The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

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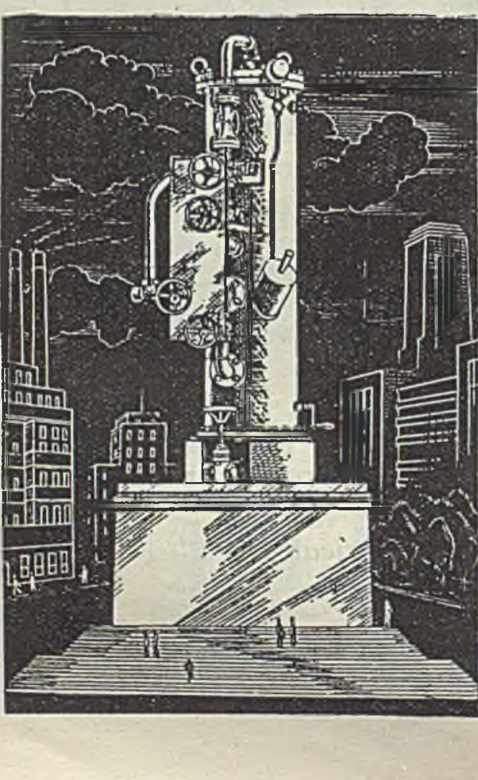

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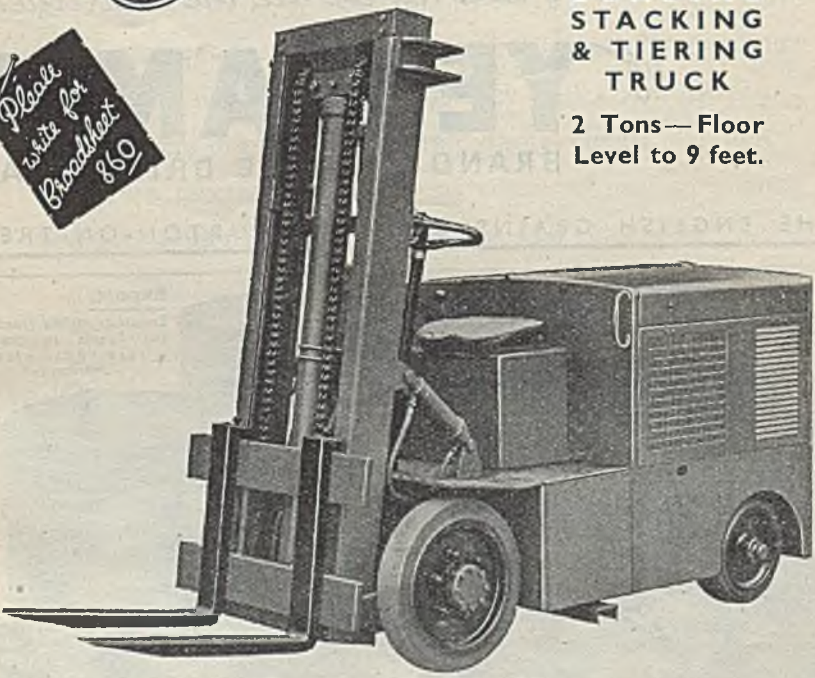

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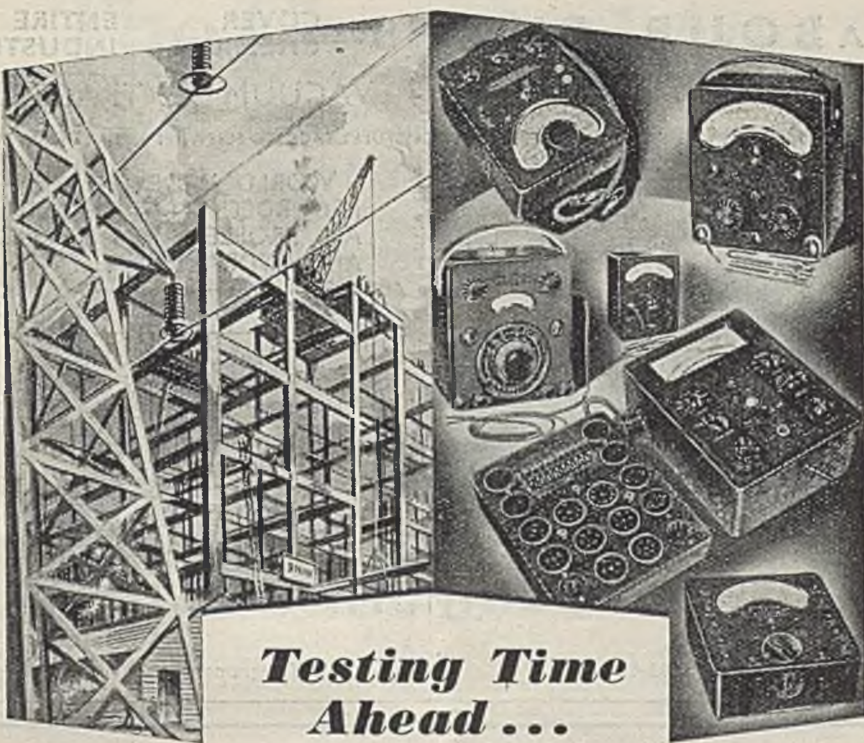

Testing Time Ahead . . .

RECONSTRUCTION, as we now know too well, means something other than enjoyment of the non-existent fruits of victory. The amenities of a world at well-earned peace are not for us until we have replaced the ravages of war with the necessities of life and the realities of universal peaceful intent for victors, victims and vanquished alike. That is speaking collectively. . . . For ourselves, we learned much and progressed far in the six years of ceaseless toil, urged on by dire necessity and peril. We are not resting now. We are still pressing on, pressing into the service of those engaged in rebuilding the body and soul of a whole world the knowledge gained, the advancements perfected, the skill and craftsmanship that outmatched the efforts of our enemies.

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The Scientist as Administrator

IT is a curious fact that many people believe themselves to be born administrators. We recollect showing a group of public schoolboys round a chemical works not so long ago, accompanied by their careers master. The purpose was to encourage them to enter the profession of chemical engineer. Consequently, it was arranged that at some time during the day every boy should have a few minutes' chat with a senior member of the staff, and in the course of that chat every boy was asked what he wanted to be. At least 80 per cent. replied that they wanted to be an "administrator." Pressed to explain how they proposed to reach that exalted position, the boys, almost without exception, replied that on leaving school they expected firms to offer them such jobs right away, and clearly believed, moreover, that they would thereupon be given a large desk in a well-furnished room, there to sit like a spider in the centre of things "directing" the activities of grown men and women who would be told exactly what to do by the "administrator." It did not seem to have dawned on anyone that the administrator needs wide experience of men and affairs to do his job successfully, nor did anyone appear to have the least conception of what an administrator was supposed to do. Possibly that may be the effect of translating boys into prefects; but it suggests a lack of realism on the part of the careers master, who should surely be charged with the job of explaining industrial conditions to his boys.

Is this example unique? Do the delusions of youth die with adolescence? We doubt it. Witness the frequent demand that the scientist should take a prominent place in government, solely on the ground that he knows scientific facts and will therefore not make obvious mistakes that a little scientific training would avoid. This demand comes from scientists, and seems to be unpopular among politicians. We have no evidence that the unscientific politician is necessarily a good administrator. We are, in fact, witnessing at the moment the working out of the universal truth that the amateur does not make a good professional without further experience. For any work, training and experience are essential, and, with the complexity of modern life, are becoming more essential than ever before. The wisest administrators recognise how little they know. Cardinal Richelieu, on being asked by his niece, an abbess, for support in a legal action, refused on the ground that it would lead to his authority being discussed:

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"Whether you rule an abbey, a village, a realm, or a nation," he said, "you must always be careful not to allow anyone to discuss your intentions. Act, and let your actions alone be discussed." Is not that the antithesis of the scientific method, which demands discussion of the probable mechanism of reactions so that all is laid bare from start to finish? Much the same thought was expressed later by Lord Mansfield: "Give your decisions, never your reasons; your decisions may be right, your reasons are sure to be wrong."

We shall risk the execration of every youthful scientist by proposing the thesis that only indifferent scientists should attempt to become administrators. Administration is a human problem; the good scientist is not necessarily sufficiently humanised to be an administrator, a ruler of men and women. He may assess the technical problem correctly, but only a few scientists will be equally at home with the intangible human reactions to what is done. We have heard it said that the most ghastly fate that could overtake human society would be for it to be run like a machine or a chemical reaction, ordered and governed by scientific principles only. Hsiung, the Chinese philosopher and writer, tells of a prominent scholar who once remarked to him that the Chinese language was the second most difficult thing to tackle in the whole world; the first, he added with a sigh, being his wife. Therein lies the crux of administration. Technical problems are the second most difficult thing in the world; the first being human relationships. Scientists as a class have the reputation of glueing their eyes to the test-tube, whereas the administrator must lift his up to the hills. We question whether scientists in general make good administrators; there are, of course, exceptions, but is not their function primarily to advise the trained administrator—whether he be politician, town councillor, or managing director—on scientific matters of fact, leaving to others the task of making decisions which must often be made by intuition or by a deep knowledge of the human mind?

The problem goes farther than that. We have lately read an article by Sir George Stapledon, F.R.S., in *The Countryman*. "I am sure," he wrote, "the incubation of ideas is greatly favoured by long periods during which a man will work alone and do everything for himself. A scientist will begin to deteriorate as a scientist, and perhaps also as a man, when he ceases to work with his own hands, when he ceases to coordinate hand and brain. He may still be a useful citizen, perhaps a good administrator, and fulfil necessary functions, but he will have lost something in insight and power. . . . The danger is very real at the present time when, because of the shortage of well-trained men, first-class scientists are likely to attain to positions of administrative responsibility and leadership while still quite young. These men, the custodians of future research, should be supremely on their guard."

Why should scientists wish to become administrators? What is the glamour, whence is the glamour, that surrounds the administrator? Is it anything more than the assumption of greater authority, or the receipt of a higher salary? If it is these things, then again we declare that the really good scientist should not be lost to scientific work by being made an administrator. The time is surely coming when younger men will be selected, either at their university or within a very few years of entering industry, to be trained as administrators. If, as we maintain, administration is in fact the hardest job in the world, why should we not train men for it? Why should we promote to the administrator's chair men who happen to have shown ability in quite other walks of life?

In support of our thesis we might cite the case of an eminent scientist who was persuaded—against his better judgment, we believe—to accept a politically administrative post. Having a first-class brain, he fulfilled his duties with great skill and with lasting and beneficial effect to the community. But he conceived a violent dislike for the attendant conditions, and gladly threw off the chains of office at the first opportunity, convinced that science and politics do not mix.

No! Again at the risk of being hanged, drawn, and unpleasantly quartered, we maintain that *as a body* scientists who are good at their scientific work should remain at it. The lure that attracts them away from it, whatever it may be, should be removed. That may imply higher pay for scientific and technical men; it may mean a higher status in the organisation in which they operate; it may involve setting up technical departments which are more nearly autonomous than they are to-day. But whatever it is let us keep the true scientists away from administration in order that they may make their best contribution to the problems of the day.

NOTES AND COMMENTS

Cost of Atomic Energy

SOME figures collected by the Washington correspondent of the *Financial Times* and published last Tuesday bear out the findings of Mr. Dutton in our principal contributed article this week. The figures have been extracted from the report submitted by a group of scientific advisers to Mr. Baruch, U.S. representative on the United Nations Atomic Energy Committee. Due notice having been taken of both the dangers and the advantages of an atomic energy plant, the report comes to the conclusion that it would be possible to produce electrical energy at an operating cost some 26 per cent. higher than with a plant using coal. Basing their estimates on current costs in the United States, Mr. Baruch's advisers give their opinion that a complete nuclear power plant producing 75,000 kW could be built " in a normal locality in the Eastern United States " for about $25 million (£6,250,000). Assuming operation at 100 per cent. capacity, and interest charges at 3 per cent., operating costs would be about 0.8 cents per kWh. A comparable coal-power plant, under the same conditions, would cost $10 million (2,500,000), with operating costs at 0.65 cents per kWh, taking the price of coal producing 13,500 B.Th.U. at $3.50 per ton at mine and $7 per ton delivered. Appropriate stress is laid on the fact that the industrial use of atomic energy is in its infancy, and that lower costs of nuclear power plants can best be attained by an extensive programme of research and development.

The Steel Board

PRESS comment on the composition of the Steel Board (which, it may be noted, is not yet complete) has been revealing, not to say entertaining. "City" interests claim that the appointments are " political "; more moderate opinion takes the line that a considerable degree of impartiality has been used in making the appointments. We are distinctly inclined towards the latter view. Two members of the Board have been drawn from the employers' side of the industry, two from the trade unions concerned; the chairman is independent (though he may certainly be classed as an industrialist), while the Treasury representative may also be reckoned as independent, and a similar status will be required of the missing member, we presume. To those who complain that control of the industry is to be taken away from men who have long experience of it (*i.e.*, the Iron and Steel Federation), and that undue weight has been given to the trade union side of the question, we would suggest a Fabian policy. In present circumstances it is inevitable that the trade unions should have a greater share in the governing of the industry than previously; but neither Mr. Callighan nor Mr. Lincoln Evans can be described as a political firebrand. There is, moreover, no reason to suppose that Sir Alan Barlow will attempt a reversal of the previous attitude of the Treasury, which has been consistently friendly to the Federation. As we see it, the great thing is that *something* has been done to get this cardinal industry going at full steam. There has already been nearly five months' delay since the first announcement of nationalisation was made. And, as we have already pointed out, the Board is still not complete. In the present instance, we do not believe that the delay has been entirely the Government's fault; but their reputation for getting things done quickly is not so high that they can afford to miss any opportunity for decisive action.

Wood Chemistry in Russia

ONE direction in which chemical technology in Russia is expected to develop is evidently in the improvement of processes dealing with the chemical usage of wood and its residues, an important source of raw materials in an area so rich in forests as is the Soviet Union. In the latest five-year plan, the Chief of the Central Administration of the Wood Chemical Industry of the U.S.S.R. has published figures indicating the value of wood from his point of view, claiming that one cubic metre of wood processed chemically yields, besides charcoal, some 40 kg. of chemical products. Wood-tar residue appears to have become a basic ingredient for the manufacture of many chemicals in Russia, and wood-tar oil is stated to be excellent for stabilising petrol produced by cracking, superior indeed to the synthetic inhibitors used in America, as well as being cheaper and simpler to manufacture. Pitch, as a binder for moulds, has already replaced starch and molasses at many foundries. A new discovery on the part of Russian wood chemists is pyrocatechin, which is stated to provide the most suitable material for dyeing furs black. Intensive development of the dry distillation of wood and the manufacture of rosin and turpentine are envisaged during the five-year period, while, in an entirely different direction, bearings produced from impregnated wood, subjected to heat and pressure, are claimed to be more durable than bronze bearings, and to be especially suitable in underwater applications.

