The Chemical Age, August 3rd, 1946.

WITH METALLURGICAL SECTION

The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

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The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

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Isaac Newton

THE tercentenary of Newton's birth should have been celebrated in 1942, a year during which we were occupied by more pressing events. The wise decision was then taken by the Royal Society to defer the official celebrations of this event until the danger which menaced freedom of thought throughout the world had been removed. Now that we have rolled down our sleeves and put our coats on again, we have been able to turn our minds to the victories of peace—victories no less renowned and more enduring than those of war.

It is well that this generation should appreciate the debt that it owes to Isaac Newton. It is too commonly believed that because the science of those days was sparse, because scientific knowledge was rudimentary, the stature of the older scientists was lower than those of their modern descendants. A distinction must be drawn between the extent of knowledge and the discovery of new knowledge. The student of 1946 has far more to learn than his counterpart of the 17th century. There were comparatively few books, but Latin and Greek were required of the educated man. Education was concentrated on the humanities. Scientific knowledge was embryonic and for the most part incorrect. The mass of known facts is to-day so great that no student of science can learn more than the basic facts and the principles of his science; at an early age he must specialise, so that he gets little chance of a wide education such as was given to the youth of past generations. The pressure upon students is greater to-day than ever it was. Is that one reason for a different outlook on research and discovery? The mind must become saturated with existing knowledge before it sets out on voyages of discovery. Science has become a professional employment, whereas once it was the plaything of the amateur; and it is not in science alone that this change has come to pass.

The discovery of new knowledge is to be sharply distinguished from the acquisition of existing knowledge. Discovery demands special qualities of mind; courage to strike out boldly into new territory, acute perception to deduce new principles from known facts, clear thinking, and above all deep and continuous thought. Great as were the achievements of Newton, he recognised the existence of much that he had not discovered. He speaks, in those oft-quoted words, of "the great ocean of truth lying all undiscovered before me." It is difficult to discover the truth in

On Other Pages

an untrodden field. It is doubly and trebly difficult to discover truth when everyone else is convinced of the "truth" of beliefs that are in fact erroneous.

There is perhaps no single anecdote about Newton which has so seized the popular imagination as that concerning his discovery of the force of gravity—an immense achievement, if one comes to think of it, sufficient of itself to make his name known for evermore. We were taught as children that, sitting beneath an apple tree, the fall of an apple to the ground caused him to wonder why it fell downwards and why it did not float upwards. If it had befallen in that naïve manner, the discovery of gravity would have been unique in the history of science. Many historians have roundly denied the story of the apple, but there is evidence from Newton's own times that there was truth in it. Dr. Stukeley dined with Newton at Orbels Buildings, Kensington, on April 15, 1726, a year before his death at the age of 85, and wrote in his diary: "After dinner, the weather being warm, we went into the garden and drank thea (*sic*), under the shade of some apple trees, only he and myself. Amidst other discourse, he told me, he was just in the same situation, as when formerly, the notion of gravitation came into his mind. It was occasioned by the fall of an apple, as he sat in a contemplative mood. . . ."

It was justly said by another great scientist much later in time than Newton that "Chance only favours the prepared mind" (Pasteur). That is a principle which all research workers must follow. Intense thought on an intractable problem may appear to yield no solution till one day a trifling incident shows the truth like a lightning flash. What deep thinker has not experienced this? Thus, the probability is that Professor Andrade's account of the discovery of gravitation is the correct one. Newton, aged about 23, was staying at Woolsthorpe and thinking hard about the moon's motion. Why does it not fly away as a stone does when whirling round on a string and the string is released? What is the equivalent of the string which keeps the stone on its appointed circular path so long as it is firmly attached to hand and stone? The fall of the apple suggested the train of thought that the same pull of the earth that pulls the apple to the ground might extend to the moon.

The story of the apple, while it has a lesson for all who would follow in Newton's footsteps, has unfortunately obscured much of the light that Newton shed on his contemporaries and down through the ages to us. He is undoubtedly the greatest figure in science. He is the supreme mathematician of all time; the inventor of the calculus; the author of the *Principia*, in which he calculated not only the effect of the conception of gravity on the motions of the planets, but also the main irregularities of the moon's motion caused by the gravitational pull of the sun and of the earth, as well as explaining the tides. The general foundations of mathematical science are laid in the *Principia*, including early conceptions on wave motion. The magnitude of these achievements can be best understood when it is realised that, before his work, the accepted idea was that the motions of the heavenly bodies were due to special celestial causes generally of an occult nature. This of course was the basis of astrology. Newton had been born into a world which ascribed occult causes to even the simplest of happenings, which still was ridden by witchcraft. There were scientific workers in the modern sense before him, of course, and it has been truly said that Newton himself stood upon the shoulders of giants. Nevertheless, it was he who showed to the world the modern scientific methods, he studied Nature's ways, from the facts thus gleaned he deduced general laws from particular cases, and he showed finally how by those "laws" great classes of happenings could be explained.

It was not only in mathematics and in the motions of heavenly bodies that Newton's work was so prolific of results. His book on optics has been known and studied for generations and has laid the foundation for a great deal of subsequent work.

A remarkable fact about Newton was that the *Principia* was finished by the time he was 40 years of age and after that date, although he made certain additions and corrections to the *Principia*, he did not publish much more original scientific work of outstanding importance. He was for many years President of the Royal Society and it cannot be doubted that that Society, and consequently the evolution of science in Great Britain, owes a great deal to his administrative genius. Newton in fact was no freak genius but the concentrated embodiment of all the distinguishing characteristics of British scientists. Starting as an investigator and original thinker, he finished, as do so many scientists, as an administrator. At this delayed tercentenary it is well to remind ourselves of the impact of Newton's life on the lives of everyone engaged in following the scientific method. He was the supreme genius and while, no doubt, ordinary people cannot follow " a mind for ever voyaging through strange seas of thought alone," all can at least seek to follow the scientific method which he initiated.

