cheese-melting salts for the manufacture of "processed" cheese of the Cheddar type, H. J. Palmer and W. H. Sly, of Swift & Co., Ltd., London, S.E. (*J.S.C.I.*, 1944, *63*, 363), conclude that sodium citrate, though comparatively expensive, is the best melting-salt known to the industry. It is a powerful emulsifying agent, easily soluble at all temperatures, and conserves the natural cheese flavour while conferring great stability on the processed product. The authors have found mixtures of sodium citrate with small proportions of disodium orthophosphate to give even better results than the unmixed citrate. Canned cheese processed with a 9 : 1 mixture of citrate and orthophosphate has been stored for periods up to four years without appreciable deterioration.

Parliamentary Topics

D.S.I.R.

IN the House of Commons last week, Sir E. Graham-Little asked the Lord President of the Council whether he would appoint a public relations officer to the D.S.I.R.

Mr. Attlee replied that the measures taken before the war to extend knowledge about the Department's work were now being resumed and that it was proposed to expand them considerably in the post-war period. He felt, however, that the suggested appointment would not be appropriate.

Fertilisers

Rear-Admiral Beamish, who asked the Minister of Agriculture whether he was aware of the shortage of fertilisers in East Sussex owing to delay in delivery, and that a good deal of winter corn had had to be planted without any, was told by Mr. T. Williams that apart from a restricted supply of basic slag, the Minister was not aware of any general shortage of fertilisers in East Sussex. Sea transport had been employed for the movement of fertilisers to this county and would continue to be used whenever practicable.

Fuel Economy Equipment

Relaxation of Licensing Standard

TOWARDS the end of 1943, the Ministry of Fuel and Power, in reviewing the progress of the Fuel Efficiency Campaign, considered that, notwithstanding the excellent results that had been achieved by improving the efficiency with which fuel was being used in industry, even greater savings were required. To secure these, they decided that some relaxation was necessary in the rigid restrictions which then existed on the manufacture and installation of fuel economy plant. Agreement was reached with the Ministry of Production, and arrangements were made both to increase the availability of fuel economy equipment and to simplify the procedure for the granting of licences and material allocations required for approved fuel economy schemes. It was agreed that licence applications would be considered if the total capital cost of installation would be repaid, within 2½ years from the date of licensing, by the value of the fuel that would be saved. During the last 12 months, over 2000 licences have been granted, corresponding in aggregate to an estimated saving of 433,000 tons of fuel per annum.

It is clear that utmost economies must continue, not only during the present winter, but for some considerable time thereafter. For this reason, it has been decided to make the licensing of fuel-saving plant still easier. In future, schemes that will repay the capital expenditure within four years (instead of 2½ years) will be considered. Schemes which have been rejected because they did not conform to the 2½-year standard can now be reviewed. Applications for licences under the new standard should be made to the Secretary of the Regional Fuel Efficiency Committee at the appropriate Regional Office of the Ministry of Fuel and Power.

Coal Gas and Crops

Hydrocarbon Gases for Seed Potatoes

AT the Botanical Institute of the Agricultural College at Brno (Czechoslovakia) some interesting experiments have been in progress since 1940 to increase yields by treating seed potatoes with hydrocarbon gases, *e.g.*, coal-gas, acetylene, and Fischer-Tropsch synthesis gas. According to a recent report (*Chem. Eng. News*, 1944, *22*, No. 11) systematic trials with individual components of coal-gas have shown that satisfactory results can be obtained, but care must be taken in dosing. Ethylene, for example, is poisonous in concentrations of more than 4.5 per cent. Acetylene, propylene, and butylene have also been separately examined. Besides ordinary coal-gas, fuel gas obtained by the Fischer-Tropsch synthesis has been tried out with good results, because of the unsaturated hydrocarbons, propylene and butylene which it contains. According to the report, coal-gas has been found to provide a simple and effective means for increasing crop yields. The seed potatoes were treated without difficulty in gas-tight chambers, the cost involved being much less than that of hormone treatment. Potatoes obtained by this method are said to have a higher vitamin content and are larger than the average. Best results were obtained with a 7.5 per cent. concentration, while with synthesis gas higher concentrations, of up to 20 per cent., were required for optimum results. It is hoped that coal-gas treatment may give similar results for sugar-beet, lucerne, and possibly wheat. A higher sugar content was noted in the potatoes shortly after the treatment.