Linseed Oil Surprise

PUTTING up the price of linseed oil to more than double what it was, as announced in The Chemical Age last week, has apparently come as a shock to people in the paint industry, particularly as they had been given no inkling of any such increase. When considering the present figure of £135 per ton, it is almost impossible to realise that the average London price in 1939, up to the outbreak of war, was but £24. The following year the Government spot selling price reached £43 10s., and this figure remained more or less the same for a couple of years; then it went up to £48 17s. 6d. In 1944 the price rose to £61, and, before the latest increase was announced, it went up to £65. So far as paint consumers are concerned, the increase will probably work out at between 6s. and 7s. a gallon, and it is being pointed out that this will add considerably to the bill for reconversion and rehabilitation in industry generally. Such a considerable increase could not have come at a worse time.

Free Market Wanted

AMONG the reasons given by the Government for embarking on the policy of buying commodities in bulk were that prices would be kept steady and that adequacy of supply would be ensured, but the latest move has made the first of these arguments appear painfully thin, while nothing has been said to indicate that there will be larger or more assured allocations. Indeed, the present allocation to the paint industry of 49,500 tons a year is woefully inadequate. When a delegation from the industry met Mr. Belcher, Parliamentary Secretary to the Board of Trade, at the end of July, they pointed out that the industry required 90,000 tons a year, and could use 120,000 tons. The return of a free market is now being more strongly urged than ever, it being considered in trade circles that this unexpected and spectacular advance in the price of an essential raw material condemns still more the Government's policy of bulk-purchase.

The Advance of Chemistry

ON all sides there is evidence of the advance of chemistry. Much of this progress is due to the mutual exchange of information and in this connection the reports of the survey teams of scientists and others now inspecting German plant and interviewing workers are of especial importance. Some of the teams are American, others British, and they work independently, but the information gleaned is shared between the two countries, and, apparently, is soon to go further afield. Addressing a meeting of Australian scientists at Sydney recently, Mr. Bradley Dewey, president of the American Chemical Society, alluded to the importance of the reports and said he understood they would soon be available to Australia. Going on to speak of the possibility of the swift advance of chemistry being checked by inability to find enough men of adequate training and education to carry it on, he deprecated undue alarm, declaring that there were many evidences that the younger generation recognised the opportunities which chemistry and chemical engineering offer.

A New Approach

MR. DEWEY was of the opinion that as rapidly as educational institutions could train them, there would be a supply of young men to support and advance what has already been undertaken, but he added the hope that before long there would be an entirely new approach to scientific and technical training in the schools. "All of us older men have long realised," he said, "that the barriers are breaking down, or have broken down, between classical chemistry and classical physics. The one, we know, blends into the other even as engineering merges into both. I know many of you will share my hope that we shall see a basic training in the future in which science will first be taught as a whole—as the complete knowledge of material things that it is. And when this broad science has been understood by the student, it will be time enough for him to concentrate upon the specialities we shall term 'chemistry' and 'physics.'

Some Chemical Aspects of Atomic Energy

The Present Position and Possible Applications

by GUY G. S. DUTTON, B.A., A.R.I.C.

THE publication of the Smyth report[1,2] last year has focussed the attention of the world on the possibilities of using the energy produced in atomic fission for various industrial purposes besides its war-time application for atomic bombs.

The present-day conception of an atom is that it contains a central nucleus in which is concentrated the majority of its mass. Surrounding this nucleus are electrons which are arranged in several concentric shells. The mass of the nucleus is made up of neutrons and protons each of which has a mass slightly greater than unity, but the proton also has a unit positive charge whereas the neutron has no charge. Since an atom is electrically neutral the number of planetary electrons must be equal to the number of protons since each electron has one negative charge. The mass of an electron is only 1/1840 that of a proton and so if this is neglected the atomic weight of an atom is the sum of the weights of the neutrons and protons in the nucleus. The atomic number corresponds to the number of protons, which we have seen is the same as the number of electrons.

Radioactivity

The phenomenon of radioactivity was discovered in 1896 by Becquerel, who observed that salts of uranium were capable of affecting a photographic plate even when this was wrapped in black paper. The celebrated work of the Curies showed that the material in the uranium affecting the photographic plate was a new substance which they called radium. At the same time another radioactive substance was discovered, and was called polonium, after Madame Curie's native country, Poland. A little later a third radioactive substance was isolated and this was called actinium.

Radioactive materials are so called because they spontaneously decompose with the emission of various particles. The three main types of particle which are emitted in this manner are the alpha particle, the beta particle, and gamma rays. It has been shown that an alpha particle is a doubly charged helium atom, that is to say it has a mass of four units with two positive charges. The beta particle has been identified with the electron and so it has a unit negative charge and negligible mass. The gamma rays are electro-magnetic vibrations similar in nature to X-rays, but of much shorter wave length.

The isolation of these radioactive products led to the idea that the alpha particle in particular might be used for bombarding other atoms and thereby producing atomic transmutations. This was first achieved by Rutherford in 1919, who bombarded atoms of nitrogen with alpha particles and found that a small amount of oxygen was produced. Since an alpha particle is doubly charged and the nucleus of an atom is also positively charged there is bound to be electrostatic repulsion between the two. Consequently the number of direct hits by an alpha particle on the nucleus of any atom is small.

Discovery of the Neutron

The discovery in 1932 by Chadwick of the neutron was a great step forward. Although this particle has only one-quarter the mass of an alpha particle it has no charge and can therefore enter more freely into the interior of an atom. As an example of a bombardment reaction using neutrons we may take the case of the reaction between protons and neutrons, thus: $2\ {}_1H^1 + 2\ {}_0n^1 = {}_2He^4$. Considering the masses of the particles on the left hand side we have 2.01794 for the neutrons and 2.01516 for the two protons. On the right hand side we have one helium nucleus with a mass of 4.00388. It would appear that 0.02922 units of mass have been "lost" in the course of the reaction. It was, however, propounded by Einstein that energy and mass are equivalent. His relationship states that $E = mc^2$, where E is the energy in ergs if m, the mass destroyed is in grammes, and c, the velocity of light, is 3×10^{10} cm. per sec. The mass which is apparently lost in a reaction of the above type appears as energy according to this relationship and it may be calculated that the production of one gramme of helium by this method will liberate 165×10^{12} cals.

In the production of helium by this method the neutrons must be supplied from an outside source and as soon as the supply is cut off the reaction will cease. The next important discovery in laying the foundations for atomic energy was made by Hahn and Strassman, who found that bombarding uranium with neutrons caused the uranium atom to split into two portions of approximately equal mass, in the course of which reaction more neutrons are formed. Here we have the very important difference between this reaction and the bombardment of protons with neutrons to produce helium; the former is self-supporting because of the production of more neutrons, while the latter reaction ceases as soon as the external supply of neutrons is withdrawn.

Natural uranium consists of three isotopes of masses 234, 235 and 238. Of these the U234 is of no importance from our point of view since it is present in only very small amounts and takes no part in nuclear reactions, while U235 and U238 are present in the proportion of 1 to 140.

Further work showed that the U235 is the important isotope in producing a chain reaction, since it is this which undergoes fission into two particles of different masses with the simultaneous production of more neutrons, the number of which may vary from one to three per fission. These neutrons have very high energies (of the order of 200 Mev.), but it is only neutrons of low energies (about 0.025 Mev.) which are effective in bringing about fission of the U235 nucleus. These neutrons are sometimes referred to as thermal neutrons, since their energy is equivalent to that produced by thermal agitation. It is obvious then, that if a chain reaction is to be made possible, these high-energy neutrons must be slowed down in order to produce further fissions. This may be accomplished by a series of elastic collisions. Since the transfer of energy is greatest when a neutron collides with an atom having approximately the same mass as itself, it would appear that hydrogen would be the best material to use. Any material which is used for slowing high speed neutrons is known as a moderator, but the choice of hydrogen for this purpose is ruled out owing to its great affinity for absorbing neutrons. Other materials which have been suggested as moderators are deuterium, in the form of heavy water, beryllium, and graphite.

Factors Influencing a Chain Reaction

From what has been said above it is clear that a chain reaction becomes possible by using a lump of natural uranium which contains the fissionable U235, in conjunction with a moderator to slow down the fast neutrons produced in fission to those of thermal energies. This, then, is the essential requirement for constructing an atomic pile. Just as hydrogen cannot be used as a moderator owing to its power of absorbing neutrons, so also other substances are encountered as impurities in the uranium and graphite which will absorb neutrons. It has been stated that 1 to 3 neutrons are produced per fission, and since it is essential that at least one of these neutrons be available to promote further fissions, it is advisable at this point to consider the factors influencing the useful life of a neutron. There are four ways in which a neutron may react. It may: (1) be absorbed by U235 producing further neutrons; (2) be absorbed by U238; (3) be absorbed by impurities in the uranium and the moderator; (4) escape completely from the uranium. It is clear that for a chain reaction to take place the gain in neutrons by the first process must be greater than the loss by all the other three processes combined. This fact has given rise to the use of a constant k, known as the reproduction factor, which is defined as the ratio of the number of new neutrons produced in fissions to those originally present.

Purity Requirements

In order to reduce the loss of neutrons by any of the three means listed above, the greatest attention must be paid to the purity of the materials used. It would appear at first sight that it would be helpful to separate the U235 from the U238, but although this is desirable from the point of view of an atomic bomb it is not essential in the construction of an atomic pile. Although U238 does not undergo fission when bombarded with neutrons it will absorb a neutron and be converted to an isotope of mass 239. This is unstable and by emitting a beta particle will pass to an atom of mass 239 and atomic number 93. This is known as neptunium, which is also unstable, and by the loss of another beta particle passes to plutonium of mass 239 and atomic number 94. Since plutonium also undergoes fission on bombardment with neutrons its production will help to keep the chain reaction in operation. Thus we see that it is not necessary to separate the isotopes of uranium but it is essential that the uranium metal used is of very high purity.

There are two main sources of pitchblende, which are situated near the Great Bear Lake in Northern Canada, and in the Belgian Congo. After the uranium has been extracted from the ore it is best purified by conversion to uranyl nitrate. This compound has the property of being soluble in ether and so if a solution of the impure nitrate is ether-extracted the pure salt will dissolve in the solvent (together with a little vanadium), leaving the impurities in the aqueous layer.

It has been estimated that a neutron makes 200 collisions with the moderator and travels 2.5 cm. before it is slowed down to an energy level suitable for producing further fissions. It should be evident from these figures that the purity of the moderator is of great importance. Of the moderators already mentioned the world's stock in 1940 of heavy water was only about 500 lb., a quantity quite insufficient for the construction of a pile. Similarly the stock of beryllium metal was extremely low and the cost of production very high. Attention was therefore turned to graphite as the most convenient material to use as a moderator. Commercial graphite electrodes from which the blocks of graphite moderator are made are manufactured by graphitising petroleum coke, which is pressed into bars. Graphite made in this manner will contain a certain amount of residues from the petroleum products, but since these may usually be eliminated by heating to a higher temperature, the first attempts to improve the quality of the graphite were concerned with the elimination of the boron. Commercial graphite normally contains one part in 500,000 of boron and although this quantity is acceptable for most purposes it is too much when the graphite is to be used as a moderator. This is because boron has a very high affinity for neutrons and consequently even a small amount will tend to reduce the value of k below unity. It is significant that within a year the purity of the graphite had been so improved that the degree of neutron absorption was reduced by 20 per cent.

It is interesting to note the many methods of analysis which were employed in order to check the purity of each batch of materials for use in the pile. The techniques employed included the usual ionic analyses in conjunction with spectrophotometry and polarography, but since it is not the presence of any one impurity which is injurious, but the combined effect of all the impurities, these tests were supplemented by functional trials. These were carried out by inserting a sample of the material under test in a chain-reacting unit and measuring the neutron density at fixed distances from the neutron source.

The escape of neutrons may be governed by altering the size of the lump of uranium. If the uranium is considered to be in the shape of a sphere the loss of neutrons will be dependent on the surface area, proportional to r^2, while the capture of neutrons producing fission occurs throughout the volume of the material and is therefore proportional to r. It is evident, therefore, that it is possible to have a piece of uranium of such a size that these two effects are balanced. This is denoted by the term "critical size," which is defined as the size for which the production of free neutrons by fission is just equal to their loss by escape and non-fission capture.

Construction of an Atomic Pile

It has been noted that a pile consists essentially of uranium, which contains U235, and a moderator, and that the purity of these materials is of prime importance. The question now arises as to how, given suitable materials, they may be assembled in order to generate energy which can be used for industrial purposes. The first pile to be built consisted of seven tons of uranium metal in the form of lumps inserted in a regular manner in an eight-foot cube of graphite. During the course of the chain reaction fission products are produced from the U235, and since most of these are radioactive and capable of absorbing neutrons there comes a time when the value of k may fall below unity. This may be overcome by periodically removing the lumps of uranium and inserting fresh metal. If an atomic pile is likened to a currant cake in which the currants represent the lumps of uranium it will be seen that it is difficult to remove the uranium without disturbing the rest of the pile. To overcome this difficulty the uranium is inserted in the form of rods, known technically as slugs. By this means it is comparatively simple to push out an old slug and replace it with a fresh one.

The process of fission occuring in a pile generates a large quantity of heat. This is the energy produced by the apparent loss of matter, according to Einstein's equation. In order that the pile may do useful work this heat must be harnessed. Two cooling materials were originally proposed. These were helium and water. The piles which have been built and operated up to the present have all been water-cooled. The decision to use this method was taken mainly on account of the hazards involved in case any of the helium should leak away, carrying radioactive fission products.

Cooling Methods

Naturally, the most efficient way of cooling the uranium slugs is to have the water circulating in direct contact with them, but this is impractical since the uranium will react. It is therefore necessary to sheathe the uranium slugs in some manner in order to protect them from corrosion. The choice of material to be used for protecting the slugs is governed by two main factors. The first is that the material used must not be attacked by water, and secondly, it must not readily absorb neutrons or disintegrate under the influence of the gamma rays present in the pile. Considerations of these limitations restricts the choice of materials to Pb, Bi, Be, Al, Mg, Zn, and Sn. The materially finally chosen was aluminium, and the slugs were protected by being sealed inside aluminium cans. This method of protecting the slugs is the result of much experimenting with other processes, such as metal spraying, all of which proved inferior to the canning method.

If pipes to carry the cooling water are to be inserted into a pile and yet the pile is still to remain self-supporting, *i.e.*, for k to be greater than unity, it means that initially the pile must have been producing more neutrons by fission than were needed just to maintain the chain reaction. If for every fission by a neutron two more neutrons are produced, these two, when they cause further fissions, will produce four neutrons, and soon the process will get out of hand and become explosive. This is obviously undesirable in a pile designed for the production of a steady quantity of energy for industrial purposes and it is necessary to have a means of controlling the number of neutrons available for producing fissions. This is done by inserting into the pile rods of material which have a strong absorption for neutrons. The materials most commonly used for this are cadmium or boron-steel. The distribution of these rods in the pile, and their size, are arranged so that when they are pushed right into the pile the value of k is reduced well below unity, and when they are pulled out it will rise above unity, thus allowing the pile to be run at different energy levels. For a pile to run at a constant energy level the value of k should be 1.0. It is possible for an operator to acquire, in a few hours, sufficient experience to keep the output level. In more recent plants the movement of the control rods is governed automatically by instruments which measure the value of k; in this case all the operator has to do is to watch the control dials.

