The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

VOL. LII
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The Chemical Age

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Coal

DURING the discussion on Dr. Parker's paper to the London Section of the Society of Chemical Industry, Dr. Levinstein asked a question. "Will someone," he said in effect, "tell us how to reduce the price of coal so that our industries will again be able to compete in world markets?" The best and most complete answer that has been given hitherto is the report of the Technical Advisory Committee on Coal Mining set up by the Ministry of Fuel and Power, now coming to be known as the Reid Committee. The Minister of Fuel, it is true, has declared since the publication of this report that he does not see much prospect of an early fall in the price of coal, particularly as there must be no disturbance of the level of wages in the mining industry, and there is justification for this view if it is considered that the present inflated wages are to be continued after the war. The Reid Committee has made a technical analysis of the coal industry and has shown its defects strikingly. The policy arising out of their recommendations must be put into effect immediately, but even so it cannot influence the price of coal for some considerable time to come.

The inefficiency of the coal industry has long been suspected, but now for the first time it is exposed by men connected with the industry. The Committee that drew up this report was composed of mining engineers of the highest calibre who were for the most part managing directors of large colliery concerns. The onus of the inefficiency which has developed is laid on the coal owners. Whether they are individually and personally to blame for this, however, is doubtful. The colliery industry is an old one that rose to its highest peak in the Victorian period and naturally, in an age when the rights of private property were more highly esteemed than they are to-day, each owner developed his mines and cared nothing for those of his neighbours. The fault, then, lies primarily at the door of the system and it is only when the system breaks down that we begin to see where it has led us.

The Reid Committee points out that in Britain the fact that ownership of the mineral has been in private hands has often resulted in unduly small or awkwardly - shaped leaseholds; in the development of an excessive number of mines of insufficient capacity for the

On Other Pages

requirements of the best mining practice; and in inadequate attention to the conservation of resources. The conditions attaching to the transfer of the ownership of the mineral to the Coal Commission have left most of these difficulties still unsolved. On the Continent, the mineral has been owned by the State, and both concessions and individual mines have generally been large. Such grouping has facilitated the closing down, or merging, of uneconomic mines, and the concentration of operations in the remaining shafts. The lay-out of the Continental mines with straight level roads driven through the strata provided a basis for reorganising the underground workings. Another fact which emerges is that the average tonnage of saleable coal handled by each haulage worker per shift is 50 tons in the U.S.A., 20-25 tons in Holland and 5 tons in Britain.

Many technical points are put forward by the Reid Committee into which it would be improper to enter here in any detail. These are addressed essentially to mining engineers and the solution of these problems must be left to them. It is obviously important, however, that the coal industry, in common with other industries, shall not be run by "business men," accountants, or amateurs, but should be in the hands of technical men of the highest ability.

Having reached this conclusion it is well to point out that the Reid Committee has had the courage of its convictions to go further and to state flatly that "it is not enough simply to recommend technical changes which we believe to be fully practicable, when it is evident to us, as mining engineers, that they cannot be satisfactorily carried through by the industry organised as it is to-day. It is vital that these technical changes should be carried through if the cost of production is to be so reduced as to enable the coal industry to meet all the needs of the country, and especially of the export trades. It follows that every practicable economy in costs must be sought, and that the volume of new investment should not be unnecessarily inflated. In addition, all this must be done in a manner compatible with careful regard to the national coal resources."

The basic facts of the situation are that there are mines on the point of exhausting their reserves; mines which should be closed down altogether and their reserves worked from adjoining collieries; mines where the remaining reserves can, under no scheme of reconstruction, be worked profitably; mines between which valuable coal has been sterilised to form barriers; and mines which for a period of their reconstruction, will have to be completely closed down. There are undertakings which have a lease of coal that could be worked to better advantage by another undertaking; and undertakings whose mines are widely spread through a district, and even among several districts. There are new sinkings required where the reserves which should be worked from them are leased to two or more undertakings; and new sinkings where, by reason of the depth to be reached, so long a view has to be taken and such heavy interest payments incurred, that the cost of the shafts, plant and development is likely to be beyond the resources of the undertaking owning the leasehold. There are surface plants to be erected which should serve a number of mines, which may be under different ownership. There are districts where the reconstruction of certain mines would enable the output required to be maintained, leaving no place for the remaining mines in these districts.

"In these circumstances," says the committee, "it is evident to us that it is not possible to provide for the soundest and most efficient development and working of an area unless the conflicting interests of the individual colliery companies working the area are merged together into one compact and unified command of manageable size, with full responsibility for the development of the area. . . . It is essential that geological, geographical and other technical considerations should be the determining factors." It is further considered that an authority must be established to put these plans into effect, and "to stimulate the preparation and execution of the broad plans of reconstruction made by these units, and of conserving the coal resources of the country." This is perhaps the first time that the mining industry has officially recognised that its duty is not only to bring coal to the surface, but "to conserve the coal resources of the country."

NOTES AND COMMENTS

The Two Coal Plans

SCANNING our leading article, the observant reader will note that the Reid plan is somewhat different from the Foot plan, if only in detail. The detail, however, is an important one, for whereas the Foot plan visualises the maintenance of individual ownership, with a tendency towards amalgamations but without interference with the autonomy of individual undertakings, the Reid plan would sweep away much of the individual ownership which is at present handicapping the industry, and would substitute for it large concerns based on a geographical area. Both plans reject nationalisation. It is interesting to notice that this appears to be the general way in which British industry is reorganising itself to meet post-war conditions. There is to be a merging of similar concerns into larger, continued private ownership, but a self-governing of each industry by elected representatives in close co-operation with the Government. British genius for compromise seems to be producing something which is neither complete private enterprise nor complete nationalisation, but which will give the Government a sufficient say in industry to change the character of industrial management basically as compared with that known to our Victorian forebears.

Workers' Responsibility

WHILE there is much work to be done by the coal owners and their engineers, the Reid Committee recognises that on the workmen and their leaders, too, falls a grave responsibility. They must combine with the mining engineer in an entirely new spirit for a united effort to raise the productivity of the industry to the highest level, and be ready to accept obligations, as well as to claim rights. In particular, they must accept the need for a high standard of workmanship, welcome the introduction of machinery, and do their utmost to see that it is made to give the greatest possible yield. They must recognise that the existing level of wages cannot be maintained without a large increase in output per man-shift for all employed; that men will have to be transferred from one mine to another, and, in some cases, even from one district to another; that double-shift working will very generally be essential; and, finally, that an industry, rebuilt in the way we have suggested, cannot be expected to provide employment for anything approaching the number of unskilled men who are, at present, dependent upon it. The Reid report ends on a note of urgency. Its final words are: "There is no time to be lost." Industry burdened by coal at impossibly high prices will agree fully with this statement. The mine owners have also put forward their plan. They have not yet expressed publicly their view of the Reid Committee's report. The ball seems to have been passed to the Minister of Fuel and Power and he will no doubt pass it in turn to the Cabinet.

Letting in the Light

THOUGH there is every reason for congratulation that, thanks to our military and industrial superiority, we and our allies have beaten the German beast into submission; and though there is probably no harm in taking a couple of days off to pat ourselves on the back; nevertheless, we must avoid the danger of relaxing as yet beyond the point of easy recovery. Even while we are celebrating, as we soon shall be, the surrender of Germany, let us not forget that Japanese bullets and jungle diseases are still killing our young men in the East, and that most of Europe remains a half-starved chaos. In many directions, and those the most important, supplies will be even more scanty in the next twelve months than they have been during the past year, and it will be an important part of the chemical industry's task to see that the shortage is relieved as soon as may be. There can thus be no slacking-off of our effort to-morrow or the next day. Nevertheless, there is plenty of room for satisfaction in the removal of irksome restrictions. In this office, probably nothing has brought home the approach of victory so vividly as the removal of the semi-permanent black-out arrangements, and we hope that similar incidents have lightened conditions of work in plants and factories throughout

the country. With factory black-out cleared away, it will be all the easier to work with a good will to finish off the job; and we trust that the removal of this black-out will signify also the approaching end of the black-out that has been imposed (for more or less good reason) on the revelation of the work our chemists have been doing in aid of the national effort.

Chemicals from Petroleum

SIR FRANK SMITH, who has just concluded his series of three Cantor Lectures before the Royal Society of Arts, is to be congratulated on his lucid and brilliant introduction of the vast subject of Synthetic Chemicals from Petroleum, delivered entirely without notes. Clearly, it is impossible to do justice to the contents of his lectures in a general comment and our utterly inadequate paper allocation prevents us from giving any lengthy extracts. Suffice it to say that the lecturer took his audience on a tour which started with methane and ended with some of the highly complex hydrocarbon copolymers which have, in the form of "tailor-made plastics," played such a tremendously important part in the later stages of the war—for instance, as dielectrics—and which are, after all, only at the beginning of their promising career. The next decade, Sir Frank asserted, will see the development of many new chemicals based on hydrocarbons, including not only fuels, but special rubbers, and plastic materials with new properties and greater mechanical strength. In a particularly striking passage, Sir Frank paid high tribute to the back-room boys who were given the task of raising the octane number of aviation fuel from 87 to 100 by the production of iso-octanes. The large-scale output of high-grade aviation fuel, both in this country and across the Atlantic, has, it is well to recall just now, enabled our bombers to carry the heavy loads which have brought Nazi Germany to its doom.

An outstanding event of the Canadian Chemical Conference, to be held in Quebec City on June 4-6, will be a symposium on research, on June 6, concerning the "co-ordination of chemical research with the national welfare."

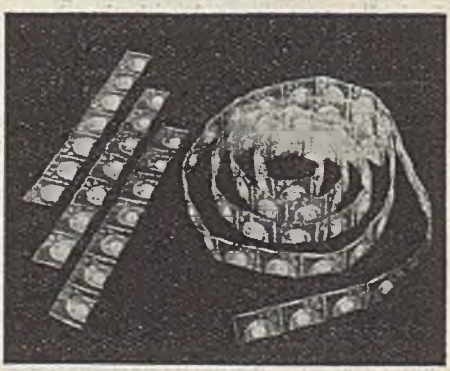
War Against Malaria

A Week's Dose Packed in Polythene

ILLUSTRATED herewith is a sample of the way the anti-malarial drug, mepacrine, is packed in polythene for use by British and Allied troops in the jungles and swamps of the Far East. The drug and its packing represent a double triumph for British chemical research and manufacture.