MULLARD WIRELESS SERVICE CO., LTD., Century House, Shaftesbury Avenue, W.C.2, have just issued a leaflet describing their Electrometric Titration Apparatus, Type E920, designed to supply the need for a robust, self-contained potentiometric titration apparatus which is sufficiently simple to be used in routine testing by unskilled operators and yet capable of meeting the requirements of the industrial research chemist.

Personal Notes

MR. M. G. TALBOT RICE has been elected to the board of J. C. & J. Field, Ltd.

MR. PHILIP RANDALL has been appointed a director of the Kolok Manufacturing Co., Ltd.

New directors of the British Thomson-Houston Company are MR. W. W. VINSEN, manager of the Coventry Works, and MR. E. S. LITTLE, comptroller and head of the accounting department.

MR. R. B. WILSON, A.R.I.C., and MISS B. M. BARCLAY have been awarded the degree of Ph.D. by the University of Edinburgh for theses on "Studies in the Benzanthrone Series" and "Studies in the Carbazole Series," respectively.

DR. C. RIMINGTON, Ph.D., B.Sc., has been appointed, from May 1 next, to the chair of Chemical Pathology of London University, tenable at University College Hospital medical school. Since 1937 he has served on the National Institute for Medical Research.

Obituary

MR. F. HUDSON-COX, F.R.I.C., who died at Weymouth on January 20, aged 80, was trained as a pharmacologist and served as analyst to a number of companies, including the Hydralene Sanitary Soap Company of Leicester. Later, he has assistant to Alfred H. Allen, the well-known Sheffield analyst. His Fellowship of the Royal Institute dated from 1899.

SIR REGINALD CLARRY, M.P. for Newport, Mon., who died on January 17, aged 62, was a consulting engineer by profession, and at one time engineer and manager of the Swansea Gas Co. In the 1914-18 war, he joined the Ministry of Munitions in an honorary advisory capacity, taking an active part in organising the chemical and high-explosive department. From 1930 to 1937 Sir Reginald was chairman of the managing council of the British Road Tar Association.

DR. GUY DUNSTAN BENGOUGH, M.A., D.Sc., F.R.S., F.C.S., who died at St. Leonard's-on-Sea, Sussex, on January 20, aged 68, was a leading authority on metallography and corrosion, and was Consultant to the Chemical Research Laboratory of the D.S.I.R. at Teddington. He followed up his education at Cambridge and the Royal School of Mines by practical work on gold and tin ores in Burma, and on his return to England was appointed Lecturer on metallurgical subjects at Birmingham and Liverpool Universities and, later, Investigator on Corrosion to the Institute of Metals. After service, both military and technical, in the 1914-18 war, he was appointed Principal Scientific Officer in the Chemical Research Laboratory at Teddington, later undertaking the special work of Consultant. He was chairman of the Marine Corrosion sub-committee of the Iron and Steel Institute, and was elected F.R.S. in 1938.

General News — From Week to Week

DTD Specification No. 700, entitled "Synthetic Sapphire Boule," has just been published by the Ministry of Aircraft Production.

The Board of Trade has issued a revised list (price 3d.) of persons whose names were on December 16, 1944, entered in the Register of Special Producers.

Acceptable new-year gifts, issuable in return for a penny stamp, have included a refill pocket diary for 1945, from W. J. Bush & Co., Ltd., and an illustrated calendar from Rhodes, Brydon & Youatt, Ltd.

Chemurgy—the development of chemical industries from farm products—and the use of agricultural wastes, as well as scientific research in the wool industry to meet competition from artificial fibres, are among the technological subjects for which work is on hand in Australia, according to Mr. G. B. Gresford, of the Australian Scientific Research Liaison Office, addressing the Royal Society of Arts in London last week.

The Industrial Health Research Board has just issued a report on the proceedings of a conference on Industrial Health Research held in London on September 28 last. (H.M.S.O., 7d., post free.)

At the request of the Ministry of Fuel and Power, the Ministry of Information has prepared a short film bearing the title "Steam." It deals with the efficient use of steam in industry, and demonstrates common sources of waste involving consequent waste of fuel. The film will be generally available on February 1.