The water used for cooling will become heated in its passage through the pile and this heat may be utilised in the form of hot water or low-pressure steam for process and space heating, but neither of these methods is likely to be of much industrial importance. More important applications are for generating electricity either by the heating of air to drive a gas turbine or for a high-pressure indirect steam generator to drive a steam turbine[3].

Potential Energy of Fission Reactions

It is convenient at this point to compare the energy available in an atomic pile with the energy to be derived from more normal sources, such as coal, and at the same time it should be borne in mind that so far atomic piles have only been run with the sole idea of producing plutonium, in which case the energy generated has been dissipated as waste heat.

(It was recently announced at a meeting of the Atomic Scientists' Association that a pile is at present being constructed in the U.S.A., and that it is hoped to drive a turbine with it within a year.)[4]

It has been stated earlier that it is only the U235 isotope which undergoes fission and that this is present in natural uranium to the extent of one part in 140, or 0.7 per cent. It can be calculated that if one pound of uranium be completely destroyed by fission the energy released will be 3,000,000 times that produced by burning the same quantity of coal. When the factor of 0.7 is taken into consideration this figure is reduced to 20,000, so that, in round numbers, 1 lb. of natural uranium is equivalent to 10 tons of coal. The price of uranium metal in a state of purity suitable for use in atomic piles has already fallen from £200 to £4 per lb., and it is reasonable to suppose that this figure will be reduced still more as manufacturing experience and the demand increase. In the light of these figures it would appear, then, that any industry depending on coal as its main source of energy may expect, in the course of the next few years, to obtain this energy for a fraction of its present cost from atomic sources.

As an example of the fallacy of this line of thought let us consider the generation of electric power since, in this country, this industry relies almost entirely on coal as its source of energy. In 1938 the Central Electricity Board published the following itemised account of the cost of electricity production, taking coal at £1 0s. 3d. a ton. Fuel accounted for 28 per cent. of the cost; capital charges 28; salary, wages, and maintenance 10, and profit 34 per cent. Consideration of these figures will show that even if the cost of fuel is considerably reduced it will not greatly affect the cost of electricity. On the other hand, the plant needed for generating atomic energy and the special precautions to be observed in handling radioactive substances may well cause an increase in capital charges and maintenance. It would therefore appear that the cost of generating electricity is not likely to be fundamentally altered by the discovery of atomic energy. On the other hand, what this method of producing energy has done is to make it possible to generate electricity where supplies of coal do not exist, and it is likely that a method will soon be developed whereby air can be used as the coolant, thus dispensing also with the need for an adequate water supply.

The possibilities of such an arrangement have many far-reaching applications. Among these may be mentioned the fact that it will now be possible for industries to be situated without regard to supplies of coal and water for the provision of power, and this may in future be a factor in helping to even out the distribution of labour in this country. A second application that may be noted is that if new deposits of minerals are found in desert areas it may become a practicable proposition to work them.

Some Drawbacks

So far we have reviewed the construction of an atomic pile for producing energy, the materials required and their methods of purification, but nothing has yet been said about the many hazards and difficulties of operation which are to be encountered. It has already been noted that the materials to be used have to be specially purified and so we cannot expect many piles to be constructed in the near future until methods of producing these materials in large quantities, in the required state of purity, have been perfected and the necessary plant set up. As an indication of the amount of material needed for a pile it may be stated that the first pile ever to be operated contained seven tons of uranium imbedded in an 8 ft. cube of graphite, but even these amounts of materials only produced 200 watts.

Besides the quantities of materials required, the size of the pile must be taken into consideration. As can be judged from the figures quoted above, the size, even for moderate outputs of energy, is unwieldy, using graphite as a moderator, but if this is replaced by heavy water the size can be materially reduced owing to its much greater efficiency in slowing up high-speed neutrons. It is interesting to note in this connection that when an experimental pile, using heavy water, was built, the chain reaction became self-supporting when only two-thirds of the calculated quantity of water had been added. We see then that there is scope in the chemical industry for processes designed for the economical production of pure uranium, graphite, and heavy water.

Harmful Radiations

When the U235 undergoes fission the two particles which are formed, in addition to the neutrons, are radioactive. This means that as soon as a pile is put into operation radioactive materials are produced and these in turn give off harmful radiations. Just as radium for clinical use is enclosed by a thick shield of lead when not in use so also must a pile be shielded to prevent workers on the plant from being affected by the radiations. The screen normally used consists of a thick wall of steel or concrete, and even for a pile of modest energy output this shield will weigh something of the order of 50 tons. This, then, would appear to shatter illusions which seem prevalent at the present time that cars and aeroplanes will soon be running on atomic energy. There is, however, one form of transport which may be able to utilise atomic power, and that is ships. Taking the case of the *Queen Mary*, which uses 6000 tons of fuel in crossing the Atlantic; it may be, that allowing for the weight of the shielding required, a saving in weight will be effected.

The fact that the fission products produced in the pile are radioactive leads to other problems, among which two may be mentioned. The water flowing through the pile as coolant will become radioactive and cannot, therefore, be discharged immediately as this would endanger both human and animal life. To overcome this the water must be kept in reservoirs or a lake until the radioactivity has died down. It must be remembered that radioactive decay is a spontaneous process and its rate cannot be altered by any of the usual agents.

Secondly, no engineering plant can run for ever without attention, and efficient maintenance is essential. Whereas, if a piece of machinery is sprayed with poison gas, it is a relatively easy matter to decontaminate it by means of a squad of men dressed in protective clothing, the matter is much more complicated in the case of a radioactive pile. The only known method, at the moment, for dealing with this problem is to leave the pile until it is safe to approach. Since the half-life of some of the fission products is quite long this means that the pile will be lying idle for some time. One way of overcoming this is to have a battery of piles, some of which are always "cooling off," but this is likely to lead to an increase in running costs.

Other Fission Products

There is, however, a bright side to the production of these radioactive fission products and that is that among them is iodine; and radioactive carbon, phosphorus, and sulphur can be made in a similar way by neutron bombardment. The implication of this is important in biological work for elucidating points of interest in connection with tissue growth and the mode of action of drugs. Radioactive carbon will also provide the organic chemist with a useful tool in investigating the mechanism and course of reactions. Only very small amounts of these tracer elements are required since, for a radioactive element with a half-life period of 100 hours, 10^{-15} of a gram can be detected with ease. It is more likely that great strides will be made in this field in the near future rather than in the production of atomic energy.

Just as the discovery of steam did not at once give us long-distance trains travelling at high speeds, nor the discovery of the internal combustion engine aeroplanes travelling at speeds approximating to that of sound, so it is unreasonable to expect that a self-supporting atomic pile, first operated on December 2, 1942, will immediately revolutionise our way of living. Advances there will no doubt be, and although an atomic pile generating about half a million kilowatts is by no means outside the bounds of possibility, it would be idle to suppose that it will be built overnight; but when it comes it will provide a large contribution to the four million kilowatts of electricity at present generated in Great Britain. Most of the chemical industry depends on power in one form or another, and the advent of cheap and adequate supplies of electricity will be of far-reaching importance.

REFERENCES

[1] Atomic Energy, H. D. Smyth, H.M.S.O., 1945.
[2] For a full summary of this report see THE CHEMICAL AGE, 1945, *53*, pp. 359, 385.
[3] *Power Plant Engineering*, *50*, No. 4, p. 81.
[4] *Nature*, August 24, 1946, p. 255.

Iron and Steel Board

Names of the First Members

NAMES of the first members of the Board set up to supervise the development and reconstruction of the iron and steel industry were announced by the Ministry of Supply on Friday last week as follows: Sir Archibald Forbes (chairman), Sir Alan Barlow, Mr. A. Callighan, Mr. Lincoln Evans, Mr. G. H. Latham, and Mr. R. Mather.

Mr. A. C. Boddis of the Ministry of Supply has been appointed secretary of the Board. An additional member with experience of general industry is to be appointed and his name will be announced shortly.

Sir Archibald Forbes, who was formerly a member of the firm of Thomson McLintock and Co., Ltd., became a director of Spillers Ltd., in 1935, and was released in 1940 to join the staff of the Air Ministry. After a period as Deputy Secretary to the Ministry of Aircraft Production, he subsequently took over also the post of Controller of Repair, Equipment and Overseas Supplies.

Sir Alan Barlow, Bart., has been a Joint Second Secretary of the Treasury since 1942.

Mr. A. Callighan became national president in 1939 of the National Union of Blast Furnacemen, Ore Miners, Coke Workers and Kindred Trades, and became general secretary of the union in November of that year. He has had long experience of trade union activities.

Mr. Lincoln Evans became assistant general secretary of the Iron and Steel Trade Confederation in 1936 and succeeded Mr. John Brown as general secretary of the Confederation early this year. He is a member of the T.U.C. Advisory Committee on the coal-mining industry.

Mr. G. H. Latham has had more than 40 years' experience with the Whitehead Iron and Steel Company, Ltd., of which he is now chairman and managing director. He was managing director of Richard Thomas and Co., Ltd., for a period. He is president-elect of the British Iron and Steel Federation, vice-president of the Iron and Steel Institute, and Technical Adviser for the steel industry on the Finance Corporation for Industry.

Mr. Richard Mather is chairman and managing director of the Skinningrove Iron Company, Ltd., and a director of Pease and Partners. He was technical adviser to the Indian Tariff Board in 1923-24, and again in 1926-27, and was technical director of the Tata Iron and Steel Company from 1930-40.

Duties of the Board

The main duties of the Board will be:

(a) To review and supervise programmes of development needed for the modernisation of the iron and steel industry and to watch over the execution of approved schemes in such programmes.

(b) To supervise as necessary the industry in current matters, including the provision of its raw material requirements, and the administration, under powers delegated by the Minister, of such continued direct control as may be required over the production, distribution and import of iron and steel products.

(c) To advise on general price policy for the industry and on the fixing of prices for controlled products.

The salary of the chairman will be £8500 per annum, and the other members of the Board, who are on a part-time basis, will each receive £1000 per annum.

Magnesium Alloys

Technique of Gas Welding

WITH the growing importance of the applications of light alloys to the engineering industries, special interest attaches to a report, "Technique for the Gas Welding of Magnesium Alloys," issued by the British Welding Research Association. Magnesium alloys proved their worth during the war and many current developments in industry would suggest that more will be heard of them in the future. The publication just issued is a memorandum prepared by a joint committee of the British Non-Ferrous Metals Research Association and the British Welding Research Association on Fusion Welding of Magnesium-rich Alloys.

It is pointed out that the readiness and ease with which magnesium - 1.5 per cent. manganese alloy may be welded renders possible the construction of complicated assemblies, but to achieve that most advantageously the designer must make adequate use of all available forms of the metal, that is to say tubes, extrusions, sheet, etc. Particulars are given of design, edge preparation, setting up, manipulation, and finishing and protective treatment, including removal of fluxes, hammering, chemical cleaning, chromating, painting and temporary protection. An outline is given of the properties of magnesium affecting welding technique, the effect of the composition of the alloy on welding behaviour, notes on the welding flame, the flux and welding rods. Of special interest are references to weld defects and inspection and testing. The appendix gives details of chromating treatment. There are several excellent illustrations.

Copies of "Technique for the Gas Welding of Magnesium Alloys" may be obtained (2s. post free) on application to the Director of Research, British Welding Research Association, 29 Park Crescent, W.1.

India's Scientist-Builder

Sir Shanti Swarup Bhatnagar, O.B.E., D.Sc., F.R.S.

by CHANDRA KANT

Sir Shanti S. Bhatnagar

NOT least among India's leaders on whom has devolved the heavy responsibility of shaping the destiny of the country in some respect or other is the 51-year-old scientist and Professor of Chemistry, Sir Shanti Swarup Bhatnagar, who is the only Indian chemist elected to the Fellowship of the Royal Society of London. In Indian science to-day he holds a key position, inasmuch as it is not confined to purely academic or university work, but comprises the all-important organisation and development of scientific and industrial research for national welfare. Indeed, it is in this latter respect that he is more widely known in India and outside, and is chiefly responsible for evoking world-wide interest in the industrial potential of India.

Sir Shanti Swarup is the Director of Scientific and Industrial Research and Principal Scientific Adviser to the Government of India. In this capacity he played a vital role in the scientific war effort of the country. In 1940 he organised the Council of Scientific and Industrial Research; harnessed scientific resources of India at a critical period in the history of the country, indeed of the whole world; developed numerous industrial processes for the manufacture of much-needed goods for the prosecution of the war; co-ordinated the work of more than 100 Indian research workers and gave impetus to Indian industry through research. It is through his untiring and ceaseless efforts that Indian industrial sciences have earned recognition at international level; and, through his vision, initiative and scientific achievements, the country has realised the importance of research for progress. His achievements were honoured by the award of a knighthood in 1941.

The most outstanding effort through which Bhatnagar has set out to serve his country is in industrial chemistry and the organisation of scientific and industrial research. There were many personal circumstances which moulded his career in this respect, starting from childhood. Even at the early age of eleven he had to become self-supporting and see himself through school by winning scholarships and doing odd jobs for a little money. In his undergraduate days he worked out a successful formula for the manufacture of gelatin duplicating pads for a Lahore stationer and earned his examination fees. The really big chance, however, came in 1935, when he was director of the Punjab University chemical laboratories. The Attock Oil Company approached the university with one of their insuperable problems and one on which they had spent much money and effort—the coagulation of mud in drilling operations when salt deposits were encountered. The university chemists put forth various suggestions for overcoming the difficulties which, however, were not quite feasible. Dr. Bhatnagar (as he then was) immediately realised that it was a simple problem in colloid chemistry, a subject dear to him, and could be solved by protecting the colloidal mud by means of protective agents, especially Indian gums. Before the day was over he had demonstrated his idea in the laboratory; before the week was over it was employed in the oilfield with great success. His solution attracted world-wide interest, especially among petroleum technologists, and this first big success gave birth to a highly flourishing school of applied research at Lahore, covering all branches of chemical industry.

The Steel Brothers Company offered him a lac and half of rupees as reward for the successful investigation of their problems, and Dr. Bhatnagar made over the whole of this amount to the Punjab University for the encouragement of applied research.

It was in a most crucial period of the country's history that Dr. Bhatnagar showed his abilities as a great scientist and builder, and set the country on the path of industrial progress. In 1940 the conditions created by the outbreak of the war suddenly left even the established industries of the country bereft of some of the commodities essential for their continued functioning. These industries had come to depend on other countries, countries not even within the British Commonwealth of Nations, for the supply of such commodities. Many sources of supply to India of finished products were either stopped entirely or much curtailed. The Government also felt at that time that the commodities essential for the prosecution of the war could not be produced in the country and could not be obtained from outside without serious difficulty. Very soon India had to occupy a key position as supply centre for the whole of the Middle East and Far East.