Mepacrine was produced by I.C.I. to replace quinine, from which Britain was cut off by the Japanese capture of the East Indies. It was found, however, that mepacrine tablets dissolved or deteriorated in the damp heat of tropical jungles. An entirely new method of packing therefore had to be devised and packing experts tried all ordinary materials without success. Then someone thought of the recently discovered polythene. Polythene is the flexible plastic whose discovery by I.C.I. is one of the major scientific achievements of the past ten years. It can be produced in thin flexible sheets which are both waterproof and retain their flexibility over temperatures varying from that of ice on the one hand to boiling water on the other. Polythene had never before been used as a packing material, but the most rigorous tests showed that not only was it unaffected by tropical heat, but that the mepacrine tablets wrapped in it could be left lying even in salt water for months and emerge as fresh as when packed.

The two next important problems were how to get the tablet into its individually sealed compartment in the ribbon of polythene, and how many millions of tablets a week could be thus wrapped. This is where



Genatosan, Ltd., came in. This firm had the only suitable machinery for the work available in the country, and it was found that after slight adaptations these could take a special fine grade of polythene film.

A week's supply at a time, a strip of seven pockets, is issued to the men on the Burma front. Each day one pocket containing the daily dose can be torn off the strip, leaving the rest safely protected.

Food Yeast

A Valuable Empire Product

THE story of a "venture in nutrition," the research and development work connected with the production of food yeast, was given in a paper, entitled "Food Yeast: its Nutritive Value and its Production from Empire Sources," read by Dr. A. C. Thaysen, of the D.S.I.R., before the Royal Society of Arts on March 20. This paper provides a background for the technical details recently published, both about the Teddington pilot plant and the Jamaica project of the West Indies Sugar Co., Ltd., in THE CHEMICAL AGE (1944, 51, 125).

Food yeast, Dr. Thaysen pointed out, signifies a special type of yeast which can be used in human nutrition and which conforms to a certain standard both in appearance, taste, vitamin content, and protein content. It was no new departure to employ micro-organisms—yeast, bacteria, and fungi—in human and animal nutrition. In fact, nature had shown the way in this field, for there was little doubt that all ruminants and other species of herbivorous animals had in their intestinal tract locations of active bacterial growth which supplied the host with both protein and vitamins such as riboflavin and the other members of the B group. A more conscious microbial diet had been devised by termites and certain ants in their subterranean fungus gardens, where they grow fungi as food on wood and leaves.

Rôle of Micro-organisms

Turning to human diet, Dr. Thaysen said that micro-organisms were used in the preparation of bread, beer, cheese, soya sauce, and certain milk preparations such as koumiss and yoghourt. In the early middle ages, beer, which was then much more extensively consumed than it is to-day, may well have provided the consumer with 6 to 10 g. of dry yeast per day. For the beer of those days was not the crystal clear beverage we now drink, but a turbid liquid containing an appreciable percentage of the yeast which had gone to its making. As in Europe during the Middle Ages, so in most tropical and sub-tropical countries until a much more recent time, large quantities of yeast and bacteria were consumed in beer and palm wines. The contact of these peoples with western civilisation frequently deprived them of this valuable source of protein and B vitamins which play an essential part in the digestion of carbohydrates.

As is so often the case, the work which led to an appreciation of the dietetic value of micro-organisms, that is of bacteria, yeast, and fungi, had its roots in an economic problem, the disposal of the surplus quantities of yeast which year by year issue from the brewing plants of Europe and America. By the end of the 19th century, chemical analyses had disclosed that this yeast, when dried, contains as much as 50 per cent. of protein. Attempts were made to use it for the feeding of cattle in place of other protein concentrates, and small quantities were also consumed medicinally in the treatment of certain inflammatory conditions of man. Where it was consumed, favourable reports on its value were not lacking, but on the whole little progress was made in the disposal of surplus brewers' yeast.

German War Investigations

When the last war broke out Germany and her Allies, cut off from overseas supplies of protein concentrates for stock-feeding, turned to the utilisation of brewers' yeast. Anticipating greatly increased demand for protein concentrates, investigations were started by the Central Powers to explore the possibility of applying the observations of Pasteur and Duclaux to the effect that protein can be synthesised by yeast from inorganic sources of nitrogen such as sulphate of ammonia. By 1915, German workers had devised a technical process in which a certain type of yeast could be produced from inorganic nitrogen, provided sugar was supplied either in the form of molasses or any other cheap form. Large-scale production, however, was never proceeded with, presumably because of the shortage of sugars in Germany at the time.

In this country, during the same period, another type of protein from a microbial source was tried out successfully in the rearing of pigs. The material was obtained from the bacterial residues accumulating during the manufacture of acetone and butyl alcohol by the fermentation of cereals. At the time no attempts were made to discover the reason for the beneficial effect as regards growth, but subsequent work has shown this residue to be rich both in protein and in B vitamins.

Since the end of the last war great interest has been taken in the dietetic value of micro-organisms both from the point of view of their protein and of their vitamin contents. Most of this work has been done on yeast, starting with the publication of the American workers Osborne and Mendel in 1919. Of special interest are the observations of Macrae and his collaborators (1942) who not only confirmed the earlier observations on the value of yeast in nutrition, but showed that a small addition of yeast protein to a diet, containing only

cereal (maize) protein of low dietetic value, raised the nutritional level of the maize protein to a much higher level.

Some micro-organisms constitute the most potent source of water-soluble B vitamins known, richer than any animal source, and are actually able to synthesise B vitamins from inorganic materials provided they are supplied with the necessary energy in the form of sugar or starch. Another interesting aspect of microbial protein and of B vitamins is the speed with which they can be synthesised. Half a ton of living yeast, for instance, the approximate live weight of a bullock, will produce 2048 tons of fresh yeast in 24 hours, if it be assumed that each yeast cell reproduces itself once in two hours, a moderate estimate. This means that from half a ton of living yeast 245 tons of protein can be synthesised in 24 hours.

It is of more than topical interest that in cases of urgency, where animal husbandry is dislocated, as in war-stricken countries, a rapid method is available for the production of nutritionally valuable protein and of B vitamins which might well supplement the much slower rate of synthesis by farm animals. A pound of dried yeast will not replace a large juicy steak with the necessary trimmings; but it is possible to devise many ways in which food yeast, added to the diet, will greatly enhance the flavour. Bread to which 2 per cent. of food yeast has been added has a most attractive flavour and is most pleasing to the eye with its golden brown crust. Given in this way, it supplements, in a most remarkable way, the nutritive value of white bread to which many nutritional authorities are opposed. Added to soups and stews in proper proportions food yeast imparts a pleasing flavour. Food yeast can be incorporated in many other dishes, for instance, in spaghetti, in dumplings, in curries, in pies and in gravies. It has even been used in chocolates and toffees, and children eating these have relished them.

Sources of Sugar

Returning to the subject of food yeast production, the lecturer said that while the supply of nitrogen, either in the form of sulphate of ammonia or ammonia gas, both readily available, was easy of solution, it was the provision of an abundant supply of sugar that led to difficulties in planning large-scale production of food yeast, for each ton of food yeast required the provision of about 1.7 tons of sugar, or its equivalent in starch. Before the war, there would have been no difficulty in securing such quantities, for molasses was then often dumped into the sea or put on the land as a manure. It was available almost anywhere in sugar-producing countries at a price little higher than its cost of transport, and most countries had sources of waste sugar or starch which could be used —rotten bananas and citrus fruit or apples, surplus maize, or other grains, waste potatoes and a host of other produce all of which might have served the purpose. To-day, the choice was more restricted and might remain so for some years to come. Fortunately, the British Empire offered a choice of several sources of cheap carbohydrates, the West Indies, molasses; the African continent, maize and other grains; the Middle East, waste citrus fruit or carob beans. India offered large quantities of molasses, while Canada and Newfoundland had waste sulphite liquor from paper manufacture.

The selection of a suitable and palatable yeast, Dr. Thaysen continued, which gave high yields from sugar was fairly easily accomplished, for several such types were already known and others possessing special characters, notably good growing properties at temperatures prevailing in tropical countries, might be isolated.

He then proceeded to describe the difficulties of planning a rapid rate of continous production, details of which we are unable to give on account of considerations of space. It is sufficient to say that the Teddington plant and the Jamaica project are proof of their having been solved successfully.

Yeast and the Nation's Food

Referring briefly to a dispute which had arisen about the place food yeast is likely to have in the normal human diet as distinct from its use in the treatment of certain ailments in which it is anticipated to be beneficial, Dr. Thaysen said that it was claimed by certain authorities that, in Europe and in the United States at any rate, the diet, in normal times, was sufficiently balanced to take care of itself without the introduction of food yeast, and where, for economic reasons, the balance was upset, the proper step to take was to raise the purchasing power of the affected sections of the community to such a level that the high-grade foods, meat, milk, eggs, and cheese, could be partaken of in sufficient quantities.

There was a great deal to be said for this argument, but the poorer sections of the community might have to wait a long time for such a rise in income which, when it came, might not be spent on additional foods. And further, under the present disturbed world conditions, it was likely to be a long time before a sufficiency of meat, eggs, and milk would be available to give everybody—even in Great Britain and in the United States—their full share. In consequence, a product should be made available forthwith which was known to supply the missing ingredients of an un-

balanced diet at a price within the reach of everybody—even the poorest. For food yeast could eventually be sold over the counter at less than one shilling per pound. As each pound will provide a person with sufficient additional high-grade proteins and vitamin-B concentrates for 45 days, the daily expenditure would amount to only about one farthing. The present-day extensive demand for yeast extracts point to a potential large demand for food yeast in the normal diet by a large section of the community.