The manufacture of penicillin will bring a new industry to South-West Durham, one of the pre-war special areas. The Ministry of Supply is building a factory covering approximately 100,000 sq. ft., to be taken over by a well-known firm for the large-scale manufacture of penicillin. At the outset there will be employment for 250 people.

Reprints of the article by Dr. B. S. Gidvani and Mr. N. R. Kamath on Lac Derivatives as Substitutes for Alkyd Resins (reprinted from *Paint Manufacture*) are available on application to the London Shellac Research Bureau, 79 Grassmarket, Edinburgh, 1.

Heat-treatment of steel was the subject of a lecture at Dundee Technical College, by Dr. A. L. Robinson, chief chemist with Ransome & Marles, Ltd. Temperature control, he said, was a fundamental of the operation which was often ignored by the furnace operator during the process, and he strongly advocated the installation of automatic temperature-control instruments.

Wholesale prices in December for chemicals and oils, iron and steel, and non-ferrous metals showed no change from November, according to the monthly figures of the Board of Trade. During the year there was a slow but definite upward trend, with percentage increases of 0.7 in chemicals, 1.5 in iron and steel, and 1.6 in non-ferrous metals.

Foreign News

A gift of 3 grammes of radium, to be used in military hospitals, was made last year by the Belgian Congo to the Soviet Union.

In the United States, the cost of new chemical plant erected since 1939 amounts to about £375,000,000. Plant construction work for 1945 is being estimated at about £37,500,000.

The Tennessee Valley Authority reveals in its report for the year 1944 that production of elemental phosphorus has been increased by 30 per cent.; output of calcium carbide amounted to 100,000 tons and that of ammonium nitrate for fertiliser purposes to 130,000 tons.

Six plastic-moulding factories in Palestine consume about 60 tons of moulding powder annually, principally in the production of tableware and household goods. The capacity of the factories is considerably larger, but output is limited by the supply of moulding powder available.

Drilling for petroleum in the marine areas of Trinidad will not be undertaken until after the war. This decision was reached at a conference recently held in London under the aegis of the Petroleum Division, Ministry of Fuel and Power, when other questions related to marine drilling were also settled.

New sulphuric acid manufacturing capacity in the U.S.A., has been recommended by the Inorganic Acids Industry Advisory Committee, in consequence of the shortage of tank cars. With the projects now planned, the industry should reach a maximum capacity of 9,426,000 tons by June 30. As a result, more spent acid will be available for the production of superphosphate.

A deposit of nitrate ore containing approximately 5,000,000 metric tons of potassium nitrate has been found at Huangyenkou, in Kansu Province, China. Reports state that the nitrate factory at Chengtu now has a monthly output of 44,000 lb. of refined potassium nitrate.

Zinc oxide is now being produced in Palestine by Pigment Works, Ltd., Haifa, on a sufficient scale to meet local needs. The furnace equipment is adaptable either to the direct (American) or indirect (French) process, so that either metallic zinc, zinc ore, or zinc-containing waste can be used with equal success.

The Spanish Ministry for Industry and Trade has ordered a further curtailment in the export of lead because the quotas fixed for home consumption have been inadequate. In order to alleviate financial loss to the owners of mines and exporters, the fixed home price regulations on lead ores and lead bars have been cancelled.

The case for the establishment of a Commonwealth Geological Survey, to supplement the existing State Surveys, has been presented to the Prime Minister of Australia, by the executive committee of the Australian Institute of Mining and Metallurgy. Australia is the only British Dominion still without a national geological survey.

The world's undiscovered oil reserves can supply civilisation, at the present rate of consumption, for centuries, declares *Ethyl News*, a publication of Ethyl Corporation. Predictions of shortages are misleading since they are based solely upon known reserves, excluding prolific potential supplies in the untapped areas of many lands.

Exports of North African phosphates are at the rate of approximately 2,500,000 tons annually, all to European destinations, according to a report by the North African Economic Board. However, shortages of labour, equipment and transport are hampering production in Morocco, Algeria, and Tunisia.

A new organic adhesive installation has recently been constructed in Palestine by Levant Glue, Ltd., Tel Aviv, utilising, as raw material, animal bones obtained mainly locally and, to a small extent, from Syria. The export of bones from Egypt to Palestine, formerly 3000-4000 tons annually, is now prohibited.