A Central Research Board

As the situation became acute, it came to be realised that planned industrial research on the many problems of the chemical, metallurgical and engineering industries under Indian conditions was almost completely lacking, and that to make India industrially self-sufficient, also an effective source of war supplies, a Central Research Organisation should be established immediately. This serious gap in the country's industrial development was filled by the creation of the Board of Scientific and Industrial Research by Government in 1940, and Dr. Bhatnagar was called upon to organise, direct and co-ordinate the work of the Board. The magnitude of the responsibility devolving on him was overwhelming, as everything had to be done right from scratch. But Dr. Bhatnagar saw in this his life's biggest chance to serve the country through scientific research and took it up with the zeal and devotion characteristic of a builder. Accompanied by a batch of trained workers from Lahore, he went to Calcutta, started his laboratories and infused new life into the scientific workers of the whole country.

Thereafter, the story of his contributions to the cause of Indian industry is largely the story of the achievements of the Council of Scientific and Industrial Research, which played such a notable part in winning the war and latterly in India's post-war industrial development. At one time more than 50 research chemists and physicists worked in his laboratories, under his direction, covering diverse fields of industrial research—plastics, paints and varnishes, oils, heavy and fine chemicals, fertilisers, pharmaceuticals and drugs, lubricants, etc., and contributed to the successful investigation of more than 100 research problems. New aspects of research, some of them unique in the whole world, were opened up and results of far-reaching importance were obtained. His scientific advice was sought for by the R.A.F., U.S.A. Air Forces, supply and food departments, and several other defence organisations of the Government. Under his direction the work of the Council expanded phenomenally in every branch of science and industry, and the Council became the premier scientific organisation of India. He organised surveys of Indian industries and raw materials, and gathered much valuable information. He established scientific liaison with the advanced countries of the world and raised Indian industrial sciences to the international level.

The organisation of post-war research in India is yet another mission in his life to which Sir Shanti is now devoting all his attention and energy. Even within this short period of five years since the inauguration of the Council, he has made the public and the Government keenly alive to the importance of research to national progress. As a result of his efforts the Government have sanctioned one crore of rupees for the further development of scientific research in India. Seven national laboratories—National Chemical Laboratory, National Physical Laboratory, National Metallurgical Laboratory, Fuel Research Institute, Central Glass and Ceramic Research Institute, Road Research and Building Research Institutes—have been planned to be established in the immediate future. What these laboratories would mean to the country needs no explanation. They are the vital arteries of the country's progress, and the man responsible for them is a national asset. It is, indeed, a fitting recognition of his work that the British Society of Chemical Industry elected him an honorary Fellow in 1945.

Educational Work

On return to India in 1921 from England, with high academic honours and experience in chemical research at the London University, Bhatnagar was appointed University Professor of Chemistry in the Benares Hindu University. He served this university until 1924, when he joined the Punjab University, his *alma mater*, as University Professor of Physical Chemistry and Director of University Chemical Laboratories. It was here that he built up an expanding school of chemistry, now so widely known. He attracted to Lahore a very large number of students, many of whom now occupy professorial chairs in various Indian universities and important places in research institutes. It is not strange that Dr. Bhatnagar, with family traditions of culture and learning, and with the inspiration derived from great masters, devoted a good part of his life to the cause of education. In recognition of his services to the cause of education, Sir Shanti was made a Fellow of the University College, London, last April.

Bhatnagar's contributions to science have been from two points of view—the advancement of scientific knowledge, and the utilisation of this knowledge for material progress. In both these he has been a great Indian pioneer. His work in the field of pure or academic research is apt to be overshadowed by his outstanding work in industrial chemistry, which has attracted wide public interest and has brought him fame, but the former is no less important and praiseworthy. Indeed, it is his firm hold on fundamental or theoretical sciences that has helped him to serve the cause of applied science. His contributions to magneto-chemistry are both impressive and brilliant, and a comprehensive review of his work on this subject, with scores of references to the applications of the precision magnetic interference balance developed by him, has appeared in the Annual Reports on the Progress of Chemistry issued by the Society of Chemical Industry. The balance has been manufactured by Messrs. Adam Hilger & Co. His monograph on magneto-chemistry is recognised as a standard work on this most intricate subject. His contributions to colloid chemistry, photo-chemistry and the study of chemiluminescence, carried out over more than 20 years, have played no small part in the development of these subjects.

Personal History

Sir Shanti Swarup is the eldest son of an ancient cultured Hindu family of Kayasthas, whose earlier members held high office in the Moghul Court. His father, a meritorious graduate of the Punjab University in English and history, became one of the earliest followers of Brahmo Samaj, the great Hindu reformist movement started by Raja Ram Mohan Roy. He was on this account disinherited from family property, not a rare thing in the India of that period; and instead of joining judicial or executive service, which was the family tradition, became the headmaster of a high school. He died when Sir Shanti Swarup was only eight months old.

Education came the hard way to young Bhatnagar in the circumstances in which he found himself at a very early age, without any means of support. He had to struggle hard to pay for his education—by doing odd, part-time jobs and by winning merit scholarships. He found, however, in one Mr. Raghunath Sahai a real friend, philosopher and guide. Mr. Raghunath Sahai was a class-fellow and friend of Shanti Swarup's father, and one of the best-known educationists of his time. Bhatnagar later married Mr. Raghunath Sahai's daughter, Lajjawati, at the age of 20.

As a student in the school and college, Bhatnagar topped the classes and won the praise of his teachers. He evinced keen interest in science and, while still in the intermediate classes, contributed a paper on the fermentation of pomegranate juice. He had his university education first at the Forman Christian College, Lahore, and later at the Punjab University chemical laboratories. At the latter he did his first post-graduate research on the effect of adsorbed gases on the surface tension of water, which formed his thesis in part-fulfilment for his M.Sc. degree. In 1919, with the help of a scholarship from the Dayal Singh College Trust, Bhatnagar entered London University as a research scholar under Prof. F. G. Donnan. He worked on emulsions and qualified for the D.Sc. degree of London University.

During the summer vacations of 1919-21, Bhatnagar worked as a research student at the Kaiser-Wilhelm Institute, Berlin, and the Sorbonne, Paris, and came into close contact with leading scientists—Professors Haber, Freundlich, Bodenstein, Einstein, Planck, Urbain, Perrin, and others—from all of whom he derived great inspiration for scientific research. During his stay in England he held a Fellowship of the Department of Scientific and Industrial Research.

The realm of science is the realm of utility, and a scientist in the present age serves mankind most by making the most useful contribution to its material progress. At its higher levels, however, scientific pursuit is the pursuit of truth. We have seen that Bhatnagar's contributions to India's industrial progress have been great, but his researches in the theoretical sciences, it must be emphasised, are of equal significance Beyond the satisfaction of material ends man has deeper yearnings, profounder needs of the spirit. This is the reason why artists will always be reckoned the equals of scientists in the service of mankind. It is rare that both rôles are played by the same individual. In Sir Shanti Swarup, however, urge for science has not crowded out the craving for poetry. He is a poet of distinction, and to him poetry is as dear as chemistry. He is the author of over 50 poems in Urdu, many of which, especially "The Wife and the Book," "The Chemist and the Philosopher," etc., are famous for their depth of thought and feeling and for their beauty of composition.

TIMBER PRESERVATION

For the preservation of timber used underground in the Rand mines, a new vacuum-pressure plant has recently been placed in operation in South Africa. The impregnating solution contains 3 per cent. of zinc sulphate and 0.3 per cent. of triolith. Composition of the triolith is: potassium bichromate 35 per cent.; dinitrophenol 10 per cent.; sodium fluoride 55 per cent.

The method of impregnation is a three-stage vacuum-pressure-vacuum one, and it results in the complete penetration of the sapwood of the timber. The type of timber treated is mostly mixed gum and wattle of comparatively recent growth. There is little or no penetration of the heart-wood. The net liquid absorption is 0.75 to 1.0 gallons per cu. ft. of timber.

LETTERS TO THE EDITOR

B.A.C. and T.U.C.

SIR,—Mr. Sheldon leaves me even more dissatisfied with the B.A.C. than before. He still does not tell us whether his letters are officially written on behalf of the Association or not.

I said nothing in my letter about the B.A.C. having a political bias. It would not worry me much if it had. The trouble is that it hasn't got any kind of bias, except, perhaps, a bias for sitting on the fence. Why the Council of the B.A.C. should go to all the trouble and expense of holding a ballot to do something which they have not even made up their minds they want to do is beyond me.

Being a technical representative who travels a wide area and meets many chemists, I can assure Mr. Sheldon and his colleagues on the B.A.C. Council that the apparent vacillation and indecision which they exhibit does far more damage to the B.A.C. than any hint of a political bias. An association which cannot make up its mind will interest only those chemists who cannot do so either. Those who can, join either the Institute or the A.Sc.W. Those who cannot, fail to join even the B.A.C., just because they cannot.

Frankly, I would sooner see the B.A.C. go violently Communist than continue in its present sloth and torpor. As a professional body, it just isn't on the map: as a trade union, it is a farce. It has huge accumulated funds which it does not know how to use and its dwindling membership is a sad commentary on the enthusiasm which it originally displayed in 1918, and which I also recall sharing.—Yours faithfully,

NON-SOCIALIST CHEMIST.

September 7.

Industrial Jewels

SIR,—I read, with great interest, your editorial on "Industrial Jewels" (*see* THE CHEMICAL AGE, Aug. 24, p. 219), and I fully agree with your point of view that the diamond has hitherto resisted all efforts to be manufactured synthetically, having the same composition and quality as in nature.

You refer to the fact that the most remarkable piece of evidence for the correctness of Hannay's manufacture is that some of the twelve pieces in the collection of the Natural History Museum are of the "rare" structure of the type II class of diamond, being a mosaic, less perfect, type of structure than that of the more "numerous" type I diamonds. It may, perhaps, interest you that at present the type II diamond is really a more common one as its characteristics are widely known in diamonds discovered in the Belgian Congo and Sierra Leone. A great number of these diamonds are covered by a relatively thick coat and, as shown by X-ray studies, this coat reveals the properties of type II diamond. Practically all diamonds used for abrasive purposes come to-day from these mines.—Yours faithfully,

P. GRODZINSKI.

London, N.W.3. August 31.

Synthetic Caffeine

SIR,—We see in the issue of THE CHEMICAL AGE for August 31 (p. 267), under the heading "Foreign News," that you report that the Monsanto Chemical Company is erecting a plant for the synthesis of caffeine.

As a matter of form, we should like to take this opportunity of calling your attention to the fact that our company also has succeeded in effecting the synthesis of caffeine. A plant for this purpose was erected during the war, at a time when we were cut off from our normal raw materials, and we were thus able to satisfy French requirements.—Yours faithfully,

SOCIETE DES USINES CHIMIQUES RHONE-POULENC.

Paris. September 3.

Origin of "Nuron"

SIR,—References have been made in the technical Press to the effect that "Nuron," the new contact resin developed by the plastics division of I.C.I., may be derived from allyl alcohol. This is not so. Although "Nuron" is a cross-linked resin and can be used in the manufacture of many forms of laminates, it is distinct from the allyl type of contact resins produced in America. The British resin is made entirely from raw materials available in this country.—Yours faithfully,

GORDON LONG,
Press Officer,
Imperial Chemical Industries. Ltd.

London, W.1. September 4.

CHEMICAL ENGINEERING COURSES

The Ministry of Labour and National Service announces that as one method of meeting the demand for chemical engineers which modern industrial development is creating and increasing, the Ministry of Education is arranging for full-time intensive training courses in a number of technical colleges. The courses, which will last for approximately twelve months, will be open to men who have graduated in engineering, physics or chemistry or have secured the Higher National Certificate in engineering or chemistry, or who have obtained a general science degree in mathematics, chemistry and physics.

South African Chemical Notes

Extraction of Oil from Shale

(from Our Cape Town Correspondent)

A RECENT private investigation into the possibilities of extracting oil from South African shale deposits by the electro-thermal process developed by the Swedish engineer, Dr. F. Ljungström, revealed that in certain circumstances the process could be used economically in the Union.

A statement issued by the Swedish Consulate in Pretoria says that it appeared that the seams of oil-shale in the Transvaal were covered by a very thick layer of sandstone. A depth of sandstone of about 55 yards had to be penetrated before borings reached the seam of oil-bearing shale, which was about 12 yards thick at the most. Dr. Ljungström did not consider this exceptionally favourable for the process he had developed. The covering layer above the shale should not be more than 12 to 18 yards thick, and a heavier seam of shale of from 18 to 23 yards would be desirable. But the average percentage of oil in Transvaal shale was estimated at 10 to 15 per cent., against only 5 per cent. in Sweden, and he therefore considered it possible to start economic production based on 12 yards of shale covered by about 23 yards of sandstone. If the oil shale in the Transvaal yielded, when gasified, equal calorific values of gas and oil, it should be possible to produce all the electric energy needed for Dr. Ljungström's process of heating the shale by using the gas in a power station.

The report states: "Dr. Ljungström considers that to form a definite opinion of the economic possibilities of oil production from the shales of the Transvaal it would be highly desirable for a closer geological investigation to be carried out." It added that a successful oil industry depended largely on finding more favourable geological conditions than those so far revealed.

Organic Chemicals

The possibility of establishing an organic chemical industry in the Union was discussed in a paper recently read by Dr. S. R. Haas, chemical engineer, at the conference on "Science in the Service of South Africa" at the University of the Witwatersrand. He said that at the moment South Africa had only two branches of the organic chemistry industry which were well developed. These were the manufacture of explosives and of chemicals based on alcohol and by-products. The remainder of the so-called organic chemical industry in the Union was actually only a "mixing" industry, which depended on materials coming from overseas. This was an unsound state of affairs. There seemed to be a reluctance to discuss the idea of an industry based on indigenous raw materials. Objections offered were that the country had a limited consuming power for such products and that coking coal deposits—the true basis for an organic chemical industry—were small. The answer lay in creating a demand for the products, and using the large deposits of low-grade coal as a substitute for coking coal. The Fischer process had proved that low-grade coal could produce a full range of organic compounds—even including, before the war, petrol at 6d. a gallon.

Anti-Fouling Paint

The efforts that are being made by the Iron and Steel Institute in England to produce a master paint that will resist barnacles are being supported by the scientists in Cape Town, in conjunction with fellow-scientists in other parts of the world. At the Sturrock graving dock and also at the old dry-dock in Cape Town, a young woman is often seen with one or two assistants scraping the hulls of ships. She is Dr. N. A. H. Millard, of the Cape Town University Zoological Department. She collects mussels, barnacles, and ugly tubeworms which foul ships' bottoms. These are studied and classified at the university, and the data are forwarded to the institute in London. Dr. Millard said that her work would continue for a year. To produce the ideal paint, the scientists in London must have all the facts of the habits in different waters of sea pests. Reports are also collected from captains of ships calling at Cape Town on the areas in which their hulls have been fouled. It costs the owners thousands of pounds a year to have the hulls scraped. Normally, ships have to enter dry-dock every nine months. It has been found that marine growth can slow up a ship by 1½ to 2 knots per hour, and that at slow speeds fuel consumption is increased by 50 per cent. Two types of paint are used on ships' hulls. One is anti-corrosive, on top of which an anti-fouling paint is used. The difficulty about the poison, Dr. Millard said, is that it must be sufficiently soluble to seep into the water and keep the organisms away. If it is too soluble the ship will lose it. A happy medium has to be found.