Referring to the project of the West Indies Sugar Co., Ltd., in Jamaica, Dr. Thaysen revealed that the machinery needed had been made and despatched. The staff to run the plant had been trained and was ready to begin work. It was hoped that actual operations would start in the summer of this year with a daily output of 12 tons of food yeast. In addition to this scheme, sponsored by the Colonial Office, the Indian Central Government has decided to construct a food yeast plant in India. The South African Government has taken preliminary steps in the same direction, and both the Australian and the New Zealand Governments are similarly engaged. Thus, Government initiative had played a not inconspicuous part in the development of a scheme which was likely to lead to the raising of the nutritional standard of a large section of humanity.

Wood Sugar for Fodder Yeast

Some American Experiments

SINCE the publication of Dr. Thaysen's paper (*see* above), an account has been received in this country of investigations carried out by three American authors (PETERSON, SNELL, and FRAZIER, of the U.S. Forest Products Laboratory, Madison, Wis.), who devoted considerable study to the German literature (*see Ind. Eng. Chem.*, 1945, *37*, 1, 30). Their efforts were directed primarily to yeast as a source of animal fodder.

Wood sugar, as the hydrolysates of wood are commonly called, requires extensive pre-treatment to make it fermentable, as it contains "toxic" material which has to be removed or inactivated before good fermentations can be obtained. Of the various pre-treatment procedures examined, the following was adopted, the quantities of materials added being based on 5-6 per cent. reducing sugar.

Calcium carbonate was added to bring the *p*H of the hydrolysate from 1.3-1.5 to 5.0 (about 0.75 gm. to 5 gm. reducing sugar), followed by the addition of 0.05 per cent. sodium sulphite, for detoxification. The solution was heated to boiling, and kept boiling for one minute, then cooled and filtered. Then 0.06 gm. urea and 0.05 gm. potassium dihydrogen phosphate per gm. of reducing sugar were added, and the solution diluted to the concentration desired for fermentation.

Of the yeasts studied the three most promising were *Torula* (*Torulopsis*) *utilis* No. 3, *Candida tropicalis*, and an unidentified yeast denominated "P-13." Of these, the first was chosen for all the later experiments, because of its known nutritive properties. It is noteworthy that the No. 3 strain of *T. utilis* was found to acclimatise itself to the wood hydrolysate more successfully than the *major* strain developed at Teddington for use with molasses.

Of the inoculum media tested, the following was found most useful: 5 per cent. beet molasses, 2 per cent. diastatic malt extract, 0.75 per cent. (by vol.) corn steep liquor, and 0.1 per cent. diammonium hydrogen phosphate. In all the routine fermentations, a standard level of 1 gm. of cells (dry basis) per litre of fermentation medium was used.

On the basis of the experimental results, the procedure for a typical fermentation (7 litres of medium) was as follows: 6300 ml. of prepared medium was placed in a 5-gal. Pyrex bottle. This was inoculated with 700 ml. of inoculum containing 1 gm. of cells per 100 ml. and standardised by centrifuging an aliquot in a graduated tube. A canvas-bag aerator was placed in the bottle, well below the surface of the medium, and 10 ml. of an antifoam agent added. The bottle was placed in a constant-temperature bath at 30°C., and 20-40 litres of saturated air per min. were passed through the canvas bag and diffused into the medium. The fermentation was usually complete in 16-18 hrs., but was allowed to proceed for 24 hrs. It is noted that calcium hydroxide is preferable to the carbonate as a reagent for raising the initial *p*H, as it avoids the foaming difficulty, but the *p*H requires watching.

The wood sugars examined were mainly derived from spruce, Douglas fir, and southern yellow pine, the spruce sugar being the most easily fermented, the Douglas fir the most difficult. Hardwood hydrolysates, so far as they were examined, appeared to ferment more easily and to give slightly larger yields of yeast. Under the best conditions developed, with the three softwoods mentioned, 37-40 per cent. conversion to yeast of the total sugar was repeatedly obtained.

LETTERS TO THE EDITOR

Extinguishing Phosphorus Fires

SIR,—We are interested in the above subject as reported on p. 350 of the April 21 issue of THE CHEMICAL AGE in which the use of water and aqueous solutions is mentioned. In 1939 the late Dr. Bleyberg and the writer carried out many experiments for extinguishing white phosphorus fires. We found that water and aqueous solutions were most unreliable for extinguishing these fires and the results were not lasting. We discovered that our standard "DX" Powder, used in small quantities, extinguished at once, but to obtain permanent extinction it was necessary to use this powder in larger amounts than was usual with metal fires. If left undisturbed "DX" extinguished at once, and when removed disclosed a hard crust of molten "DX" which had re-solidified, completely sealing the remaining phosphorus from the air. These tests were carried out with 10 g. of phosphorus.

We were satisfied that water and aqueous solutions were unreliable extinguishing media, and would not like to rely upon a mixture that must be shaken before use in an emergency.—Yours faithfully,

For DURSTON LANG & CO., LTD.,
G. HAROLD DURSTON,
Technical Director.

Industrial Alcohol Production

SIR,—The article by Mr. A. E. Williams published in your issue of April 14 with the title: "Industrial Alcohol—Some Notes on its Modern Production" will be welcome to specialists and to industry generally because the subject is one of the greatest importance, a fact recognised in many countries. Although the survey is so extensive, it may be that shortly more information will be available, showing how the problems concerned have been scientifically and industrially developed in countries which are so far not open for observation.

You have already (December 30, 1944) opened the columns of your journal to an article on "Industrial Alcohol from Crops," and in the January 6, 1945, issue you published on page 17 some remarks of mine. In these I drew attention to newly-developed methods of using, instead of cellulosic material as raw source for hydrolysis and saccharification, purified cellulose produced therefrom, and a short hint was given of processes developed in this country for manufacturing highly purified cellulose by a cheap method.

Mr. Williams discussed extensively in his survey the use of various types of plant material, giving yield figures of alcohol production and describing the processes so far used. It may, therefore, be of interest to give further information on the advantages of using purified cellulose instead of cellulosic material. Plant materials contain varying quantities of cellulose, which is practically their only constituent capable of hydrolysis and subsequent transformation into alcohol, yeast, etc., whereas almost all other constituents of plant material must needs be regarded as ballast for hydrolysis, etc. Furthermore, the cellulose is so intimately "wrapped up" in these companion bodies which practically take no part in hydrolysis, that not only the cost and size of the plants using this cellulosic material, but also the costs of the processes themselves, are much higher than when purified cellulose is used as raw material. This has been well known for many years, ever since scientific research on the transformation of cellulose into sugars was initiated, giving quantitative theoretical results.

Later on industry took this up and devoted much study to developing processes based on the use of purified cellulose. Many papers have been published, but only one need be quoted here. Professor Hägglund, the eminent Swedish cellulose scientist, published in the *Svensk Papperstidning* (1941, 102-105) details of a modification of the Bergius and the Scholler processes (not mentioned in the survey by Mr. Williams) which use costly plants. If the material were finely divided, he pointed out, acid could be saved. The material was moistened with dilute sulphuric acid and dried to 10 per cent. moisture, when it became brittle and broke down readily to a fine powder. The treatment of the powder with the sulphuric acid gave a 44 per cent. yield of reducing sugars in 10 per cent. concentration and fermentation gave 19 litres absolute alcohol per 100 kg. of dry wood. Fodder cellulose powder, which is a purified cellulose pulp, containing about 80 per cent. cellulose or more, was quantitatively saccharified by H_2SO_4 to give 49 litres of absolute alcohol per 100 kg. of dry materials.

From these figures it can be seen how much higher the yield of alcohol is when purified cellulose is used for saccharification purposes instead of raw cellulosic material. It was of great interest to the writer to see that Mr. Williams quoted, when discussing potato haulm as raw material, that this received a pre-treatment with acid for a similar purpose and with a similar effect to that mentioned above. Such a transformation into hydrocellulose which powders the cellulosic material is a very useful first step in hydrolysis.

I also wish to quote a Swedish patent No. 108,127 granted on March 27, 1941, to the Deutsche Bergin A.G. für Holzhydrolyse, making use of the priority of a German application with the date of November 16,

1940. Both dates, be it noted, are war-time dates. This Bergin (Bergius) patent may cover only a type of theoretical process. However, the figures given in it of alcohol yield by treating clean cellulose are extremely high and seem to confirm the advantages obtainable when purified cellulose instead of natural cellulosic material is used.

All these facts are no doubt known to many; but it would seem that the practical application of such methods has so far been hampered by an excessive cost price of starting material, and the price question is mentioned in the introduction of Mr. Williams' article as one of the prime conditions of producing industrial alcohol. It appears then, that the cheap production of purified cellulose from cellulosic material, such as cereal straw and other indigenous plant material, may very well be achieved by the new processes elaborated in this country, notably in connection with mills producing cellulose pulp.—Yours faithfully,

G. ULLMANN, Ph.D.

SIR,—In reply to Dr. G. Ullmann's letter on the advantages of using purified cellulose, instead of cellulosic material, in the production of alcohol, I would say that while being aware that processes have for some years been in operation for producing purified cellulose from cellulosic materials, I am unaware that anyone has yet claimed that alcohol can be made more cheaply by this innovation. In comparing costs, the cost of producing purified cellulose would obviously have to be added to the cost of producing alcohol from the purified cellulose; and also the relative values of the resulting by-products—which are often worth as much as the alcohol itself—of the two processes, for use as fertilisers, etc., would need to be considered.

When producing a purified form of cellulose, for example, from waste wood, it is necessary to eliminate—among other things—the resinous and ligneous constituents of the material without causing appreciable injury to the cellulose itself; and it is only with difficulty that one can imagine this being accomplished, followed by the production of spirit from the purified material, at a cost lower than that of acting directly on the raw material itself for alcohol production. In the absence of any reliable data on the cost of making, with a commercial plant, alcohol from purified cellulose, I concluded that it was wiser to omit references to this process in an article which was written primarily to show the low cost of making alcohol from well-known materials. However, I, no doubt, in common with many other readers of THE CHEMICAL AGE, would welcome any information which Dr. Ullmann may be able to give regarding the cost of producing alcohol from purified cellulose. —Yours faithfully,

A. E. WILLIAMS, F.C.S.

DDT and Gammexane

SIR,—In a recent number you quoted Dr. Slater as stating that Gammexane or 666 appeared to be five times as effective as DDT. This statement was apparently based upon some experiments with grain weevils. Will you permit me to state my experience?