A new aluminium plant, situated at Bogtslovsh in the Urals, is expected to be in operation within the next three months, using the Krasnaya Shapochka bauxite deposits. An open-cast lignite mine, with an annual output of two million tons, is also to start operations. Two further coal and lignite mines have been discovered, which may become the main source of fuel in the Northern Urals.

The British Columbia Industrial and Scientific Research Council will investigate the properties of charcoal obtained from local softwoods to determine whether this material can be used for the reduction of iron ore for an iron and steel industry proposed for the Province, to be established in the Zeballos Valley on Vancouver Island.

The shortage of Portland cement in Switzerland is attributed to a recent reduction in coal imports from Germany. From October 1, cement purchases without a permit were limited to 1 ton monthly to building contractors, master masons, and master plasterers; 250 kilograms to bricklayers; and 50 kilograms to other persons.

Newfoundland pyrophyllite, reported to be of the aluminous rather than the magnesitic variety, is said to be suitable for use in the ceramic, rubber, and cosmetics industries. Possible annual production is estimated at from 5000 to 6000 tons. The only commercial deposit in Newfoundland is located at Manuels, Conception Bay.

Plans have been made to transfer Argentina's only electrolytic potassium chlorate plant from the Buenos Aires area to Rio Negro, where 2000 hectares have been purchased near Cinco Saltos Falls. A project involving from 20,000,000 to 30,000,000 pesos is being considered. In addition to chlorate, carbide, insecticides, and other chemicals will be produced.

In the Urals, at the Chelyabinsk metallurgical plant, the first coke battery with an annual capacity of 420,000 tons was completed on August 1, 1944, reports the Soviet Press. A yield of 7000 tons of coke was reported for the first 10 days of operations. The plant expects to complete a second blast furnace and coke battery, together with chemical shops.

Extensions and development in the industrial and chemical spheres have necessitated the employment of more capital by Imperial Chemical Industries of Australia and New Zealand, Ltd. The directors have therefore allotted a further 500,000 ordinary shares of £1 each, at par. Ordinary capital now totals £5,453,239, while issued preference capital is £1,000,000.

The manufacture of a plastic material from maize will be undertaken in Argentina by several organisations including the General Industrial Department and the National Technological Institute of the Ministry of Agriculture, the Faculty of Industrial and Agricultural Chemistry and the National Litoral University. Funds have been allocated for the construction of equipment for laboratory experiments on the material which is expected to be similar to "bakelite" or "ebonite," and the establishment of an experimental plant is planned preliminary to the production on a commercial scale.

As an expression of gratitude to Holland, the Swiss University of Zürich has decided to contribute to the revival of Leyden University through the reconstruction of various departments and of the library, as well as by sending professors.

From liberated Yugoslavia comes the news that a cement factory near Split has resumed operations with a daily output of 30 tons. Production of bricks and tiles has also recommenced and daily output of lignite totals 500 tons.

A new Australian standard—A.S. No. H. 18-1944: Deoxidised copper cakes and billets (conductivity not specified)—has been issued by the Standards Association of Australia. The specification provides requirements for a general purpose deoxidised copper intended for subsequent conversion into sheets, bars, tubes or other forms.

Forthcoming Events

January 29. Institution of the Rubber Industry. Court Room, Caxton Hall, S.W.1, 6.30 p.m. Dr. S. Buchan: "New Methods of Moulding."

January 31. Royal Institute of Chemistry (Birmingham and Midlands). Technical College, Wolverhampton, 6 p.m. Dr. J. H. Schulman: "Synthetic and Natural Emulsions."

February 1. The Institute of Fuel. Institution of Mechanical Engineers, Storey's Gate, S.W.1, 2.30 p.m. Mr. P. M. K. Embling: "The Gasification of Bituminous Coal in Producers."

February 2. The Royal Institution, Albemarle Street, W.1, 5 p.m. Professor E. N. da C. Andrade: "Metal Crystals and Crystal Strength."

February 5. Society of Chemical Industry. Chemical Society's Rooms, Burlington House, London, W.1, 2.30 p.m. Dr. F. Bergel: "The Use of Amino Acids and Sugars for the Synthesis of Foods of Nutritional Importance."

February 6. Electrodepositors' Technical Society (Birmingham Section). James Watt Memorial Institute, Great Charles Street, Birmingham, 6 p.m. Messrs. S. R. Goodwin and H. A. Bechtold: "Influence of Anodes on Plating Processes."