Dusting wattles by aeroplane for the control of bagworm will be resumed shortly. It is proposed to use Gammexane powder so as to compare its efficiency and cost with that of cryolite.

Lever's, who are South Africa's largest

soap-makers, with their main factory in Durban, have had to cut their production by nearly half owing to the world-wide shortage of oils and fats. This information was given by Mr. A. D. Gourley, chairman of the South African company. The Union used to get most of its oils and fats for manufacturing purposes from India and the Belgian Congo, he said. Now India, owing to its own shortage, had stopped exporting ground nuts. The Belgian Congo supplies go into a central pool and are allocated by the Combined Food Board in Washington. South Africa's allocation has been cut sharply. The raw materials for soap and edible foodstuffs were largely interchangeable. A large proportion of the raw materials intended for soap-making had been diverted and after being refined and treated were now being used for edible fats. The company is operating its own rationing scheme, but the Director of Food Supplies and Distribution was considering the inclusion of soap in his national rationing plan. All customers have had their orders cut down in proportion to the amount the factory is able to produce.

New DDT Tests

New extensive tests of the efficacy of DDT in combating the tsetse fly will be made in the Mkusi Reserve in Zululand in August. DDT will be disseminated in smoke form through the exhaust pipes of six aircraft. In the experiments last year the DDT was sprayed from aircraft. A preliminary test of the new method had had very promising results, a 90 per cent. "kill" being achieved, according to an official of the Onderstepoort laboratory. "The results may be the same as those achieved by the spray," he said, "but we think we will get a better penetration of the thickets with the smoke." In three months it was hoped to exterminate the tsetse in the Mkusi area. "We can tackle only the adult fly by smoke and spray, so we have to spread the tests over a sufficient period to allow pupæ to develop," the official said. Because aircraft could be used only in certain areas, further tests would be made with smoke generators on the ground.

Pigment Grinding

Rolfe Bros., Elandsfontein Rail, Germiston, Transvaal, have installed new pigment-grinding equipment at their factory which, they claim, will enable them to turn out a product at least equal to that imported. The firm is now producing a new range of chromes in three shades of green, three shades of orange, and three shades of yellow. The yellow range is sulphur primrose, lemon, and middle chromes. There is an increasing demand for such products in South Africa.

New Control Orders

Export Licensing

THE Export of Goods (Control) (No. 3) Order, 1946 (S. R. & O. 1946, No. 1473), which becomes operative on September 16, makes certain changes in the export licensing control of exports.

Among the additions to the schedule of goods requiring export licences are:

Group 3. Products of the sulphation (sulphonation) of aliphatic alcohols and aliphatic hydrocarbons, salts of such products, and mixtures (other than medicinal preparations) containing any of the foregoing.

Group 6 (1). Ores and concentrates of thorium and uranium.

Group 8. Polymers of vinyl chloride, copolymers made mainly from vinyl or polyvinyl chloride, and compositions consisting mainly of any of these materials, in the form of rough sheet, strip, powder, granules, or chips.

Group 13. Aqueous emulsions of asphalt, bitumen, and pitch (other than coal-tar pitch) whether natural or not; cadmium compounds, cadmium mass, and cadmium lithopone.

LIGHT METALS CONTROL

The work of the Light Metals Control Office of the Ministry of Supply has been transferred to the Ministry's Metal Division following the release of Mr. C. G. McAuliffe from his appointment as Controller of Light Metals. Inquiries and correspondence should be directed as follows: Metal Supplies—Ministry of Supply, M.4 (Trading), Southam Road, Banbury, Oxon. (Tel. Banbury 2821). Statistics Licences—Ministry of Supply, M.4 (Statistics), Southam Road, Banbury, Oxon. (Tel. Banbury 2821). Matters relating to production—Ministry of Supply, M.4 (Production), Shell Mex House, Strand, W.C.2 (Tel. Gerrard 6933).

DUNLOP RESEARCH GRANT

The Dunlop Rubber Co. is contributing £350 per annum for seven years to the Department of Colloid Science at Cambridge University for research work on molecular structure. For the past two years the Department has been carrying out research work for Dunlop on the structure of natural and synthetic rubber molecules, and the changes occurring in vulcanisation. The research will continue under the direction of Dr. G. B. B. M. Sutherland, a pioneer and world authority on the use of the infra-red spectroscope. The work under the new scheme will probably also include ultra-violet and ultra short-wave radio technique.

Austrian Chemical Industry

Dependence upon Imports

A SURVEY of the industrial chemical industry in Austria reveals considerable shortages and shows that for some time the Austrians will have to rely to a large extent upon imports, according to the Directorate of Information Services, Control Office for Germany and Austria. This is in direct contrast to the situation which existed before the Anschluss, when most of the chemicals required were produced within the country.

When the Nazis took over they closed many factories in order to boost their own products from Germany. In addition, much damage was sustained by plants and factories. The result was that after the liberation the Austrian chemical industry was faced with the task of starting again almost from scratch, and is now making great efforts to reduce dependence upon other countries.

Sulphuric Acid Shortage

One of the greatest requirements is sulphuric acid, of which Austria requires from 40,000 to 50,000 tons a year. The greatest amount formerly came from the Moosbierbaum works in Lower Austria. Since these have been dismantled, and the factory at Deutsch Wagram burnt out, the only source now is the Liesing factory, which produces about 7500 tons of sulphuric acid annually, thus leaving a great deficiency to be made up from other countries.

The iron and steel industries, artificial silk, and ersatz wool industries all need sulphuric acid for their work. Production of nitric acid, essential to agriculture, has been at a standstill, but it is hoped that the nitrogen works at Linz will soon be in production again. Soap and washing powders are extremely scarce owing to lack of the raw materials. Carbide is another essential commodity which is scarce; it is produced by only one factory, in the Tyrol. Compressed oxygen for use in welding is, of course, essential to all works of reconstruction, but cannot be obtained in anything like adequate quantities. There is no production of oxygen or salicylic acid.

Combined Chemical Industries, whose factories are at Floridsdorf, Vienna, state that they are beginning to make black and white enamels under new patents, but that raw materials are extremely scarce. They also state that they have acquired numbers of unspecified patents. They will be able to begin manufacture of bakelite again, but it will be impossible for them to make saccharin for some time.

Some Recent Improvements

In contrast with the general situation, considerable increases in the production of chemicals are reported from the province of Carinthia, which comes within the British zone. Hydrochloric acid and carbide were the only chemicals showing decreases in last month's production figures, but there were several new products.

Last month's production included 72 tons of hydrochloric acid (31 per cent. decrease), 28 gallons of amyl alcohol (a new product), 50 tons of carbide (2 per cent. decrease), 48 tons of barium sulphide (against none in May), 2 tons of barium sulphate (40 per cent. increase), 4 tons of sodium hypochlorite (none in May), 3 tons of calcium molybdate (none in May), 27 tons of sodium sulphide (none in May), and a quarter-ton of magnesium carbonate (new product).

New Mobile Crane

Simple and Convenient in Operation

A VALUABLE adjuct in the problem of speeding up the handling and moving of goods within the confines of factories and works is the "Stanhay," the first air-operated mobile crane to be produced. It can be used either inside or outside a factory, and its versatility gives it a special claim to the attention of the chemical industry, where buildings of various shapes and sizes are the rule. The basic principle

The "Stanhay" mobile crane.

of this crane, which is fully mobile and self-propelled, is the conversion of compressed air into mechanical energy. The maximum height of the jib hook of the 1-ton model is 16 ft., and the maximum outreach 9 ft.; haulage capacity is 5 tons approximately. It is also worth recording here that the jib control lever is so responsive to the touch that a ton weight may be lowered to rest on the point of an upturned pencil without breaking the lead. Owing to its low total height the machine can lift, travel and turn in a radius of only 9 ft., and can hoist with load through doorways only 10 ft. high. The manufacturers are Stanhay, Ltd., Elwick Works, Ashford, Kent.

Scottish Seaweed Industry

Survey of a Year's Work

AT a Press conference held last week in Edinburgh, Dr. F. N. Woodward, B.Sc., Ph.D., F.R.I.C., technical director of the Scottish Seaweed Research Association, Ltd., presented a survey of investigations made by the Association during the past year, and threw out a few guarded hints about future possibilities.

Alginic acid is an extremely versatile raw material, and can be employed in almost as many ways as can cellulose, *e.g.*, in the manufacture of light-weight fabrics, transparent paper, textile size, and soluble surgical ligatures. It is also a possible ingredient of many foods, such as custard powder, soup, and ice cream, and can be used in the fining of beer. Dr. Woodward was careful to point out, however, that the one "selling point" of alginic acid fabrics was that they were non-inflammable; otherwise they could not compete with established fabrics. An interesting point, however, was that if woollen thread is combined with alginate yarn filament and then woven, the acid can be dissolved out, leaving a woollen fabric weighing only 1½ oz. per sq. yd., instead of the 5½ oz. per sq. yd. that is the lightest possible with untreated wool.

Possible Source of Mannitol

The polysaccharides known as mannans have been found to be present in Scottish wrack in greater quantity than anywhere else in the world, and Dr. Woodward suggested their possible exploitation as a source of mannitol. The principal raw materials hitherto have been the American ivory-nut and the carob bean; also spruce cellulose, which gives a mixture of mannose and dextrose. The naturally-occuring mannans are hydrolysed to give mannose, and that is reduced in its turn to produce mannitol, a constituent of certain explosives used during the war.

Obviously, the harvesting of the seaweed is of prime importance, and investigations have shown that the most promising sources of littoral weed are North Uist, in the Outer Hebrides, and Orkney. A survey of 3000 miles of coastline has revealed about 140,000 tons of littoral weed, allowing, perhaps, for a harvest every three years. Last May a survey of sub-littoral weed was started in Orkney; this type is much more difficult to harvest because it does not float when cut, and is not visible from the surface of the water, but a type of mechanical shovel has been evolved for the purpose.

The task of the Association, Dr. Woodward explained, is not only to find out where the weed is and how to harvest it economically, but to study variations in composition of the different kinds, and the effects of location, season and tides. Financially the work has been carried on on a fifty-fifty basis between the Government and the industry. The work of research is now to be financed 90 per cent. by the Treasury for a further period. Three factories are at present operating on the west coast and one in South Uist.

A large house at Inveresk is to become the headquarters of the Scottish Seaweed Research Association, with eleven acres of ground for further development. Copies of the Association's report are available from the hon. secretary, Mr. C. J. M. Cadzow, 28 Rutland Street, Edinburgh.

International Trade Fair

British Exhibits at Stockholm

A BRITISH visitor to the international trade fair which has just ended in Stockholm can scarcely avoid a sense of disappointment that Britain's great export drive has been so shyly reflected in the trade mirror held up to the Scandinavian people, writes our Staff Representative. True, St. Erik's Fair is relatively new—this was the fourth fair, and foreign participation was not possible until 1944—but whereas such British exhibits as there were this year were in the main linked with the stands of Scandinavian agents, quite a number of countries had their own pavilions and much larger and more representative displays. France, Belgium, Holland, Czechoslovakia and even Poland and Finland had exhibition halls of their own.

Interest in Technical Journals

If actual exhibits of U.K. manufacturers were few, evidence of eagerness to know what British manufacturers are making was provided at two stands where specialised British trade and technical journals were available, THE CHEMICAL AGE among them. These stands were crowded day after day, and the story of our own manufacturing progress and our services was conveyed by printed word and pictures to a great many people, some undoubtedly potential buyers of British goods.

There being little, therefore, to describe in connection with British manufactures, what of the products of industrialists and manufacturers elsewhere? The Scandinavian exhibits, naturally, were the most numerous. The steel and metallurgical side was strong, and there were good displays of machine tools and machinery generally, though unlike exhibits at our own British Industries Fair, few were shown in operation. By-products of the forestry and timber industry were prominent, plastics again revealed their extending uses in a striking way, and, as might be expected, the results of electrical development and progress are particularly well marked.

The exhibition was divided into several

sections, the main displays and the pavilions of the various participating countries being in the Royal Tennishall and adjoining buildings. About 100,000 visited the fair last year and 150,000 were expected this year. That "target" must have been well broken. Certainly on the final day (September 1), when the general public, as well as trade buyers, were admitted at 2.50 Kr. (about 3s. 6d.), the people were milling round in their thousands.

Zinc Plate Corrosion

New Phosphating Process

A PRE-TREATMENT of zinc plate, which, it is claimed, will revolutionise the whole field of phosphate coatings, has been described by a research chemist of Westinghouse Electric & Manufacturing Co., to the Elecrochemical Society.

The process, which is now being used in improving the corrosion resistance of zinc plate, was a more or less accidental discovery. Westinghouse began a research project to improve the corrosion resistance of painted metal plate. The focal point of the investigation was to seek a chemical predip which would confer upon the metal sheet the same superior acceptance of phosphate treatments (bonderising is one example) as mechanically polished samples. For some reason a highly-polished plate, will, after phosphating, make a firmer paint bond, and hence have better corrosion resistance than unpolished specimens. To the Westinghouse Co., in need of superior fittings for their electrical instruments, mechanical polishing of the many varied and intricate shapes was a physical impossibility; thus arose the emphasis and necessity for a pretreatment, such as a chemical dip, which would penetrate and evenly affect every square inch of the metal fixture.

After many months of fruitless search, the research chemist, in the course of the investigation, dipped zinc plate into disodium phosphate, gave it the usual commercial phosphate treatment, and after the salt spray and steam chest tests were made, the disodium phosphate pre-treatment was far superior to anything else. More extensive and elaborate experiments on disodium phosphate failed to duplicate, in any way, this one success. More tests showed that only one disodium phosphate in the whole laboratory would give the superior result and that came from the same bottle that gave the first success. Chemical analysis failed to show anything unusual, but suspecting a trace element, a spectroscopic analysis was made and a faint suggestion of titanium was found. Additions of this element, in various forms, still failed to bring about the wanted results from other disodium phosphates.

Success came, finally, from two directions, when a method to make the titanium impure salt was found. The exact reason why titanium should give such protective action still eludes research, though it is almost certain to be a colloidal phenomenon.

At present the concentration of titanium in the salt is 1/1000 per cent., and only a 1 per cent. solution of this disodium is used as a pre-dip. In production, the metal pieces, on a chain conveyor, pass through the pre-dip in 10 seconds. From there they go directly to the usual commercial phosphating bath, after which comes the spray painting or lacquering. Samples so treated will withstand 200 hours of salt spray or steam chest without any corrosion; conventional methods show the unwanted zinc "flowers," sign of failure, in 48 to 72 hours, which is unacceptable by modern standards.

Swiss Chemical Research

The Robert Gnehm Foundation

FURTHER proof of the interest and active support given in Switzerland to chemical research is provided by the report that Dr. Maria Gnehm has left one million francs to the famous Federal Technical Institute at Zurich, to be used for the encouragement and support of teaching and research in the field of chemistry.