After considerable experience, I test the efficacy of these materials in a simple manner. I take a standard solution of approximately 5 per cent. DDT or Gammexane, as the case might be, and put it in a test tube for 12 hours (the solvent is the same in each case). I then throw it away and rinse out the test tube with hot water and dry it with a soft cloth. At the end of another 12 hours I admit a house-fly into the test tube and watch its reaction.

I obtained DDT from Messrs. Stafford Allen & Co., Ltd., and some 666 Gammexane powder which had been supplied to a fruit grower through an agricultural merchant.

My tests of the two substances did not bear out Dr. Slater's claims. In the case of DDT, fly after fly became paralysed and died after one hour in the test tube. In the case of 666 no fly died. I kept and fed one for 96 hours before letting him go and he flew off apparently unaffected. In each case the full standard powder killed flies in an apparently similar fashion and in about the same time.

Unfortunately, the whole output of DDT is being used for Service purposes and only Gammexane is being made available to agriculture, but much more work will have to be done before it is possible really to compare the two.—Yours faithfully,

F. N. PICKETT, M.I.Mech.E.

SHEEP AS FLY-TRAPS

Two sheep-dipping trials, using DDT as a preventive measure against the sheep blow-fly, were last year carried out at the School of Agriculture, University College of North Wales, Bangor, in collaboration with the Unit of Insect Physiology of the Agricultural Research Council. The trials showed that five weeks after dipping with DDT, from 30 to 60 seconds contact with the dipped fleece was sufficient to poison sheep blow-flies. This year, extensive trials with DDT as a sheep dip against the sheep blow-fly and other species are to be made at Bangor. Attempts will also be made to increase the effectiveness of the dip by making it an attractant, thus turning the sheep into walking fly-traps.

Personal Notes

CAPTAIN P. VIVIAN, R.A., has recently been appointed sales manager of the Oxley Engineering Co., Ltd.

MR. F. DALTON has resigned, for reasons of health, from the board of the United Premier Oil & Cake Co., Ltd.

MR. G. DIXON, gas engineer to Nottingham Corporation Gas Department, has been re-elected chairman of the East Midland Section of the Institute of Fuel.

PILOT-OFFICER FRANK SMITH, R.A.F.V.R., who has been awarded the D.F.C., was on the staff of the I.C.I. Central Laboratory, Widnes, before volunteering for service in 1941. He is 24 years old.

DR. E. J. F. JAMES, who has been selected by the governors of Manchester Grammar School as High Master, is an Hon. Fellow of Queen's College, Oxford, where he graduated B.A. with first-class honours in chemistry in 1931.

MR. C. J. BAKER, head of the bullion department of Johnson, Matthey & Co., Ltd., metallurgists, refiners, assayers, and instrument-makers, of Hatton Garden, London, is retiring after 48 years' service with the company.

DR. EDWIN R. GILLILAND, former assistant rubber director, has been chosen first recipient of the Leo Hendrik Baekeland Award of the North Jersey Section of the American Chemical Society. Dr. Gilliland is a professor of chemical engineering at the Massachusetts Institute of Technology.

DR. RAYMOND M. HANN, of the U.S. National Institute of Health, has been awarded the Hillebrand Prize of the American Chemical Society (Washington Section) for 1944, in recognition of his work on the chemistry, structure, and synthesis of methylene and benzylidene acetals of sugar alcohols.

MR. NORMAN CLARKE JONES, who is to contest the Hornchurch Division of Essex as a Liberal candidate at the general election, is a chemical engineer and industrial technologist who has specialised in wood technology. The distillation of wood, and the use of by-products, including sawdust, are his particular sphere. He is an Associate Member of the Institution of Chemical Engineers, and last year presented a paper on "Forestry and the Utilisation of Waste Wood and its Products."

Obituary

MR. REUBEN DEASE RILEY, director and secretary of Riley's Chemicals and Colour, Ltd., Clayton-le-Moors, near Accrington, Lancs, has died at the age of 48.

MR. EDGAR ROUSE SUTCLIFFE, O.B.E., who died at Edenbridge, Kent, on April 24, aged 70, was the founder and chairman of Sutcliffe, Speakman & Co., Ltd., engineers, of Leigh, Lancashire. He was also managing director for many years until ill-health overtook him some two years ago. The company which he founded in 1901 is particularly well known in the chemical industry for its active-carbon solvent recovery plants, which are notable as being purely British in origin. Mr. Sutcliffe had himself much to do with the attainment and maintenance of the very high standard of excellence reached by his company's products, and he placed his professional skill and energy unreservedly at his country's disposal in the two great wars against Germany.

Leather Trades' Chemists

New Manchester Committee

THE ninth meeting of the Manchester Group of the British Section, I.S.L.T.C., was held on April 21 at the Engineers' Club. In a paper entitled, "Some Aspects of 'Wet Work Procedure' for Heavy and Light Leather Manufacture," Mr. W. R. Atkin, of Leeds University, outlined the chemical and physical aspects of modern soaking and liming processes. The use of calcium and sodium hydrosulphides was discussed and an interesting point to note was that Böttger had used these materials fifty years ago. He had prepared calcium hydrosulphide by passing hydrogen sulphide through a lime solution. The prevention of iron staining resulting from the use of sodium sulphide was demonstrated.

The committee for the 1945/46 session was elected by ballot as follows: *Chairman*, Mr. A. L. Ferris; *vice-chairman*, Mr. F. Eyre; *hon. secretary*, Mr. C. Gordon Turner; *hon. treasurer*, Mr. W. Scowcroft; *co-opted member of the British Section*, Dr. D. Burton.

Analytical Methods

Standard Methods Sub-Committee

THE Council of the Society of Public Analysts has authorised the Analytical Methods Committee to proceed with a survey of current analytical methods, with particular reference to standard methods lacking or insufficiently described, to collate the information so obtained, and to report and act thereon. The committee will take steps to make approach to other bodies in order to co-operate in devising approved methods, and later, possibly, to sponsor them. To assist in the collection of information the Analytical Methods Committee has appointed a sub-committee, to be called the Standard Methods Sub-Committee. The chairman is Mr. G. Taylor, F.R.I.C., and correspondence on the sub-committee's business should be addressed to its Hon. Secretary, Dr. D. W. Kent-Jones, 88 Madeley Road, London, W.5.

Diphenylene Sulphide in Coal

Research in the U.S.S.R.

DIPHENYLENE sulphide, which can be separated from coal-tar, has hitherto been considered to be a product of the dry distillation of coal. No experimental work, however, appears to have been carried out on the extraction of sulphur-containing substances from coal under conditions which would preserve their nature unchanged.

Professor S. I. Gusev, of the General Chemistry Department of the Molotov State Medical Institute, has recently published (*Russ. J. Appl. Chem.*, 1944, *17*, 178) the results of an investigation into this matter making use of organic solvent extractions and avoiding pyrogenetic processes. He has succeeded in isolating from coal derived from the second seam of the Lenin pit a crystalline substance identical in its properties with diphenylene sulphide. It is concluded that the substance was probably formed during the period of the origination of the coal.

The work fell into two parts. The first involved the separation of bitumens from coal samples and the determination therein of certain classes of sulphur compounds; the second was the isolation of individual substances and their identification. Solvents employed were pyridine, aniline, or quinoline.

Separation of the Bitumens

For the pyridine extraction of the bitumens 10 g. of the finely-divided sample were left in contact with 10 ml. of freshly-distilled pyridine for 24 hours. The coal, swollen to double its original volume, was then transferred to a thimble, a plug of cotton wool inserted, and the whole placed in a Soxhlet extractor and submitted to extraction on a sandbath for 30 hours. The pyridine extract (125-150 ml.) was poured as a thin stream into 4 litres of distilled water, whereby the bitumen was thrown down as a brown, amorphous precipitate. This was then filtered and washed with hot water until the washings were free from pyridine when tested with $CuSO_4$ and KCNS. The bitumen was dried over calcium chloride in a vacuum desiccator.

With aniline and quinoline, swelling of the coal did not take place in the cold. The sample was therefore soaked in the solvent at 150°C. The other operations were the same as for pyridine, except that the extracts were poured into dilute hydrochloric acid (1.0 *N*) to precipitate the bitumen, washing was carried out to remove chloride as much as possible, and the product was placed in a Soxhlet and extracted with hot water for three hours.

The presence of sulphur in all the bitumens obtained was qualitatively indicated by Lassaigne's test. For quantitative determination the method used followed that described by Waters: 0.2-0.3 g. of the bitumen in a porcelain crucible covered with a watch-glass were treated with 2 ml. of nitric acid (sp. gr. 1.40) and 2-3 drops of pure bromine, left on a water-bath for 30 min. and then evaporated, for about 3 hours, to fumes. The crucible was cooled, 7 g. of Na_2CO_3 were added, and the mixture was heated again on the water-bath at 100°C. The dried residue was gently ignited, the cooled melt dissolved in water, and sulphur precipitated as barium sulphate.

The results of determination of the sulphur content of 18 samples showed no considerable variations. Different portions of the same sample were taken for extraction by each of the three solvents. The pyridine bitumens contained between 1.95 and 3.02 per cent. sulphur, the aniline bitumens 1.75 to 3.05 per cent., and the quinoline bitumens 1.59 to 2.98 per cent.

Test for Mercaptans

The bitumens separated by means of the various solvents were tested for the presence of mercaptans and the lower members of the thiophen group. For the detection of mercaptans 0.2 g. of the bitumen was dissolved in 10 ml. of benzol, free from sulphur compounds, and the solution shaken with half its bulk of sodium plumbite solution. The benzol solutions were then treated with a small quantity of sulphur. In no case was a positive reaction given. For the detection of thiophens the isatin reaction was used. Again, all the indications were negative. It was concluded, therefore, that the mercaptans and thiophens which occur in coal-tar are present as the result of pyrogenetic processes.