February 7. The Institute of Fuel (Yorkshire Section). Royal Victoria Station Hotel, Sheffield, 3 p.m. Dr. R. J. Sarjant: "The Insulation of Furnaces."

February 7. Society of Public Analysts. Chemical Society's Rooms, Burlington House, London, W.1, 3 p.m. Physical Methods Group, inaugural meeting. Mr. R. C. Chirnside, "Physics and the Analyst"; and (4.30 p.m.) Mr. H. P. Rooksby, "Some Examples of the Use of the X-ray Powder Diffraction Method in Quantitative Analysis."

Prices of British Chemical Products

FIRM price conditions continue to prevail throughout the London general chemicals market and the movement as regards contract deliveries to the consuming industries is fully maintained. Fresh inquiry is on a moderate scale, the demand for a number of items being in excess of available supplies. Among the soda products; nitrate of soda, bicarbonate of soda, soda ash, and sulphate of soda are in steady demand, while there is a persistent call for yellow prussiate of soda and chlorate of soda, with both items in limited supply. Conditions in the potash section remain unaltered and pressure for priority supplies of solid caustic potash continues. Permanganate of potash is in good demand, with values well held, and a fair trade is passing in acid phosphate of potash. In other directions white powdered arsenic is a good market and a steady trade is passing in sulphur. Glycerine is in good request. In the coal-tar products market prices remain steady and a good demand is reported for creosote oil and crude tar. A fair trade is passing in the naphthas and xylols, and the toluols and benzols are active.

MANCHESTER.—The undertone of prices on the Manchester chemical market as a whole is undoubtedly strong and a stiffer tendency has been indicated in one or two sections during the past week. Fresh inquiries in the market have covered a fairly wide range of materials and moderate additions to order-books have been reported. A satisfactory feature is the maintenance of contract deliveries, especially in the alkalis, and the limited offers of all classes of the potash chemicals are being steadily absorbed. There has been little change in the position of the tar products, with the leaders in both the light and heavy sections meeting with a steady demand.

GLASGOW.—In the Scottish heavy chemical trade during the past week business in the home trade has remained steady, while export inquiries continue rather limited. Prices keep very firm.

Price Changes

Rises: Barium carbonate; formaldehyde.

Falls: Antimony oxide; arsenic, grey, 95/96%, lead, white.

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 10s. 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.—£105 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.

Barium Carbonate.—Precip., 4-ton lots, £19 per ton d/d; 2-ton lots, £19 5s. 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, £34; crystals, £35; powdered, £35 10s.; extra fine powder, £36 10s. B.P., crystals, £43; powdered, £43 10s.; extra fine, £44 10s. Borax glass, per ton in free 1-cwt. waterproof paper-lined bags, for home trade only, carriage paid: lump, £84 10s.; powdered, £85 10s.

Boric Acid.—Per ton for ton lots in free 1-cwt. bags, carriage paid: Commercial, granulated, £62; crystals, £63; powdered, £64; extra fine powder, £66. B.P., crystals, £71; powder, £72; extra fine, £74.

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., £57 per ton; dark tech., £50 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, 7¾d. per lb.; ground, 8¾d. per lb., for not less than 6 cwt.; 1-cwt. lots, ¼d. 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. 10d. per lb. for 1 cwt. lots; for 3 cwt. and upwards, 1s. 9½d. per lb.; technical, £7 18s. 6d. to £8 10s. 6d. 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, 6¼d. 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 £15 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 10¼d. 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. to 4s. 6d., according to specification. 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.—January 25.—For the period ending February 3 (for refined or unrefined 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 10s. 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).

Company News

Consolidated Tin Smelters, Ltd., have declared an interim dividend of 3½ per cent. There has been no payment since the 5 per cent. for 1940-41.

English China Clays, Ltd., report a profit, for the year to December 31, of £53,460 (£46,379). A dividend of 2 per cent. (1 per cent.) was declared.

The directors of **Benn Brothers, Limited,** have declared the following dividends, less tax, payable on February 15: 3 per cent. on the preference shares for the half-year ended December 31, and interim dividend of 5 per cent. on the ordinary shares (same).