The president of the trustees of the new foundation, which is to be known as the Robert Gnehm Foundation after the father of the testatrix, a former president of the Swiss School Council, is Dr. Arthur Stoll, vice-president of the Sandoz A.G. Part of the legacy will be used to enable lecturers from abroad to participate in the Federal Technical Institute's work. The series of Robert Gnehm Lectures was inaugurated on September 2, by a lecture given by Sir Robert Robinson, P.R.S.

Although well-known foreign lecturers have visited Zürich and other famous centres of chemical teaching in the past, this is the first instance of financial provision being made for this purpose. It is hoped this will go a long way towards re-establishing true international relations in this important branch of science.

ALUMINIUM PRICE INCREASE

The price of virgin aluminium in ingot or notch bar form was increased on Monday from £67 to £72 15s. a long ton, delivered into consumers' works. The new price applies to metal of a purity of 99 per cent. to 99.5 per cent. inclusive, with premiums for higher purities. The Ministry of Supply states that the increase in price is consequent upon the cost of metal under the Ministry's Canadian contract having risen on account of the change in the rate of exchange.

Bauxite in Australia

Survey of Likely Sources

PRODUCTION of sufficient aluminium metal to meet the full annual requirements of the Australian market is envisaged by the Australian Aluminium Production Commission, according to *Chemical Engineering and Mining Review*. An output of 10,000 tons of ingot would require the establishment of an alumina plant or plants to treat 60,000 tons of bauxite a year. The alumina will be reduced to metallic aluminium at a plant to be established in Tasmania, the site for which has not yet been finally chosen. Location of the alumina plant will depend on the results of a Commonwealth-wide survey now being carried out by the Commission.

An officer of the Commission returned recently from overseas with full information regarding the production of aluminium from bauxite, and experimental work on the treatment of Australian bauxite will be carried out at a laboratory to be established at the Derwent Park munitions factory, near Hobart.

Considerable quantities of bauxite are known to exist in Australia. Deposits in New South Wales, although extensive, are low-grade, containing 30-40 per cent. Al_2O_3. In Victoria the Mirboo district of Gippsland has a number of deposits which aggregate more than 750,000 tons containing 51 per cent. Al_2O_3, 7 per cent. Fe_2O_3 and 10 per cent. SiO_2. In Tasmania, deposits of bauxite were discovered at the Ouse in 1941, and testing with shafts and boreholes by the Tasmanian Department of Mines has proved 500,000 tons with 40 per cent. Al_2O_3 and 5 per cent. SiO_2. The Ouse deposits are ferruginous in nature.

Tasmanian Investigation

The Aluminium Production Commission is proceeding with a complete survey of all these likely sources of bauxite, and further work is now in progress in Tasmania. Testing by bores and shafts of an area at St. Leonards, near Launceston, has given encouraging results. Other deposits in Tasmania to be tested are at Campbelltown, Swansea and Myalla, west of Wynyard. Test work in Tasmania is being carried out in collaboration with Dr. H. G. Raggatt, director of the Commonwealth Mineral Resources Survey, and the Tasmanian Department of Mines.

Deposits of bauxite occurring in Victoria, Queensland, New South Wales and Western Australia are to be investigated by the Commission in collaboration with the Minerals Resources Survey and local Departments of Mines.

The Aluminium Industry Act passed by the Commonwealth Government in 1944 provides for the use of Tasmanian hydro-electric power in the manufacture of ingot aluminium under joint Commonwealth and State control. Under the Commonwealth-State agreement, ratified by the Tasmanian parliament last year, the State is committed to provide half the capital of £3,000,000 needed for the establishment of the industry. The other £1,500,000 will be subscribed by the Commonwealth Government.

Australian Patents

Revolutionary Innovation

A BILL to amend the Patents Act, 1903-1935, has been passed in Australia and will soon become law. The most important innovation is contained in Section 38A, which provides for laying open all complete specifications to public inspection immediately after filing. Complete specifications already on file will be laid open to public inspection forthwith.

This new bill goes far beyond Section 91 (3) of the British Patents and Designs Acts, 1907-1946, according to which patent specifications filed under International Convention are laid open to public inspection 18 months after the earliest convention date claimed. Efforts are being made by professional institutions to obtain a regulation deferring the publication of complete specifications at least three months after the filing date, but it is not at all certain whether they will meet with any success.

As matters stand, prospective applicants for Australian patents will have to consider carefully whether premature publication of their complete specifications does or does not affect their interests in other countries. At present there are emergency laws and regulations in most countries, extending the period available for claiming priority, but these extensions will end sooner or later, say within 1947 or 1948, and then any publication of a complete specification in Australia will prevent the invention from being validly patented in many of those countries where a corresponding application was not made during the ordinary convention period.

If the somewhat revolutionary example of the new Australian bill were followed in other countries, the whole foundations of International Patent Law and Practice might be overturned with effects on manufacture and commerce which can be hardly foreseen now. In any case, it seems deplorable that a step which affects not only the internal affairs of the country passing that legislation was taken apparently without consultation with other countries, and against the advice of the professional institutions which had the necessary knowledge of, and experience in, international patent matters.

Personal Notes

Sir Edward J. George has resigned his directorships of the Consett Iron Co., Ltd., and Consett Spanish Ore Co., Ltd.

Mr. C. A. F. Hastilow has been re-elected president of the Paint Materials Association, and Mr. S. W. Greig and Mr. C. A. Carter will continue as vice-presidents.

Dr. Maurice Stacey, now reader in biological chemistry, has been appointed to the newly-established second chair in the Department of Chemistry at Birmingham University.

Sir Alexander Fleming and Sir Howard Florey have been awarded the Society of Apothecaries' Gold Medal in Therapeutics for 1946 in recognition of their work on penicillin.

Mr. L. C. Montague, A.C.I.S., who has been appointed a joint managing director of Johnson, Matthey & Co., Ltd., has been associated with the company for 27 years; he has been its secretary for the past 12 years.

Mr. J. D. Patterson, who was chief chemist and development manager of the Goodyear Tyre & Rubber Co. (Great Britain), from 1926 until 1937, has been appointed assistant manager of the chemical products division of the Goodyear Co., at Akron.

Mr. A. Hutchison has retired from the chairmanship of Ernest Scott & Co., Ltd., and George Scott & Son (London), Ltd.; and Mr. W. Lindsay Burns has been appointed chairman and managing director. New appointments to the board are: Mr. Lindsay Burns, Jnr., Mr. I. M. O. Hutchison, and Mr. H. D. Macmurray, B.Sc., A.R.I.C., A.M.I.Chem.E.

Mr. Julian L. Baker, F.C.G.I., F.R.I.C., who is editor of the *Journal of the Institute of Brewing*, is retiring from his position as chemist to Watney, Combe, Reid & Co., Ltd., after 46 years' service, and will be succeeded in that capacity by Dr. L. R. Bishop, M.A., Ph.D., F.R.I.C., of the research department of the Institute of Brewing, Birmingham University.

Obituary

Mr. John Abbott, secretary and director of the United Drug Co., Ltd., Nottingham, has died at the age of 57.

A link with the foundation of the oldest of our research stations has been broken by the death of Mrs. Caroline Creyke, daughter of Sir John Bennet Lawes, one of the founders of Rothamsted. Mrs. Creyke, who was 101, died in London on September 8; the funeral took place at Harpenden parish church on Thursday.

Mr. Oliver Wilkins, who was chairman of the Paints Division of I.C.I. during the war, died at his home at Derby recently, aged 64. Mr. Wilkins was only 21 when he founded the Derby Chemical Co., in 1903, to manufacture paints. Four years later, the firm became Oliver Wilkins & Co., Ltd., and started the manufacture of pigment colours, which Mr. Wilkins rapidly developed. In 1928, when the firm became part of I.C.I., Mr. Wilkins joined the board of the Dyestuffs Division. Later he became largely responsible for the control of another Derby firm, Leech Neal & Co., Ltd. Mr. Wilkins retired for reasons of health at the end of the war.

Record Steel Output

Effect of More Coal in British Zone

STEEL production in the British zone of Germany in July was the highest reached in any month since the occupation began. This improvement, which was due to an increased allocation of coal and coke to the industry for the third quarter of the year, would have been still greater but for the continued serious shortage of labour.

The output of rolled products was 181,200 tons, an increase of 19,347 tons over the June figure, which was itself a record. The ingot steel output was 210,321 tons, and exceeded by 24,521 tons the previous highest level reached in March. The production of pig iron in July was substantially higher than in june and only slightly below the March record.

ALUMINIUM IN FORMOSA

According to reports recently received in this country, the aluminium industry in Taiwan (Formosa), which suffered serious damage during the war, is expected to be fully restored by 1948. Three experts from the United States are visiting the island to investigate conditions and later to collaborate in getting the industry back on its feet.

The industry is centred in Kaohsiung and Hualien, and after the Japanese surrender the factories were taken over by the Chinese Government. At present, the plants are under the management of the Taiwan Aluminium Co., which has recently been set up by the National Resources Commission. It is estimated that about $12,000,000 will be needed to repair the two plants, and it is hoped to secure 40 per cent. of this amount from the United States. The Kaohsiung plant, which was established by the Japanese in 1936, with an annual production of 12,000 tons, was closed in March, 1945. The second plant, which produced about 8000 tons a year, was closed in 1944.

General News——From Week to Week

Dutiable articles may now be sent from the U.K. to Eire by letter post.

A restricted air mail service to Germany is now available, and correspondence will be subject to censorship in Germany.

The vital need for increased use of fertilisers in Scotland is indicated in a survey carried out by the Department of Agriculture in Scotland.

A useful bibliography of insecticide materials of vegetable origin is included in the current issue of the *Bulletin of the Imperial Institute*.

Women workers in a new nylon stocking factory at Kimberley, near Nottingham, have been supplied for several months past with a special hand cream so that their hands may be smooth for handling the stockings

An important new industry has been established at Galashiels by Sanderma Fur Co., Ltd., who will exploit American methods of converting wool into synthetic fur, by means of chemical reaction methods, using materials developed in the plastics industry there.

Recently registered as a private company incorporated outside Great Britain, is American British Technology, Inc., with a nominal capital of 200 shares without par value, formed to investigate current developments in technical process, industrial designing, etc.

A conference of countries producing or consuming tin will be opened in London on October 8. The International Tin Committee, originally founded in 1931, was last renewed on January 1, 1941, and will cease to exist unless the conference decides to renew it at the end of the year.

Readers are reminded that application forms (returnable by December 2) and particulars of the Associate-Membership examination for 1947 of the Institution of Chemical Engineers may now be obtained from the Hon. Registrar of the Institution at 56 Victoria Street, London, S.W.1.

To ensure compliance with the Control of Tin (No. 3) Order, 1941, certain formalities are necessary in connection with tin metal which has to be transhipped in this country in bond when en route through the U.K. for destinations abroad. Importers should, where necessary, apply for further information either to the Directorate of Non-Ferrous Metals, 20 Albert Street, Rugby, or to the Secretary of the London Metal Exchange, Whittington Avenue, London, E.C.3.

Foreign News

Penicillin is to be produced in the Institute for Microbiology at Jena in the Soviet Russian zone of occupation.

Thirty blast furnaces, with a total capacity of 9,000,000 tons a year, are to be erected in the Soviet Ukraine.

Exports of gum arabic from the Sudan amounted to 15,200 tons for the first five months of the current year, as compared with 4900 tons for the same period last year.

The Australian Government has decided to continue control of the production and distribution of mica until the end of the year.

An extensive deposit of barytes, recently discovered in Swaziland, is now being worked by a new company, Swaziland Barytes, Ltd.

News has just come from America that the Boykin Bill received the approval of Congress on August 8, 1946, and has now been enacted as Public Law 690—79th Congress, H.R. 5223.

The South Australian Government has decided to make a three-year survey of 150 square miles of rough country in the Flinders Ranges to discover the value and extent of the State's uranium deposits.

The Behring works at Marburg, Germany's leading producer of sera and vaccines, is operating at the normal peace-time capacity, its products being supplied to all zones of occupation.

Mexican production of non-ferrous metals aggregated 9,137,497 tons for the period 1940-45, valued at 4,425,980,940 pesos. The peak production was reached in 1943 with 1,725,103 tons, worth 825,632,918 pesos.

Important deposits of bentonite are being investigated by the New Zealand Geological Survey Department. The deposits are situated mainly on the east coast, around Poverty Bay, and are now yielding hundreds of tons of the mineral.

The Swedish iron supply position for the home market is more strained than ever, stated the Minister of Supply, Hr. Gjoeres, in an interview with *Svenska Morgonbladet*. The shortage makes itself especially felt in the manufacture of agricultural machinery.

One of Newfoundland's abandoned lead mines, the La Manche mine, may soon be back in production after about 56 years' idleness. The American Smelting and Refining Company has concluded negotiations with the owners to take over and exploit the property.

Iron and steel, roller bearings, and chemical products are to be shipped to Hungary, by Sweden, and cryolite and pharmaceutical goods by Denmark, under the terms of recently concluded trade agreements. In return, Hungary will send agricultural products and bauxite.

Tin mining operations at Derby, Tasmania, once the largest alluvial tin mine in the Commonwealth, have come to a standstill, but conferences are in progress between the State Government and the company, the Briseis Consolidated N.L., to prevent the abandonment of operations.

Prospecting for oil in French Equatorial Africa has been resumed after war-time suspension, according to the French technical press, and it is reported that in the Gaboon oil-bearing strata have been reached in the neighbourhood of Lake Azingo, at no great depth from the surface of the ground.

Dyes in a wide variety of new shades have been produced by Juliette Gaultier de la Verendrye from the world-famous Holland black tulips which were sent to Canada as a sign of appreciation by the Dutch for the role played by Canadian troops in liberating their country.

The Italian heavy industrial enterprise, Società Nazionale, Cogne, Turin, a State-owned unit, which exploits iron-ore mines at Cogne and anthracite mines at La Thuile, and operates steel works at Aosta, is to increase its capital from 400,000,000 lire to one milliard lire.

At a recently held extraordinary general meeting of the Montecatini Company, the board's scheme for the reorganisation of the group's finances (*see* THE CHEMICAL AGE, August 10, p. 170) was unanimously accepted. It is hoped that this measure will substantially assist in the group's rehabilitation and reconstruction without jeopardising its financial independence.

Several new records were made in the U.S.A. domestic phosphate rock industry in 1945, according to reports submitted by operators to the Bureau of Mines, U.S. Department of the Interior. Total mined production reached a new high level at 5,399,739 long tons, and the quantities mined in Florida (3,814,935 tons) and the Western States (323,955 tons) were also new records.

A number of German metallurgical enterprises have recently resumed operations, including the parent company of the Wieland group, the Wieland works at Ulm, and its branch at Vöhringen, Bavaria. The Deutsche Edelstahlwerke A.G., Krefeld, are working with a labour force of about 500 men, and production has been resumed some time ago in the aluminium works at Nuremberg. The Luitpoldhütte furnace at Amberg, in Bavaria, has also been restarted.