Further experiments were carried out on 200 g. of bitumen extracted by means of aniline from coal obtained from the same seam. This was separated into the β-compound, insoluble in chloroform, and the γ-compound, which is soluble. For this purpose, the bitumen together with 400 g. of chloroform was placed in a 500 ml. conical flask, left until the next day, and then filtered. The residue was washed with 200 g. of chloroform and the filtrate evaporated on a water-bath to remove the solvent. The yield of γ-bitumen was about 85 g.

Sulphides were separated by Maber's method. In this case the bitumen was dissolved in 250 ml. of chloroform, placed in a litre tap-funnel and treated with 50 ml. of sulphuric acid (sp. gr. 1.84). After the mixture had been shaken for 2 hours it was

run in a fine stream into 1 litre of distilled water. The aqueous solution was removed and the acid neutralised with basic lead carbonate (300 g.). The clear, slightly yellow solution of sulphonated products obtained by filtering from the lead sulphate and excess lead carbonate was then steam-distilled. The freed sulphides came over with the water vapour. They were extracted from the water solution, which had a faint smell of rotten onions, by means of ethyl ether. This solution was dried with anhydrous sodium sulphate and evaporated on a water-bath. For complete removal of ether, the contents of the flask were heated on the water-bath in a stream of carbon dioxide for 2 hours after the bulk of the ether had been removed.

The residue was a slightly brownish wax-like mass with the odour of freshly burnt rubber. Its weight was 4 g. Any amines or phenols present were removed by successive treatments with 10 ml. of hydrochloric acid (1 : 3) and 10 ml. of 10 per cent. caustic soda. Lassaigne's reaction for sulphur gave a positive result.

The Final Product

On distillation from a 10 ml. flask the main bulk came over between 220° and 240°C. After a while dark brown crystals formed. They were dissolved in 10 ml. of ethyl alcohol, the solution decolorised by means of activated carbon, concentrated on the water-bath and then left to crystallise. The needles had a melting-point of 96.5°C. which was unchanged after three recrystallisations from alcohol. A mixed melting-point determination with synthetic diphenlene sulphide led to the same result. The content of sulphur was 17.33 per cent. and the molecular weight (camphor method) was 185. Diphenylene sulphide $(C_6H_4)_2S$, contains 17.41 per cent. sulphur and has a mol. wt. of 184.13. The yield was 0.1 g. The author failed to separate any other sulphur compounds from this bitumen.

Petrol from Natural Gas

Fischer-Tropsch Process in the U.S.A.

THE production of motor spirit with an octane number of 75 motor (83 research) from natural gas for about five cents per gallon, by a new engineering development of the Fischer-Tropsch process, is reported by the M.W. Kellogg Company, of Jersey City and New York. This process, which is said to be equally adaptable to the economical production of high-cetane Diesel oil, would lead to a commercial production of synthetic petrol from natural gas. The company states that the cost is based on natural gas at five cents per 1000 cu. ft. and a plant depreciation rate of 10 per cent. per annum. The spirit produced can be easily leaded to 80 motor (89 research) with 1 c.c. tetraethyl lead.

The new method successfully overcomes the problems of heat dissipation and accurate temperature control. A yield of 80 per cent. of 75 octane motor (83 research) spirit is obtained as a main product, compared with the pre-war European yields by the then existing methods of 30 to 40 per cent. of petrol of approximately 25 octane number. The company is prepared to build hydrocarbon synthesis plants employing this process.

These plants are designed to use natural gas, doubtless the most favourable source as long as large volumes are available. However, the basic constituents can be obtained from low-grade coal or other low-cost, high-carbon materials, should the supply of natural gas no longer remain adequate.

Chemical Stores Control

Coroner Criticises University System

THE system of controlling the allocation of chemicals at Manchester University was criticised by the Manchester City Coroner at the recent inquest on Clifford Ralph Young, a 15-year-old assistant in the electro-technics department of the University, who was killed in an explosion on March 8. It was stated that the boy was killed when filling a hollow dart with a compound of chlorate of potash, sulphur and carbon—a mixture far more dangerous than ordinary gunpowder. At least five people had supplied Young with chemicals, all without authority, and one laboratory assistant, also only 15 years old, said he never signed anything when getting materials.

Professor E. L. Hurst, Director of the Chemical Laboratories at the University, said that in his opinion the arrangements for the internal working of the Department were satisfactory although he would like to see more senior assistants. He said that the system at Manchester was tighter than at any other university and that unless they made a complete search of everyone leaving the building it would be impossible to stop a minute quantity of chemicals going out.

Recording a verdict of "Misadventure," the coroner stated that in his opinion the control was not as strict as it should have been. He said that the police found 25 bottles and phials of chemicals at Young's home and he did not think it ought to have been possible for boys to provide their friends with chemicals. He concluded by saying that he hoped that the University would exercise more care in the control of stores in the future.

Metallurgical Section

Published the first Saturday in the month

Metallurgical Section

May 5, 1945

The Manufacture of Sponge Iron

Recent Progress in the U.S.A.

THE production of sponge iron, or spongy iron as it was commonly termed in this country, has been known from very early days, dating back at least to the times of the Romans of the 4th or 5th centuries B.C. Later, it became known as the *ferrum redactum* of the pharmacists, and was simply prepared by heating together iron oxide and small coal, or by passing over the heated oxide reducing gases from the partial combustion of coal or other fuel. Hydrogen gas was often used for this purpose and several methods were tried on a commercial scale. These were merely derivatives of the processes used for the production of steel or malleable iron direct from the ore, thus avoiding the pig-iron and blast-furnace stage. The Catalan forge, for example, is well known in metallurgical history in this connection. On the basis of experience with the Catalan forge, Clay and others in the early part of the 19th century attempted to effect the above-named type of reduction—using one of the carbon oxides—in various designs of apparatus. Full details will be found in some of the older works on metallurgy, such as those of Percy or Alder Wright. Forerunners of these methods in the U.S.A. included Blair of Pittsburgh.

Ore Supply

In a paper read last year before the Boston Section of the A.I.M.E., C. F. Ramseyer, metallurgist of the H. A. Brassert Co., gave an interesting review of recent work in this field, with special reference to the use of hydrogen gas and the design of new and more efficient apparatus by his own company. The use of high-grade pure ore is no doubt a prerequisite of success, and the world's supply of such ore is somewhat limited. However, the author thought that as much as one-half to one-third of the world's iron ores could be concentrated to the desired purity.

Sponge iron is defined as almost any kind of iron made directly from ore by reduction without fusion: that is to say, solid particles of metallic iron are obtained directly from solid particles of ore without any melting of ore or iron.

Processes of manufacture, including those of the old charcoal forge, could be roughly divided into three groups according to temperature range: (a) charcoal forge, above 1100° C.; (b) more modern medium-temperature furnaces, 875-1100° C.; and (c) most recent low-temperature methods in the temperature range 550-825° C. In a brief review of current processes it was thought that, of the medium-temperature group, hardly any except two Swedish plants have met with any degree of success. Few, if any, can compete in capacity or thermal efficiency with the blast furnace which gives a tremendous tonnage of iron from widely varying ores at low cost. The older of the two Swedish plants, at Höganäs, has been working since 1910, using a very pure ore (72 per cent.) at the rather high temperature of 975-1100° C. The ore is packed in clay pots placed in ring kilns for five to ten days, and yielding layers of sponge iron of 96-97 per cent. metal, compressed into discs of sp. gr. about 5. The other Swedish plant, of the Wiberg type, has been working for 15 years at Söderfors, using pure magnetite concentrates which are first sintered, and then fed into a low shaft furnace through which hot CO is passed. From the spent gases CO is recovered for further use by passing the gases through beds of coke electrically heated.

The Germans developed a Norwegian process (Norsk Staal) somewhat similar to, but more complicated than, the Wiberg method, using imported Swedish ore. It is said to have been fairly successful, at all events for a time, with a capacity of 30,000 tons per annum, but costs were too high to compete with ordinary steel. The well-known Krupp-Renn process was also developed in Germany, and was recently described in these columns in articles on the Spanish metallurgical industry.

Modern American Plants

There are also a few medium to high temperature plants in the U.S.A., such as that at Lorain, Ohio, of the Hornsey-Wills design, with a capacity of 500 tons per day; and the Bureau of Mines plant at Laramie, Wyoming, which is still in the experimental stage and has a capacity of 50 tons daily: also the plant in Texas of J. Madaras design, working at 975° C., with natural gas as reducing agent passed through under pulsating pressure. Other U.S. plants are those of W. H. Smith, Detroit, and G. H. S. Anderson, the latter using a 100-ton unit

in which layers of mixed ore and coal are heated by a muffle as they revolve on a circular hearth. The various methods include the use of finely-ground ore, of gas under pressure, and of other devices to improve efficiency and speed up complete reduction. In particular, several advantages, some of which are fairly obvious, are claimed for the use of gas under pressure, which is one of the special merits claimed for the use of hydrogen as compared with carbon monoxide.

Although, as we have seen, hydrogen was used in the early days, it is thought that its more extensive use in recent years has been to some extent hindered by the impression, real or imagined, that in a high state of purity it is costly. It is, however, produced to-day on a tremendous scale for many important industrial purposes, including the manufacture of synthetic ammonia and nitrate and for numerous processes of hydrogenation, and costs of production have been greatly reduced. It is one of the most efficient of reducing agents. Compared with carbon, weight for weight, its reducing power is six times, and, with carbon monoxide, fourteen times as high; but the supreme advantage is that much lower temperatures can be used, thus avoiding, among other things, fusion of ore or metal.