Redfern's Rubber Works, Ltd., report a net profit for the year 1944, of £18,210 (£19,334). A final of 3¾ per cent. on the "A" and "B" preference shares, making 7½ per cent. (same), and a final of 6¼ per cent. on the ordinary, making 10 per cent. (same), accompanied by a bonus of 2 per cent. were declared.

New Companies Registered

Belvane, Ltd. (392,592).—Private company. Capital £2500 in £1 shares. Dealers in plastic materials and compounds, synthetic resins, chemical preparations, etc. Directors are: V. J. Bell, A. R. Evans. Registered office: 101 Old Winter Road, Andover, Hants.

Chemical and Allied Stocks and Shares

APART from British Funds, which were again firm, stock markets have been reactionary, more particularly industrial shares, the excellent war news having tended to centre attention of markets on the difficulties of the eventual switch-over to peace-time working. Selling has not been heavy, and the lower prices were attributed mainly to falling off in demand. Nevertheless, many leading industrial shares, despite their recent reaction, are still above levels ruling at the beginning of the month.

In accordance with the general tendency, Imperial Chemical have moved back to 39s. 3d., which compares with 40s. a week ago, although maintenance of the dividend at 8 per cent. is being generally expected, and the yield is over 4 per cent. Lever & Unilever, following their recent advance, reacted to 46s. 9d., and Lever N.V. to 46s. 3d. Turner & Newall were 84s. 3d., after 86s., and Wall Paper Manufacturers deferred declined to 42s. 9d., Radiation to 59s. 6d., United Molasses to 37s., and Dunlop Rubber to 46s. 6d. The units of the Distillers Co. showed a further sharp decline to 110s. 9d., comparing with 115s. a short while back; but, as in most other cases, there has been no heavy selling. De La Rue eased to 193s. 9d., Murex to 101s. 3d., and Triplex Glass to 43s. 3d. B. Laporte remained firmly held and maintained their recent rise to 86s. 3d., while W. J. Bush were 73s. 9d., British Drug Houses 30s., Burt Boulton 24s. 6d., and Monsanto Chemicals 5½ per cent. preference 23s. Greeff-Chemicals Holdings 5s. ordinary kept their improvement to 8s. 9d. British Aluminium at 46s., and Borax Consolidated deferred at 37s. 6d. have been steady, but British Oxygen reacted to 86s. 6d. Nairn & Greenwich at 78s. 9d., and Barry & Staines at 51s. 3d., were relatively steady, Amalgamated Metal 17s. 9d., General Refractories 17s., Imperial Smelting 13s. 9d., and Metal Box 91s. 3d., also being well maintained. Iron and steels reflected the market trend, with Tube Investments 110s., United Steel 25s. 9d., Guest Keen 38s., Allied Ironfounders 52s.; and Stewarts & Lloyds deferred at 57s. 3d. also lost most of their recent rise.

In textiles there was profit-taking following recent gains, Bradford Dyers moving back to 26s. 1½d., though the market is continuing hopeful of a small dividend increase, while Calico Printers were 18s. 6d., and Bleachers 13s. 10½d. British Celanese became weak, declining to 32s. xd. on the development of selling; Courtaulds at 55s. 6d. were also lower. British Match at 42s. 3d. held up fairly well, as did Goodlass Wall at 18s. 9d. International Paint shares kept steady at 116s. 3d., but Pinchin Johnson reacted to 39s., although, among other paint shares, Lewis Berger at 108s. 6d. were higher on balance. General Electric eased to 99s., Ever Ready to 44s. 9d., and English Electric to 57s. Beans Industries shares moved up sharply to 31s. 6d.

Boots Drug were 54s. 3d., and Timothy Whites eased to 41s., but Sangers were steady at 30s. 6d. In other directions, British Industrial Plastics 2s. shares were 6s. 6d., with Erinoid at 12s. 3d. maintaining their recent rise. Gas Light & Coke ordinary firmed up to 23s., market expectations being that the dividend is likely to be restored to 5 per cent. sooner or later. In other directions, Fisons kept steady at 52s. Richard Thomas eased to 12s. 9d., and Baldwins to 6s. 6d. Oil shares lost earlier gains, Anglo-Iranian being 108s. 1½d., Burmah Oil 86s. 3d., "Shell" 83s. 9d., but, on the other hand, Ultramar Oil at 80s. 9d. were higher on balance, although all an earlier gain was not held. Trinidad Leaseholds were good, rising sharply to 96s. 3d.

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