The first retort of a battery of six, for the retorting of torbanite shale (from which petrol is produced), was recently tested by the deputy chairman and managing director of the Anglo-Transvaal Consolidated Investment Co., Ltd. He said that at Ermelo, South Africa had the only successful oil-from-shale industry in the world.

A trade and payments agreement signed recently between Switzerland and Austria, provides for the export of Swiss industrial chemicals (mainly sulphuric acid, dyestuffs and pharmaceutical products) against Austrian steel, hardening metals, china-clay, magnesite, talcum, refractory materials, ceramics and glassware.

A report advocating the formation of a national standards body for India has been issued by a committee of the Indian Institution of Engineers. It is recommended that the work be placed under the control of a General Council consisting of representatives of industrial organisations, Government departments, and Indian States.

Zinc coating of bridges, pipes and other iron and steel surfaces, is being tested in the United States as an alternative to lead paint. The zinc is applied in powder form, mixed with an inflammable gas, from a special spray-gun, at a temperature of 800° F. The chief advantages of the method are said to be long life of the coating, which lasts about 12 years, and its lightness. No details regarding the cost are as yet available.

The latest addition to the list of Swedish iron works planning an expansion of output is Hellefors Bruks A/B. According to *Morgon-Tidningen*, the company intends to construct new plants at a total cost of 10,000,000 kronor. Total investments planned by the Swedish iron and steel industry amount to 200,000,000 kronor, of which one-half is to be invested in the Government-owned Norrbottens Jaernverk.

The Czechoslovak chemical industry reports an increased output as a result of the gradual improvement in the raw material supply position. The need to find an alternative source of certain supplies after UNRRA has ceased to operate may, however, cause new difficulties. The glass industry's position is slowly but steadily improving, although the world shortage of potash is making itself felt.

Forthcoming Events

September 16. Institution of Works and Factory Managers (S.E. London Branch). Bonnington Hotel, London, W.C.2, 6.30 p.m. Mr. A. H. Buckle, M.I.Ec.E.: "Psychological Instability—Government and Working Classes."

September 16-19. Association of Tar Distillers. Programme of meetings at Queen's Hotel, Leeds, 1: September 16, 6 p.m., National Pitch Committee; September 17, 10 a.m., National Creosote Executive Committee, 2.15 p.m., A.T.D. Executive Committee; September 18, 9.30 a.m., A.T.D. Naphthalene Refiners, 10.30 a.m., A.T.D. general meeting, 2.15 p.m. National Creosote Committee, 4 p.m., B.R.T.A. Managing Council; September 19, 9.30 a.m., Pitch Marketing Company and Pitch Supply Association.

September 17. Society of Chemical Industry (Manchester Section). Engineers' Club, 17 Albert Square, Manchester, 6.30 p.m. Mr. W. L. Badger: "Chemical Engineering in the United States."

September 19. Oil and Colour Chemists' Association (Manchester Section). Visit to works of Monsanto Chemicals, Ltd., Ruabon. Motor coach leaves Lower Mosley Street, bus station, Manchester, 9.30 a.m.

September 21. Royal Institute of Chemistry (London and S.E. Counties Section). Oak Restaurant, 18 Kensington High Street, W.8. 7 - 11 p.m. Social dance in aid of benevolent fund.

September 23-28. Welsh Industries Fair. Drill Hall, Cardiff, 11 a.m.-6 p.m.

September 25 and 26. British Ceramic Society (Refractory Materials Section). Royal Sanitary Institute, 90 Buckingham Palace Road, London, S.W.1. Autumn meetings. Sept. 25: 10.15 a.m., business, followed by joint discussion with Building Materials Section; 12.30, lunch; 2.30 p.m., papers. Sept. 26: 10 a.m., papers.

September 25 and 26. British Ceramic Society (Building Materials Section). Royal Sanitary Institute, 90 Buckingham Palace Road, London, S.W.1. Autumn meetings. Sept. 25: 10.15 a.m., business, followed by joint discussion with Refractory Materials Section; 12.30, lunch; 2.30 p.m., discussion; 4 p.m., paper. Sept. 26: visit to Stewartby works of London Brick Co., Ltd., 9.25 a.m. train from St. Pancras.

September 26-27. Council of Industrial Design and Federation of British Industries. Central Hall, Westminster, London, 10 a.m.

September 26. Royal Statistical Society. (Sheffield Group). Royal Victoria Station, Hotel, Sheffield, 6.30 p.m. Mr. A. W. Swan: "What Statistics Can Do in Industry that Other Methods Cannot Do."

September 26. Imperial Institute. Cinema Hall, Imperial Institute, South Kensington, London, S.W.7, 3 p.m. Mr. S. Bracewell: "The Geology and Mineral Resources of British Guiana."

September 26. Oil and Colour Chemists' Association (London Section). Royal Society of Tropical Medicine and Hygiene, 26 Portland Place, London, W.1, 6.30 p.m. Mr. G. T. Bray: "Drying Oils and Oil Seeds in the British Empire."

New Companies Registered

McConnel Bomford, Ltd. (418,204).—Private company. Capital £5000 in £1 shares. To acquire and turn to account scientific, chemical, metallurgical and other inventions. Directors: F. W. McConnel; D. R. Bomford. Registered office: Granite House, London, E.C.4.

L.A.C. Manufacturing Company, Ltd. (418,382).—Private company. Capital £1000 in £1 shares. Manufacturers of and dealers in chemicals, drugs, disinfectants, fertilisers, etc. Directors: H. A. Cook; Mrs. Isabel Cook. Registered office: St. Bride's House, 11 Salisbury Square, E.C.4.

Akos Chemicals, Ltd. (418,690).—Private company. Capital £100 in £1 shares. Manufacturers of and dealers in soap substitutes, soapless detergents, disinfectants, etc. Subscribers: W. E. D. Smedley; M. E. Crichton. Registered office: 36 Southampton Street, London, W.1.

Company News

I.C.I. (Export) Ltd., 57 King Street, Manchester, 2, announces that its name has been changed to Imperial Chemical Industries (Export), Ltd.

A final dividend of 10 per cent., making 20 per cent. for the year, which is the same as for the previous year, is being paid by **Titanine, Ltd.** Profit for the year ended March 31 was £20,862, which compares with £26,559 for the previous twelve months.

The United Indigo and Chemical Co., Ltd., reports that profit for the year to June 30 last was £17,839, as compared with £13,569 for the previous year. The ordinary dividend of 10 per cent. is an increase of 2½ per cent over that paid for the previous year.

As we were going to press, an extraordinary meeting of **Griffiths Hughes Proprietaries, Ltd.,** was being held to consider a proposal to convert the whole of the issued 5½ per cent. preference and ordinary shares into 5½ per cent. preference stock and ordinary stock respectively. If the scheme is approved, the stock of each class will be transferable in amounts and multiples of £1.

Commercial Intelligence

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

Receivership

FREERS CHEMICAL WORKS, LTD., 369, Richmond Road, E. Twickenham. (R., 14/9/46.) B. E. Pearcy, chartered accountant, 199, Piccadilly, W., was appointed receiver on July 4, 1946, under powers contained in debenture dated May 31, 1946.

Chemical and Allied Stocks and Shares

STOCK markets were dominated by the Wall Street slump and have moved closely with the day-to-day advices from that centre. There was a general precautionary marking down of prices in most sections, leading industrials being affected, but the lower prices brought out little stock, and the tendency generally became steadier, although buyers continued to display caution, awaiting international news. Strength of British Funds was impressive (fractional gains were again in evidence in this section) and later tended to have a steadying influence on markets generally.

Imperial Chemical have receded to 42s. 6d., at which there is a not unattractive yield, and it is generally assumed there are good prospects of the dividend remaining on an 8 per cent. basis. Courtaulds came back to 53s. 3d., British Celanese to 33s. 3d., and Dunlop Rubber to 71s., while Borax Consolidated were 46s. 9d., and shares of various other companies with business interests in the U.S. moved back, although selling was not heavy. United Molasses were 52s. The units of the Distillers Co. came back sharply to 311s. 3d., British Plaster Board receded to 32s. 6d. and Associated Cement to 65s. 9d.

Despite the good impression created by the full results and the reference to new capital requirements, which it is being assumed will involve a share offer to shareholders, De La Rue have receded to £12. Turner & Newall at 86s. reflected the market trend, but there was a better tendency in paint shares, the current view being that they had recently been marked down unduly following the big increase made in the price of linseed oil. Pinchin Johnson rallied to 43s. 3d., Goodlass Wall to 28s. 9d., and Lewis Berger were higher at 6 21/32, the latter on higher dividend anticipations. British Aluminium strengthened on the increased metal price, but later came back to 43s. 3d. Amalgamated Metal, after improving to 20s. 6d., receded to 20s. 3d., and Imperial Smelting were 19s. 6d.

Iron and steels continued to be steadied by the belief that nationalisation of the industry is postponed until at least 1948; while yield considerations and hopes of increases in forthcoming dividends again drew attention to colliery shares. Staveley were 52s., Colvilles 25s. 6d., Powell Duffryn 24s., Ruston & Hornsby 64s. 3d., Thomas & Baldwins 11s. 9d., and United Steel 26s.; but, on the other hand, Dorman Long eased to 26s. 9d., Babcock & Wilcox to 64s. 9d., and Tube Investments to 6 1/16. Gas Light & Coke were 21s. 4½d.

In other directions, B. Laporte remained at 100s., Fisons changed hands around 61s. 9d., British Drug Houses were 53s. and Griffiths Hughes 62s., while Aspro, awaiting the dividend announcement, showed activity around 39s. 6d. Beechams deferred were down to 26s., Sangers 35s. and Boots Drug 62s. 6d. xd. Triplex Glass fluctuated; after falling to 40s. there was a rally to 42s., and a subsequent reaction to 41s. 6d. United Glass Bottle, reflecting the market trend, changed hands down to 88s. British Industrial Plastics were 8s. 1½d., and Erinoid active around 16s., the latter on market hopes of a higher dividend. British Xylonite came back to £7. British Lead Mills shares changed hands around 11s. 9d. Oils showed further declines owing to market conditions, Shell coming back to 89s. 4½d., while Anglo-Iranian were 95s. 7½d., Ultramar 67s. 6d., Canadian Eagle 30s. 9d., and Lobitos 65s. 9d.

British Chemical Prices

Market Reports

CONDITIONS in most sections of the London general chemicals market remain steady, with the movement of supplies against contracts continuing satisfactorily. New business, both for home and export account, has again been on a good scale, with spot transactions restricted by the limited supply position. A steady demand persists for the general run of the potash and soda products and interest has been fully maintained in other sections of the market. Prices continue firm at recent levels. There has been little change in the coal tar products market, there being a ready outlet for available supplies.

MANCHESTER.—Chemical traders on the Manchester market during the past week have reported a steady flow of replacement buying on a wide range of textile chemicals for home users, and other leading industrial users are mostly taking good supplies against contracts. New export inquiries have also been a feature of the week's operations, and these also, in addition to the alkalis, have covered a wide field of heavy products. The undertone of the market is firm in all directions. Sulphate of ammonia is in fair request, including fresh buying for export, and new business has also been reported in slag and superphosphates. Good contract deliveries of most of the leading light and heavy tar products are reported.

GLASGOW.—No great changes can be recorded in the Scottish heavy chemical market during the past week. Business is brisk and inquiries and orders are being regularly received for all classes of heavy chemicals and raw materials, with, as usual, demand far exceeding available supplies. Export inquiries continue unabated and orders are well up to standard, prices also tending to increase.

Price Changes

Lead Nitrate.—MANCHESTER: £68 per ton d/d in casks.

Inventions in the Chemical Industry

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

Applications for Patents

Chemical reaction processes. — Anglo-Iranian Oil Co., Ltd., and R. O. Judd. 24084.

Treatment of tall oils.—Armour & Co. 24624.

Ion-exchange reactions.—A.S.P. Chemical Co., Ltd., C. L. Walsh, and B. A. Adams. 24183.

Cation exchange materials. — A.S.P. Chemical Co., Ltd., B. A. Adams, H. R. Bott, and R. C. Barker. 24182.

Treatment of textiles.—W. Baird, T. Barr, A. Lowe, and I.C.I., Ltd. 24127.

Treatment of textiles.—W. Baird, T. Barr, A. Lowe, J. Oliver, and I.C.I., Ltd. 24126.

Heterocyclic compounds. — Boots Pure Drug Co., Ltd., P. Oxley, and W. F. Short. 24045.

Aluminium alloys.—R. M. Bradbury. 23913.

Tetrahydropyran.—J. G. M. Bremner, D. G. Jones, R. R. Coats, and I.C.I., Ltd. 24130.

Magnesium hydroxide.—British Periclase Co., Ltd., W. C. Gilpin, and N. Heasman. 24668.

Electro-deposition of metals. — British Piston Ring Co., Ltd., T. R. Twigger, Monochrome, Ltd., and H. C. Hall. 23936.

Electro-chemical processes.—J. G. H. Budd. 24170.

Ethers.—Ciba, Ltd. 23986-7.

Dyestuffs.—S. Coffey, K. Schofield, F. H. Slinger, W. W. Tatum, and I.C.I., Ltd. 24125.

Penicillin. — Commercial Solvents Corporation. 24608.

Treatment of starch.—Corn Products Refining Co. 24286.

Polymeric materials.—E. I. Du Pont de Nemours & Co. 24626.

Coating compositions.—E. I. Du Pont de Nemours & Co., S. Graves, and M. T. Gillies. 24454.

Polyhydroxy compounds.—E. I. Du Pont de Nemours & Co., W. F. Gresham, and R. E. Brooks. 24122.

Coating compositions.—E. I. Du Pont de Nemours & Co., J. W. Iliff, and M. T. Gillies. 24455.

Purification of water.—J. E. Edwards, and I.C.I., Ltd. 24128.

Synthetic resin adhesives.—R. L. J. Farina. 24295.

Inorganic compounds.—H. R. Frisch. 24604.

Pigment extraction.—General Biochemicals, Inc. 24146.

Alloys.—Handy & Harman. 24189.

Light polarising elements.—International Polaroid Corporation. 24620.

Dye images.—International Polaroid Corporation. 24621.

Iodine images.—International Polaroid Corporation. 24622.

Ferrous metal articles. — H. W. K. Jennings (Al-Fin Corporation). 24509.

Heat treatment of metal articles. — H. W. K. Jennings (Al-Fin Corporation). 24510.

Styrene.—L. E. Jones (Carbide & Carbon Chemicals Corporation). 24526.

Fertilisers.—T. D. Kelly. 24230.

Polyvinyl derivatives. — R. R. Lyne, A. W. S. Clark, and I.C.I., Ltd. 24449.

Electrodeposition of nickel.—Mond Nickel Co., Ltd. 24512.

Organic compounds.—N.V. Philips Gloeilampenfabrieken. 24614.

Complete Specifications Open to Public Inspection

Production of metanilamidodiazines and intermediates thereof.—American Cyanamid Co. Feb. 14, 1945. 1213/46.