Some interesting data on the rate of reduction of eastern U.S. magnetite at various temperatures are given in a recent paper by Udy and Lorig (1943) in connection with work done at the Battelle Memorial Institute. It is shown that the maximum reduction takes place at about 600° C., at which temperature some 90 per cent. of the oxygen is removed from the ore in twenty minutes, using relatively coarse ore. Gas velocity was somewhat below 2 fps.

The new Brassert process is thought to be the only one using hydrogen at such low temperature as 550-600° C., and considerable time and research have been expended in evolving the best design of plant, described and illustrated in Ramseyer's paper. An interesting account of the mechanism of reaction, accompanied by equilibrium diagrams, is given, thus bringing out the important factors governing low-temperature reduction. It has been frequently noticed in the literature that when finely-powdered iron oxide—very loose, fluffy, and active when hot—is exposed to hydrogen, it is almost completely reduced to fine metal particles which, however, at 650-700° C. become sintered together. This is completely avoided at the lower temperature, and there are, indeed, many important advantages, both in process and plant, in working at lower temperatures. The chief source of worry is that the fine particles of metal are extremely reactive, especially, of course, in the nascent state.

The principal source of hydrogen used in this American plant is coke-oven gas, other possible sources being natural gas or petroleum products. In any case, it must be low in CO content. Two types of plant have been developed for the Brassert process. The first is that built at Warren, Ohio, at the works of the Republic Steel Corporation. There coke-oven gas is mainly used as fuel and is a very cheap source of hydrogen. The production of one ton of sponge iron takes about 16,000 cu. ft. for a 90-95 per cent. product, so that the cost of the reducing agent per ton is only about $1.05. The type of furnace chiefly used up to the present is the Herreshoff with bottom-slotted hearth. The ore at Warren is for the most part Adirondack magnetite concentrate, finely ground, with a possible flue-dust loss up to 5 per cent. Since the depth of ore moved on the hearths is only about two inches, there is no possibility of the charge hanging or slipping, as might occur in blast-furnace practice.

New Electrodeposition Memorandum

Treatment of Screw Threads

THE Electrodeposition Technical Advisory Committee, representing Admiralty, M.A.P., and M.O.S., has issued Technical Memorandum No. 2, dealing with the Rectification and Surface Hardening of Screw Threads. Electrodeposition applied to screw threads may be for one of the following four purposes: protection from corrosion; rectification of worn or over-machined threads; provision of a non-seizing or non-scoring surface; surface hardening, especially on screw gauges.

As regards the rectification of worn or over-machined threads, the memorandum points out that it is rarely possible to rectify defective threads by direct electrodeposition without final machining or grinding, because the distribution of nickel deposit on a thread form is uneven. If, as is nearly always necessary, machining or grinding is to follow electrodeposition, it is desirable that the original steel of the thread should not be exposed either during machining or as a result of wear during use. If steel is exposed during machining, a smooth finish may be difficult to obtain owing to the different properties of nickel and steel and their different reactions to the cutting tool.

The thread should be prepared in such a way that a substantial envelope of nickel

will be left on the repaired thread. Where the required deposit is more than .005 in. and the total depth of the thread less than .054 in. (equivalent to Whitworth standard form thread 12 t.p.i. or more), the thread should be machined off leaving a smooth surface; the minimum amount of metal should be removed. Nickel is then built up to a minimum thickness of .06 in. (0.12 in. increase in diameter) and the deposit is machined to the plan diameter; the thread is then formed entirely in the deposit. Larger threads may be machined to a flat top, *e.g.*, half the thread being removed.

From tests carried out it was concluded that electrodeposition of nickel can provide a mechanically strong method of reconditioning a damaged Whitworth screw thread. The deposit should generally be of "hard" nickel; soft nickel is only allowable on lightly stressed unimportant members. The procedure of nickel deposition should be as described in A.R.D. Electrodeposition Memorandum No. 2.

Nickel deposits, irrespective of their intrinsic hardness, show a tendency to seize and score when under heavy sliding pressure in contact with steel. Where screwed members are to be pulled up hard, a final deposit of .0005 to .001 in. of chromium should be applied to the machined thread before assembly. The chromium deposit, if carefully applied, should need no further finishing. This method is also useful for application to one member of a pair of screwed steel components which are likely to score.

Chromium Deposition

Electrodeposited chromium is extremely hard (VPN 800-950) and has a low co-efficient of friction and forms, therefore, a very suitable surface coating for one of two mating screwed surfaces which are frequently in relative motion. However, it builds up more unevenly than nickel. For example, on a ¼-in. brass rod, threaded 12 threads per in., chromium which had been plated to an average thickness of 0.0005 in. was found to be five times as thick on the crests of the threads as at the roots. It is thus necessary that the thickness of chromium should be so chosen that a useful increase in life is obtained without spoiling the form of the thread, and the gauge must be hard enough to withstand plastic deformation by the forces met in normal usage. It is not advised to make the whole thread of chromium deposit because of its brittleness.

Since most screw gauges are made from extremely hard steel, special care should be taken to prevent hydrogen embrittlement and cracking of the steel by the plating process, by the following precautionary measures: (1) Temper at 150°-200°C. for one hour before plating; cool in air; (2) if cleaning electrolytically in alkaline solution, make the gauge anodic, not cathodic; (3) do not pickle the gauge in acid; (4) temper at 150°-200°C. after plating.

The memorandum finally states that resetting and precision grinding of a plated screw gauge may be obviated by selecting or grounding the new steel gauge to near its low tolerance limit. It is then chromium plated, taking every precaution to obtain the most uniform distribution of deposit; the average thickness of deposit being of the order of 0.0001 in. or half the drawing tolerance, whichever is the greater. The gauge is used until the chromium just begins to show signs of wearing through and is then returned to the plating department, where the remaining chromium is chemically removed and replaced, which process may be repeated a number of times.

The address for inquiries or for obtaining copies is: The Secretary, Electrodeposition Technical Advisory Committee (Armament Research Department, Ministry of Supply), c/o S.T.A.M., Room 1043, Shell Mex House, Strand, London, W.C.2.

NON-FERROUS METALS FEDERATION

Over 150 firms in the non-ferrous metals industry have formed a new federation, with the idea of creating a fully organised industry to which Government direction can be applied as a whole. The federation's aims include the promotion of scientific development and research and particularly to encourage co-operation with other industrial bodies having the same aims. The first and founder members are: Brass and Copper Tube Association, Brass Wire Association, Brazed Brass Tube Association, Cold Rolled Brass and Copper Association, Condenser Plate Association, High-Conductivity Copper Association, Manufactured Copper Association, Nickel Silver Association, and Zinc Rollers Association. The inaugural meeting was held on April 24 in Birmingham, the first president being Mr. Horace W. Clarke. The secretaries are Peat, Marwick, Mitchell & Co., 18 Bennett's Hill, Birmingham.

Kent Alloys, a non-ferrous subsidiary of Short Brothers (Rochester and Bedford), Ltd., is to be sold to an approved buyer. The capital amounts to £50,005, in addition to a loan from Short Brothers of £50,000. It is stated that the business "is no longer essential for the efficient conduct of Short Brothers," whose shares, it will be remembered, have been acquired by the Minister of Aircraft Production. Kent Alloys' equipment comprises a non-ferrous foundry, a machine shop, and chemical and X-ray laboratories.

Aluminium Alloys Bulletin

Hand-Forming Methods

THE Wrought Light Alloys Development Association has just published its ninth technical information bulletin entitled "Spinning and Panel Beating of Aluminium Alloys," which is believed to be the only publication in this country devoted to the spinning and panel beating of light alloys. Further, the bulletin is intended to be a general introduction to the subject of the forming of alloys, and will be followed shortly by others on mechanical methods of forming.

It is interesting to note that the W.L.A.D.A. believes that despite the enormous strides made in the forming of aluminium alloys by mechanical mass-production methods, the war years have seen no diminution in the use of methods of hand-forming, such as spinning and panel-beating, but rather an actual increase.

The Bulletin begins with a survey of the forming properties of the aluminium alloys, in which the phenomena of work-hardening, softening, and grain growth are discussed as far as possible in non-technical language. The heat-treatable alloys, and the effects of heat-treatment, are similarly dealt with. Following this account of the fundamentals of forming, the spinning process is then described in some detail. Lathes, speeds, chucks, hand tools and spinning technique receive attention, while the influence of the gauge of material and annealing is also dealt with.

Panel-Beating

The account of panel-beating, which is defined as "a hand method of producing hollow forms by means of hammering," begins with a discussion of the types of blows which may be struck on sheet metal. The technique of panel-beating is then described, and so are the methods of hollowing and raising, planishing, wheeling, and the "split-and-weld" system of panel-beating. The account concludes with a description of the tools used.

It is emphasised that both spinning and panel-beating are crafts which are not always easy to describe. As with all its publications, the W.L.A.D.A. has had the willing co-operation of experts and firms engaged in these methods of forming, and the accounts given are described as authoritative records of the best contemporary British practice.

The bulletin, containing 17 illustrations, may be obtained, together with further information on any aspect of light-alloy fabrication and treatment from the association's office, Union Chambers, 63 Temple Row, Birmingham, 2 (price 1s.).

METAL NOTES

Antimony ore, imported into Argentina for the purpose of manufacturing metallic antimony (regulus), has been declared free of import duties in order to aid development of the domestic metallurgic industry.

* * *

Vieille-Montagne, the Belgian zinc producer, reports that the plants at Angleur de Creil and Bray have suffered damage in air raids, but the company's total output capacity has not been materially affected by the war. Fuel and labour difficulties are a more serious handicap.

* * *

Aluminium production in France is scheduled at a monthly average of 3000 tons for this year, a figure which compares with an annual pre-war capacity of 95,000 tons. Over 300,000 tons of bauxite are held in stock at the mines, but coal and transport prevent an expansion of output in the near future. Production rose from 800 tons in September to 2000 tons in December last.

* * *

A report on high-grade iron ore deposits in the Bomi Hills, Liberia, has been prepared by the Geological Survey, Washington, in co-operation with the Republic of Liberia. The deposits lie 40 miles north of Monrovia. The report contains a detailed geological map of the deposits, a general statement of the grade of ores, and a detailed estimate of the reserves.