Production of metanilamidodiazines.—American Cyanamid Co. Feb. 14, 1945. 1214/46.

Electro-thermo-chemical processes such as combustion, distillation, synthetic reactions, molecular or atomic dissociations and the like, particularly applicable to organic bodies.—M. E. A. Baule. May 11, 1942. 21512/46.

Waterproofing textile materials containing fibres of an organic derivative of cellulose.—British Celanese, Ltd. April 22, 1943. 7426/44.

Production of iron or steel alloys containing vanadium and silicon. — Climax Molybdenum Co. March 6, 1941. 5349/42.

Production of ferrous alloys containing cobalt and silicon.—Climax Molybdenum Co. March 6, 1941. 5350/42.

Production of ferrous alloys containing chromium and silicon.—Climax Molybdenum Co. March 6, 1941. 5351/42.

Production of ferrous alloys containing titanium and silicon.—Climax Molybdenum Co. March 6, 1941. 5352/42.

Production of iron or steel alloys containing tungsten and silicon. — Climax Molybdenum Co. March 6, 1941. 5353/42.

Chemical Processes.—E. I. Du Pont de Nemours & Co. Feb. 15, 1945. 4812/46.

Elastic fabrics. — E. I. Du Pont de Nemours & Co. Feb. 20, 1945. 5302/46.

Production of cured ethylene polymers and related materials.—E. I. Du Pont de Nemours & Co. Feb. 20, 1945. 5303/46.

Colouring fibres and the like from normally solid ethylene polymers.—E. I. Du Pont de Nemours & Co. Feb. 20, 1945. 5304/46.

Process for improving the properties of nylon fibres.—E. I. Du Pont de Nemours & Co. Feb. 20, 1945. 5305/46.

Dehydrohalogenated derivatives.—Glenn L. Martin Co. Feb. 15, 1945. 2487/46.

Laminated material and fuel containers comprising the same.—Imperial Chemical Industries, Ltd. Sept. 21, 1942. 6144/44.

Polymerisation of vinyl acetate.—Imperial Chemical Industries, Ltd. July 13, 1943. 13403/44.

Hydrolysed vinyl polymers. — Imperial Chemical Industries, Ltd. Feb. 16, 1945. 5002/46.

Synthetic resins and the preparation thereof.—International Polaroid Corporation. March 6, 1942. 4159/44.

Light polarising devices.—International Polaroid Corporation. Feb. 17, 1945. 25800/45.

Inhibiting the oxidation of copper or lead powder.—Metals Disintegrating Co., Inc. Feb. 15, 1945. 4317/46.

Recovery of metallic vanadium from mineral products. — H. F. C. C. De Montecchio. Dec. 22, 1944. 5185/46.

Processes of imparting hydrophobic properties to textile fibres.—Montclair Research Corporation. Feb. 16, 1945. 34514/45.

Dry starch preparations soluble in cold water.—N.V. W. A. Scholten's Chemische Fabrieken. Nov. 23, 1944. 21650/46.

Manufacture of foodstuffs and food preparations from leguminosae.—N.V. W. A. Scholten's Chemische Fabrieken. Jan. 22, 1943. 21927/46.

Packing made of plastic material chiefly for pharmaceutical tubes. — C. Nicolle. Feb. 19, 1945. 12828/46.

Preparation of penicillin.—Parke, Davis & Co. Nov. 23, 1942. 20638/43.

Manufacture of a thiophane derivative.—Roche Products, Ltd. Feb. 2, 1945. 3172/46.

Purification process for antibiotics.—Shell Development Co. Feb. 14, 1945. 34627/45.

Catalytic conversion of hydrocarbons.—Shell Development Co. Feb. 14, 1945. 34994/45.

Manufacture of phosphorus oxychloride.—Soc. Anon. des Manufactures des Glaces et Produits Chimiques de Saint-Gobain, Chauny & Cirey. Aug. 16, 1944. 21863/46.

Manufacture of hard calcined alloys.—Soc. Le Carbone-Lorraine. July 4, 1941. 21610/46.

Manufacture of calcined alloys.—Soc. Le Carbone-Lorraine. June 20, 1941. 21611/46.

Preparation of acetylbutyrolactone.—U.S. Industrial Chemicals, Inc. Feb. 17, 1945. 33183/45.

Refining of steel.—E. F. J. Warnant. Feb. 14, 1945. (Cognate applications 4681-2/46.) 4680/46.

Complete Specifications Accepted

Ferrous alloys.—J. C. Arnold. (Coast Metals, Inc.) April 26, 1944. 579,479.

Production of cellulose.—S. C. Bate. Nov. 5, 1943. 579,669.

Production of sulphone amidines and salts thereof.—Boots Pure Drug Co., Ltd., W. F. Short, and A. Koebner. June 6, 1944. 579,613.

Chlorination of alcohol.—W. Bridge, J. Matchet, and I.C.I., Ltd. Dec. 20, 1943. 579,678.

Solidifying normally liquid hydrocarbons.—D. M. Clark. (Safety Fuel, Inc.) Feb. 8, 1944. 579,568.

Heterocyclic compounds.—F. H. S. Curd, C. G. Raison, F. L. Rose, and I.C.I., Ltd. Sept. 5, 1944. 579,502.

Manufacture of highly polymeric substances.—J. T. Dickson. (Cognate applications 13744/43 and 13826/44.) Aug. 23, 1943. 579,462.

Production of new dyes of the anthraquinone series.—E.I. Du Pont de Nemours & Co., M. A. Perkins, and D. X Klein. May 12, 1944. 579,519.

Manufacture of *n*-butyl vinyl ether.—W. J. R. Evans, and I.C.I., Ltd. Nov. 22, 1943. 579,675.

Polymerisation and interpolymerisation of ethylene.—J. S. A. Forsyth, and I.C.I., Ltd. Nov. 3, 1943. 579,666.

Polymerisation and interpolymerisation of ethylene.—J. S. A. Forsyth, and I.C.I., Ltd. Dec. 10, 1943. 579,676.

Protective covering for metal articles and method of applying.—Hercules Powder Co. Oct. 1, 1943. 579,556.

Catalytic dehydrogenation of hydrocarbons. — Houdry Process Corporation. March 5, 1943. 579,477.

Distillation of solid carbonaceous substances.—Low Temperature Carbonisation, Ltd., and J. Cartwright. Nov. 3, 1939. (Cognate applications 29,359/39 and 17,174/40.) 579,561.

Manufacture of pyridine carboxylic acids.—Merck & Co., Inc. May 11, 1943. 579,505.

Alloys containing manganese. — Mond Nickel Co., Ltd. (International Nickel Co., Inc.). July 31, 1940. 579,643.

Process for producing insoluble sodium metaphosphate.—Monsanto Chemical Co May 27, 1943. 579,518.

Manufacture of non-ferrous welding rods or electrodes.—E. C. Rollason, and Murex Welding Processes, Ltd. June 23, 1944. 579,635.

Preparation of diethylamide of *d*-lycergic acid.—Sandoz, Ltd. April 30, 1943. 579,484.

Production of artificial insolubilised wet-spun protein filaments.—R. H. K. Thomson, D. Traill, and I.C.I., Ltd. Sept. 6, 1944. 579,588.

Resistance welding apparatus.—N. A. Tucker, and Mallory Metallurgical Products, Ltd. May 17, 1944. 579,527.

Refining of crude acrylonitrile.—American Cyanamid Co. Dec. 1, 1942. 579,787.

Production of biguanides. — American Cyanamid Co. March 5, 1943. 579,867.

Liquid fuel containers and adhesives therefor.—B. J. Balfe, and I.C.I., Ltd. Sept. 16, 1943. 579,768.

Oxidation or the removal of carbon monoxide.—J. H. De Boer, and J. Van Ormondt. Aug. 25, 1941. 579,809.

Process for the production of reactive substances containing argentic oxide. — J. H. De Boer, and J. Van Ormondt. Aug. 25, 1941. 578,817.

Apparatus used for generating and purifying oxygen.—H. L. Bolton, E. Q. Laws, and G. H. Thomas. July 23, 1942. 579,737.

Low temperature separation of compressed gaseous mixtures.—British Oxygen Co., Ltd., and R. C. Godfrey. Aug. 10, 1944. 579,712.

Curing of polymeric materials.—J. G. Cook, R. C. Seymour, and I.C.I., Ltd. Jan. 28, 1944. 579,857.

Manufacture of vinyl and ethylidene esters.—E. I. Du Pont de Nemours & Co. Sept. 24, 1943. 579,715.

Application of metal coatings on articles and surfaces of aluminium and its alloys.—E. I. Du Pont de Nemours & Co., and H. N. Gilbert. Nov. 1, 1943. 579,830.

Production of cyanogen.—E. I. Du Pont de Nemours & Co., B. S. Lacy, H. A. Bond, and W. S. Hinegardner. Dec. 17, 1943. 579,785.

Safety devices for apparatus for storing or employing liquefied combustible gases.—A. C. G. Egerton, and J. H. Burgoyne. March 8, 1940. 579,841.

Process for the production of coloured synthetic resin articles.—W. E. F. Gates, and I.C.I., Ltd. Dec. 20, 1943. 579,786.

Methods for the surface carburising of steel. — General Electric Co., Ltd., I. Jenkins, and S. V. Williams. Nov. 2, 1942. 579,742.

Detergent composition and its application in the removal of mineral oil from metal surfaces.—Imperial Chemical Industries, Ltd. March 5, 1943. 579,866.

Production of powdered polythene. — K. B. Jarrett, and I.C.I., Ltd. Sept. 17, 1943. 579,769.

Reclaiming of copper from metal plates. —H. W. K. Jennings (Crowell-Collier Publishing Co.). April 21, 1944. 579,753.

Manufacture of incendiary mixtures.—J. G. King, and C. M. Cawley. Sept. 16, 1942. 579,739.

Manufacture of incendiary pastes or gels. —J. G. King, C. M. Cawley, and J. H. G. Carlile. Sept. 16, 1942. 579,740.

SALE BY AUCTION

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DOMESTIC STREET, LEEDS, HOLBECK.

WEDNESDAY NEXT, 18th, SEPT. AT 10.30 A.M.

JAMES A. BREARLEY will sell by Auction for Messrs. H. L. Reynolds Ltd., who are acquiring new premises, under notice to quit, land being required by Leeds Corporation, THEIR BUILDERS & CONTRACTORS PLANT, SALOON CARS, SHOOTING BRAKES, viz :— 1–3 ton ELECTRIC OVERHEAD CRANE (approx. 40 ft. span) ; 1–5 ton "Coles" DIESEL ELECTRIC MOBILE do.; 1–2 ton "Coles" PETROL ELECTRIC do. ; 2–3 ton Steam do. and Rail Track ; 12 cwt. PORTABLE CRANE ; Approx. 95 tons 75 and 85 lb. RAIL STOCK AND CROSSINGS ; "Dennison" 40 ton WEIGH BRIDGE 16 ft. by 18 ft.; 25 cwt. HOIST ; Qty. ½ to 5 ton BLOCKS ; 1 to 3 Sheath Blocks ; Light and Heavy Steel WINCHES ; 120 Crane Concrete Tipping Skips ; New and Secondhand CONCRETE MIXERS ; Steam Jacketed Mixers and Pans ; Acid Mixer ; Portable STONE BREAKER ; 6 V.Q.B.N. "Ruston" DIESEL ENGINES (reconditioned) ; 3 GENERATOR DYNAMOS ; 110 v ; ELECTRIC MOTORS ; DYNAMOS AND SWITCHGEAR ; 100 Battery CHARGING SETS ; Lighting Sets ; "International," "Cletrac" and "Case" ENGINES AND SPARES ; 10 ton "Tangye" HYDRAULIC JACKS ; New Electric WELDING SET ; Electric PETROL PUMP (as new) ; 3 comp. 1,500 gal. STORAGE TANK ; 500 gal. PETROL STORAGE TANKS ; Diaphragm Centrifugal Pumps ; Trailers and Portable PUMPS ; Lge. Qty. 4 in. SUCTION AND PRESSURE HOSE ; AIR RECEIVERS ; 5 COMPRESSOR DRILLS ; Blast Hole Drill Bit 3 A.P. Steam Electric HEATING CONVECTORS ; Gravity Feed and Mechanical CONVEYORS ; New Rubber Conveyor BELTING ; JUBILEE WAGGONS ; Turntables and Rails ; "Lister" Portable WORKS TRUCKS ; 20 Works/Greenhouse HEATING BOILERS ; 8 STEEL HUTS with sliding doors (48 ft. by 35 ft. to 144 ft. by 35 ft.) ; Lge. Qty. STEEL SECTIONS AND ROOF TRUSSES ; Steel Tubing and Scaffolding ; Lge. Qty. 6 in., 10 in., and 20 in. STEEL TUBES AND FITTINGS ; Clips ; Piping ; Reinforcing Rods ; Steel Strip ; Lge. Qty. Galv. CORRUGATED SHEETS ; Barbed Wire ; CHEMICAL LAVATORIES (as new) ; 20 New STORAGE BINS ; 5 UTILITY SHOOTING BRAKES (brand new bodies) ; 1936 "Dennis" 14 str. WORKMAN'S BUS with lge. compartment ; 1939 "Hudson" 22 h.p. SALOON ; "Fordson" WAGGONS AND TRACTORS ; Qty. Rubber Tyred Wheels. Also Office Lino, SAFE, and other miscellaneous items too numerous to detail. ON VIEW any day prior to sale during business hours. Auctioneers.—LORO' MART, HALIFAX. (Tel. 4408).

WANTED

EPSOM Salts (B.P.) wanted delivery in one or two ton lots. Box No. 2346, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

HIGH Speed Fluid Mixers required urgently (about 1450 revs.) Motors 450 volts. 3 phase 1 to 5 h.p. Must be good condition. Box No. 2342, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

OERTLING Short Beam Chemical Balance in good condition. Please state list number and price. Box No. 2344, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

PHENOL. Advertiser required regular supplies of Phenol for own consumption. Full particulars of quantities and grades available to : Box No. 2341, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

WANTED Caustic Soda Solid and Liquid (90Tw), required in large and regular lots. Box No. 2330, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

WANTED.—Supplies of Nitre Cake in ten-ton lots, Box No. 2126, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

SERVICING

GRINDING, Drying, Screening and Grading of materials undertaken for the trade. Also Suppliers of Ground Silica and Fillers, etc. JAMES KENT, LTD., Millers, Fenton, Staffordshire. Telegrams: Kenmil, Stoke-on-Trent. Telephone: 4253 and 4254, Stoke-on-Trent (2 lines).

GRINDING of every description of chemica and other materials for the trade with improved mills.—THOS. HILL-JONES, LTD., "Invicta" Mills, Bow Common Lane, London, E. Telegrams: "Hill-Jones, Bochurch, London." Telephone: 3285 East.

LONDON FIRM offers complete service packing powders of all descriptions, also liquids and chemicals. Long runs only. Containers and packing cases of home and export, made on premises. Near to docks. Own rail sidings. Box No. 2331, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

PULVERISING and grading of raw materials DOHM LTD., 167, Victoria Street, London, S.W.1.

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