* * *

Arrangements have been made between the United Steel Companies and the Ministry of Supply for the purchase of the Chapel Bank works, at Workington, Cumberland. It is intended to erect a machine foundry for the production of ingot moulds and castings, a development which will provide additional employment in West Cumberland and help in the re-equipment and maintenance of the heavy industries.

General News

A further sum of £7 has been sent by the staff and employees of the Ardeer factory of I.C.I., Stevenston, Ayrshire, to the Merchant Navy Comforts Service.

Reprints are now available (H.M.S.O., 7d. each, post free) of D.T.D. Specifications 10B (High Nickel Copper Alloy Sheets) and 196 (High Nickel Copper Alloy Bars), with amendment lists incorporated.

The Council of The Institution of Gas Engineers is making provisional arrangements to hold the 82nd annual general meeting in London this year, the programme extending over two or three days.

Sir Frank Smith's series of three Cantor Lectures on "Synthetic Chemicals from Petroleum," referred to in our Notes and Comments this week, will be published by the Royal Society of Arts, John Adam Street, Adelphi, London, W.C.2, to whom applications for copies should be addressed.

The Iron and Steel Control of the Ministry of Supply announces that any "M" Form, authorising the acquisition of "steel," is now valid for the acquisition of any quality or composition (including alloy and high speed steel) unless it bears a condition to the contrary.

Dioctyl sebacate has been added to the list of low-temperature plasticisers for polyvinyl chloride (*see* THE CHEMICAL AGE, 1945, *52*, p. 79). According to an article in the New York *Rubber Age* (1945, *56*, p. 633), based on data provided by the Resinous Products and Chemical Co., Philadelphia, its plasticising efficiency is intermediate between those of dibutyl sebacate and dioctyl phthalate, while in non-volatility it is superior to the latter.

The Streatfield Memorial Lecture—the 27th in the series—delivered before the Royal Institute of Chemistry by Mr. Osman Jones on November 27, 1944, has been published in pamphlet form by the Institute. The subject is "Modern Methods of Food Preservation." Mr. Jones was doubly suited to the task, as not only is he an acknowledged authority on the commercial methods of food preservation—canning, dehydration, cold storage, etc.—but also he is an old pupil of Streatfield's.

The chemical utilisation of coal was the subject selected by Professor H. W. Melville, F.R.S., of the University of Aberdeen, for the Romanes Lecture on Chemistry at Edinburgh University last week. He paid particular attention to the future of coal as a raw material for the chemical industry, and in view of the probable difficulties of supply, he stressed the importance of ensuring the economic validity of every process of chemical conversion.

From Week to Week

Foreign News

A deposit of about 2,000,000 tons of lime has been found at Upper Musquodoboit, Nova Scotia.

The presence of diamonds and columbite has been revealed in two valleys in British Guiana.

Menthol production in Brazil in 1943-44 amounted to about 600,000 pounds worth U.S. $75,000,000.

The rayon plant in Tomaszov, Poland, has recently resumed operations. About 3000 workers are being employed.

The industrial utilisation of bagasse is being discussed in six articles contained in the *Journal of Scientific and Industrial Research*, India.

Quinine production in Madagascar will soon be sufficient to meet the needs of all French colonies. Experiments have also been made with the cultivation of totaquine.

Six pipe-lines, each of six inches, feed 3,000,000 gallons of petrol across the Rhine to the Allied armies, says an announcement by S.H.A.E.F.

Peruvian statistics disclose a guano production of 78,842 tons in 1944, against 69,696 tons for the previous year. None was available for export.

The production of dehydrated castor oil is being carried out in Brazil in its initial phase with satisfactory results in the manufacture of paints and varnishes.

Production of iron ore in the United States last year was estimated at 94,622,000 tons, compared with 101,247,835 tons in 1943. The Lake Superior district produced 52 per cent. of the total.

A Durban firm is now making black waterproof drawing inks and black stencil inks in solid block form, and a Johannesburg firm is making alum blocks under a registered brand name.

Uruguay has established standards for sheep-dip preparations (*sarnifugos*). Those with a base of calcium sulphide must have a minimum content of 25 per cent. of polysulphide sulphur.

An economical method of preparing lead iodide on a commercial scale is claimed in U.S.P. No. 2,366,953, by H. A. Beatty (assigned to Ethyl Corporation). The method is to pass a mixture of iodine vapour and an inert gas such as nitrogen or helium through molten lead. The inert gas is used as a diluent because the direct reaction between lead and iodine vapour is so highly exothermic as to be difficult of control.

In Belgium, a rayon plant has been opened by the Société Belge de Fibranne, at Zwynaerde, but the company's producing capacity is far from being fully utilised at present.

In South Africa, a relaxation of the regulations governing the regeneration of used engine oil permits the disposal of used oil to any person, providing he is in possession of a permit from the Controller of Soaps and Oils.

Coal deposits near Rio Sorocaba, Brazil, with reserves estimated at 1,000,000 tons, are considered the most important of the State of Sao Paulo, while in the Cacapava region, studies are being made with regard to lignite.

The Almaden mercury mines in Spain have ordered two complete pumps with motors to replace old equipment no longer serviceable in pumping water from the mines. They hope to obtain, if possible, a complete new plant from the United States in 1946.

Sulphur production in the United States amounted to 3,218,156 long tons in 1944, an increase of 27 per cent. over the previous year's level. Sales figures reached a new record with 12 per cent. higher than in 1943.

French Moroccan phosphate producers have been attempting to satisfy demands from the United Kingdom and to meet the needs of Spain and Portugal, which take substantial quantities. The production programme for 1945 has been fixed at twice the pre-war output.

Two further aluminium plants are being constructed in Brazil, one at Rodevalho, Sao Paulo, and another at Campos, Rio de Janeiro, where three large bauxite mines with an estimated reserve of 1,500,000 tons of ore are located. The plant at Ouro Preto, referred to in this column recently, is almost completed.

Treatment of Indian ores before export was the subject of a report discussed by the advisory committee of the utilisation branch of the Indian Geological Survey, the director of which was instructed to collect information on the production and export of essential minerals. The committee also considered the post-war conservation of coal, mica, and petroleum resources.

Dinamite Nobel, a subsidiary of Montecatini, and the biggest producer of explosives in Italy, in its report for 1943-44, reports a sharp decline in stocks. War damage to the plants at Bussi, Orbetello and Carmignano in Central Italy is described as heavy, while production in the Upper Italian plant has had to be curtailed. Gross profit declined from 134.9 to 97.9 million lire, of which depreciation absorbed 26.2 (35.8) million lire, leaving a net profit of 16.42 (18.76) million lire.

The British Columbia Industrial and Scientific Research Council advises that local agar-producing seaweed is of better quality than that found in any other part of North America. Large quantities are being collected for experimental work with a view to subsequent commercial application.

The chairman of the Kenya Pyrethrum Board and the Director of Produce Disposal have been asked by the Pyrethrum Board to visit the U.S.A. in order to go into the question of synthetics, extract factories, prices, and kindred subjects related to the industry.

Three phosphate mining concessions, which were recently granted in Mexico, are reported to be the first for the exploration and exploitation of possible phosphate-bearing areas. They cover 27 hectares in the State of Nuevo Leon, a short distance north-east of Monterrey.

Argentina's petroleum production during 1944 was 3,852,000 cubic metres, against 3,948,000 in 1943. Of the former figure, 2,576,000 cubic metres (against 2,632,901 in 1943) were obtained from the State Oilfields (Y.P.F.), and the remainder from privately-owned wells.

Soap containing a ratio of glycerol to fatty acid in excess of 1 part to 60 parts may now be manufactured in South Africa, says a statement by the Director-General of Supplies. This relaxation of the regulations is due to an improvement in the supply position.

Over 6000 Canadian scientists of a total of 40,000 in the Dominion, are now serving as technical officers in the armed forces, accounting for the shortage of trained personnel, it was revealed at a recent meeting of the board of directors of the Chemical Institute of Canada.

Sulphurous acid for the purification of clay was used at normal and elevated pressures in a large-scale trial-plant of Th. Goldschmidt A.G., of Essen, where, according to reports published shortly before the occupation of the Ruhr, clays were treated with a view to their utilisation in the aluminium industry.

The Société Chimique de Gerland has followed the example of other French chemical producers and acquired new funds by the issue of 20,000,000 fr. of 3½ per cent. debentures. The means made available to French industrial firms by issue of debentures are largely required for re-stocking, etc.

Du Pont's have offered 35 post-graduate fellowships at 29 universities for the academic year 1945-46. This is 13 higher than in previous years, and for the first time the list includes two fellowships in physics, indicating the increasing demand for physicists in the chemical industry. The amount of the stipend has been increased from $750 to $1000.

South African shellac importers may now obtain their requirements through ordinary commercial channels, although applications for import facilities must still be sent to the Controller of Industrial Chemicals. The acquisition, disposal and use of shellac still remain under regulation.

At the mills of the Alabama Flake Graphite Company, Ashland, Ala., U.S.A., plans are now under way, says *Deco Trefoil*, to recover the mica and vanadium contents which are known to be present in the mill tailings in commercial quantities. The re-ground tailings, after flotation for complete removal of graphite, will be deslimed, conditioned, and then subjected to flotation with cationic reagents for recovery of the mica-vanadium concentrate which may either be marketed as such, or treated for extraction of vanadium and possibly salts of potassium.

Estimates of Sweden's oil-shale reserves have been revised downward as the result of a study undertaken in recent months by the Swedish Government. The Kinnekulle deposits are now reported to contain some 18,000,000 metric tons of shale with an oil content of 4.4 per cent. to be exploited by open-cast mining, and from 60,000,000 to 70,000,000 tons recoverable through underground methods. Oil content of the reserves in south-eastern Scania is said to amount to but half that of the former and, moreover, usual distillation processes cannot be applied because of its high aluminium content. Since, however, this shale is ferrous and contains vanadium, exploitation of the deposits is recommended.

A contract has been awarded for preparing the site for the new synthetic liquid fuels research and development laboratory at Bruceton, Pa., for the U.S. Bureau of Mines. This laboratory, which is not to be confused with the demonstration pilot plants that the Bureau will build later to demonstrate methods for producing petrol and other products from coal and oil shale, is part of the five-year research programme in synthetic liquid fuels recently authorised by Congress. It will be used to improve the processes for hydrogenation and gas synthesis employed in England, Germany, and other countries, and will incorporate the most up-to-date techniques available.

Forthcoming Events

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

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

May 8. British Chemical and Dyestuffs Traders' Association. Waldorf Hotel, London, W.C.2. 3 p.m. Annual general meeting.

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

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

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

May 10. Society of Chemical Industry. (R. & B. M. Group). Gas Industry House, 11 Grosvenor Place, London, S.W.1. 4 p.m.: Annual general meeting; 4.30 p.m.: Mr. E. R. Hutt and Mr. W. R. Peard, "Co-operative Research in the Road Emulsion Industry."

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

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

May 12. The Institute of Physics (South Wales Branch). Physics Department of the University College, Cathays Park, Cardiff, 2.30 p.m. Professor W. V. Mayneord: "The Use of Infra-Red Radiation in Medicine."

May 16. Royal Society of Arts. John Adam Street, Adelphi, W.C.2. 1.45 p.m. Professor J. D. Bernal, F.R.S.: "The Social Relations of Science." (Trueman Wood Lecture.)

May 16. Chemical Engineering Group (S.C.I.). Waldorf Hotel, Aldwych, London, W.C.2. 12.15 p.m. Annual meeting, at which business will include the declaration of elections to the General Committee and notification of the election of honorary officers. 1 p.m. Annual luncheon, at which a record attendance is hoped for. Applications for tickets (15s. each) should reach the Hon. Secretary, at 56 Victoria Street, S.W.1, not later than May 11.

May 17. Chemical Society. Royal Institution, Albemarle Street, London, W.1. 5 p.m. Professor J. D. Bernal, F.R.S.: "The Past and Future of Crystal Chemistry." (Hugo Müller Lecture.)

Company News

The Indian Iron and Steel Company, Ltd., announces an interim dividend of 10 annas (6 annas).

Newton Chambers and Co., Ltd., report a net profit, for 1944, of £99,490 (£99,435). The dividend of 15 per cent. is repeated.

Cerebos, Ltd., reports a net profit, for 1944, of £440,762 (£410,503). The total dividend is again 40 per cent.

The Standard Oil Co. of New Jersey reports a consolidated net revenue of $155,396,460 ($123,078,279), equal to $6.69 per share ($4.15).

The Shell Union Corporation reports sales, for 1944, at $489,202,473 ($407,736,721). Net income totals $28,163,961 ($24,542,556), equal to $2.09 ($1.82) per share. The dividend is $1.50 ($1.25).

The British Oxygen Co., Ltd., reports a net profit, for last year, amounting to £370,369 (£384,527). The final of 8 per cent. (same), together with the interim of 8 per cent. (7 per cent.), makes a total of 16 per cent. (15 per cent.).

The Ultramar Company has obtained Treasury permission to offer 290,100 10s. shares at 70s. in the ratio of one for every nine shares held. The new shares will bring the concern's issued capital to £1,450,300 and the proceeds will provide funds for the Venezuelan subsidiary, Caracas Petroleum, S.A., in order to assist its mercedes development programme. At the same time, the authorised capital will be increased from £1,500,000 to £2,000,000.

New Companies Registered

Puricine Products, Ltd. (394,706).—Private company. Capital £500 in £1 shares. Chemical products for industrial, commercial, domestic or pharmaceutical use, etc. Subscribers: Norman Mundy, H. H. Mundy. Registered office: 146 Bishopsgate, London, E.C.2.

Industrial By-Products, Ltd. (394,656).—Private company. Capital, £1000 in £1 shares. Manufacturers of and dealers in goods derived from natural waste products, and by-products or residues arising from any chemical or industrial processes, etc. The first directors are: Wilfred Smith and Mrs. L. Smith (both directors of Wilfred Smith, Ltd.). Registered office: Portland House, 73 Basinghall Street, E.C.2.

Chemical and Allied Stocks and Shares

STOCK markets maintained a confident tone, awaiting peace developments. British Funds lost part of their strength, but industrials recorded numerous gains, shares of companies with overseas and especially U.S. interests responding to the announcement of an Anglo-American double taxation treaty. The prevailing view is that, later in the year, there is likely to be a supplementary Budget which will take steps to reduce the present high level of taxation.

Under the influence of double taxation relief, Borax Consolidated deferred units have advanced to 43s. Dunlop Rubber 52s, 6d., Lever & Unilever 49s. 3d., Lever, N.V. 49s. 4½d., and "Shell" 90s. 7½d. also showing good response. Imperial Chemical 40s. 6d. recorded a further rise on balance. United Molasses at 42s. 3d. rose prominently, aided by the increased distribution for the past year; but the units of the Distillers Co. have been less active, although at 118s. 3d. they continued to hold all but a small part of their recent big advance. At 87s. 6d. xd. British Oxygen were little changed on the higher payment, and British Aluminium at 45s. 3d. have been a quiet market. Amalgamated Metal shares 20s. 6d. further improved. Turner & Newall at 86s. 6d. were well maintained, with Barry & Staines firm at 54s. 6d. on hopes of improved results, Nairn & Greenwich higher at 78s. 9d., and Wall Paper Manufacturers deferred little changed at 44s. 3d.

Iron and steel shares were firm and tended slightly higher on the view that, granted future E.P.T. relief, dividends in many cases may be maintained, thus giving current yields an attractive appearance. United Steel 27s. 1½d. showed firmness on the latest factory acquisition, Allied Iron 54s. 6d. moved up, with Davy Engineering 34s. 6d., Dorman Long 28s. 6d., Hadfields 33s. 6d., and Thomas & Baldwins 13s. 1½d. also showing moderate gains. Ruston & Hornsby 54s. 9d. were higher on current dividend hopes. Associated Cement at 62s. were unchanged, the tendency being to await the results. British Plaster Board 39s. 6d. were again active, Crittalls, after rising to 38s. 3d., on the new issue terms, receded to 36s. 6d. Babcock & Wilcox strengthened to 56s. 6d. on the higher distribution.

Textiles responded to double taxation relief, with Bradford Dyers 27s., Fine Spinners also 27s., Bleachers 14s. 10½d., Coats 53s., and Calico Printers 20s. 7½d. At 35s. British Celanese, and Courtaulds 57s. 3d., were little affected by the cut in rayon prices. Among paint shares, Pinchin Johnson were firm at 41s. 6d. Elsewhere, General Refractories were maintained at 17s. 1½d. Cerebos rose further to £11¼. Among plastics, De La Rue were £11⅜, with British Industrial Plastics 2s. shares around 7s., and Erinoid 12s. 4½d.

Awaiting the results, B. Laporte have changed hands around 88s. 9d. Goodlass Wall 10s. ordinary were more active up to 21s. 6d. British Lead Mills 2s. shares were

around 5s. Sanitas 9 per cent. preference shares marked 35s. 4½d. British Drug Houses showed firmness with dealings up to the higher level of 32s. 6d. More attention continued to be given to British Glue & Chemical 4s. ordinary, with dealings up to 10s. 4½d. Cellon 5s. shares came in for increased attention, business up to 26s. 6d. being recorded.

Boots Drug showed firmness at 57s. 3d., Timothy Whites were 41s. 6d., Sangers 32s., and Beechams deferred 19s. 10½d. Gas Light & Coke were 23s. 10½d., and Low Temperature Carbonisation 2s. shares around 2s. 9d. Oil shares moved higher on balance under the lead of Shell. Lobitos 58s. 9d., Canadian Eagle 16s. 7½d., Attock 73s. 3d. were also higher. Ultramar Oil, however, eased to 79s. 3d. following the announcement of the new issue.

British Chemical Prices

Market Reports

A SUSTAINED activity has been reported from most sections of the London general chemical market during the past week and delivery specifications continue to cover good volumes. A strong price position is maintained throughout the market and fresh inquiry is on a steady scale. Among the soda products the demand for bichromate of soda and chlorate of soda is in excess of available supplies and there has been a steady call for supplies of industrial refined nitrate of soda. There has been no change in the position of Glauber salt and salt cake, which are moving steadily into consumption. Yellow prussiate of soda continues in short supply and offers are readily taken up. Firm price conditions are the main feature of the potash section. A good inquiry is reported for phosphate of potash, bichromate of potash and caustic potash. In other directions a brisk demand is reported for acetone and formaldehyde. Arsenic is receiving a moderate inquiry. There are no changes to report from the coal-tar products section this week.

MANCHESTER.—Prices generally have continued on a steady to firm basis on the Manchester chemical market during the past week and little in the nature of actual easiness has either occurred or is anticipated in the near future. The movement of contract supplies to the textile and allied trades and also to the other leading users in this part of the country has continued on steady lines and a certain amount of new business in the alkalis and many other products has been reported and further bookings are expected to result from inquiries dealt with during recent weeks. With one or two exceptions a steady movement of fertilisers is under way and in pretty well all sections there is promise of a full absorption of supplies. Among the tar products, there is a steady demand for crude tar, creosote oil, carbolic acid, toluol, and benzol.

GLASGOW.—In the Scottish heavy chemical trade business in the home market has shown a decided improvement during the past week. Prices remain very firm with no actual changes to report. Export enquiries are also more numerous.

Price Changes

Arsenic: Per ton, according to quantity: 99/100%, £49 to £52; white, 98/99%, £47 to £50; grey, 96/97%, £42 to £45; grey, 95/96%, £40 to £43.

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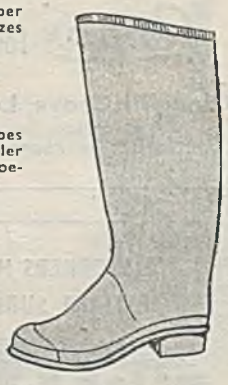

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