NOTES AND COMMENTS

Keeping Up Appearances

IT is probably a good thing to maintain an impressive façade when things are not going too well, but there is undoubtedly a limit to the value of " keeping up appearances," a practice which has sorely strained the resources of many commercial and domestic organisations in the past, and will probably continue to do so in the future. Nationally speaking, we are doing quite a lot of this sort of thing at the moment. Figures, such as those illustrating our export trade, are presented in the most optimistic manner, and the forthcoming " Britain Can Make It " exhibition is an excellent example of the practice of patting oneself on the back. Everybody concerned would probably feel happier, if the title of the show were " Britain *Will* Make It." All this philosophising arises from the perusal of a letter to the *Birmingham Post* from Mr. L. C. Hill, joint managing director of the County Chemical Company, in which he considers with disfavour the prospect of holding a British Industries Fair at Castle Bromwich early next year.

Are We Ready for the B.I.F. ?

MR. HILL makes the two following points : (1) Even with an increased supply of raw materials, export orders on hand will take more than two years to complete; and (2) Owing to restrictions, we are not yet in a position to pack our products in containers of post-war design. Moreover, as he cogently points out, where are we going to lodge our overseas visitors to the Fair, and how are we going to feed them? Visitors who remember the catering arrangements at Castle Bromwich from pre-war days will not be expecting anything very handsome in the way of entertainment, it is true, but it is dubious whether even this standard will be attained in 1947. Mr. Hill goes so far as to express the hope that prospective exhibitors, old and new alike, will refrain from taking space at Castle Bromwich in 1947, but will reserve their energies for the following year. Certainly, in a display like the British Industries Fair, our industrialists will be committing themselves to deliver the goods in a way that is not implied in an exhibition like this year's coming affair at South Kensington.

Lignite Wax " On the Air "

QUITE by a coincidence we had arranged to publish Clement and Robertson's paper on the utilisation of Scottish peat in the very week in which appeared the Fuel Research Station's booklet entitled *The Extraction of Ester Waxes from British Lignite Peat*, by Dr. C. M. Cawley and Dr. J. G. King (H.M.S.O., 6d.). The B.B.C. authorities regarded this pamphlet as of sufficient importance to award it a place in the 8 o'clock news last Monday, and although the work of Cawley and King has already been discussed in THE CHEMICAL AGE (1945, *53*, 384; *see* also 1943, *49*, 539), it is convenient to have the findings of the D.S.I.R. investigators compactly bound in one small volume. The whole thing is the result of having to find a war-time substitute for montan wax—the hard ester wax extracted by solvents from lignite—of which, before the war, Germany was practically the exclusive supplier. The only really important deposit of lignite in Britain is at Bovey Tracey, Devon, and the investigators found that the wax from this lignite was satisfactory as a substitute for montan wax—about 5 per cent. of the lignite being recovered as wax by extraction with benzene.

Wax from British Peat

THESE investigations open up the possibility of developing a new British industry—small it may be, but none the less important—by encouraging the production of this wax for peace-time uses. The amount of lignite available is restricted, but our supplies of peat, as the paper published later on in this issue shows, are considerable. The Fuel Research Station workers found that from 2.7 to 11.8 per cent. of the dry substance of peat could be recovered as wax; but that this showed certain differences from the lignite wax, and, in particular, had a lower melting-point, though the valuable dielectric properties were similar. It was found that the wax content of peat depended on the nature of the vegetation from which it had been derived: peats derived from cotton-grass, heather, and *Scirpus* are relatively rich in wax. Of the 20 samples examined, nine were from English sources, eleven from Scottish. The English samples tended to uniformity, whereas both the best and the worst results came from Scotland, the outstanding example being from "a fairly normal stretch of hill peat" in Banffshire. The official report does not go further than to say cautiously that "it is possible that the utilisation of peat waxes for industrial purposes is worth further investigation." Considering the comparative ease of winning peat, it would certainly appear well worth while, especially in view of the opportunity offered of developing a suitable industry in "special" areas.

Canadian Copper

TOWARDS the end of the war, fears were being expressed in Canada about the possibility of marketing that Dominion's copper production, which had greatly expanded during the war years, as it was pointed out that the war-time contracts from the United Kingdom would soon be automatically terminated. As it proved, these fears were groundless, especially as the U.S. relieved the difficult transitory situation by taking Canada's surplus copper for the remainder of 1945 after the war had ended. Now the trouble lies the other way. With the gradual recovery of industry, the demand for copper exceeds the capacity of smelters, and a world shortage has developed. This is aggravated by the fact that Canadian producers, having for six years pushed on with war production at all costs, were unable to carry out programmes of development with an eye to the future. Moreover there has been a sharp drop in production from the copper-nickel deposits of Ontario, owing to the greatly decreased demand for nickel in peace time. In 1946, so far from restricting its copper purchases to Africa, the U.K. received some 33,000 tons of copper from Canada in the first half of the year, and has asked for a much greater tonnage for the second half. The remainder of Canada's surplus will go, through UNRRA, to the war-torn lands of Western Europe.

Post-War Markets

IT will be some years before conditions can approach the normal again. The devastated European countries not only require quantities of non-ferrous metals to re-establish their industries, but also find themselves unable to meet these demands from their own resources, their mines, smelters, and refineries having been looted and smashed during the period of occupation. In addition, protracted strikes in the U.S. copper industry have added to the problem, and the Civilian Production Administration in the U.S. has appealed to producers to ration supplies. Canada, too, has not been without its strikes. In a review of the Canadian copper trade before the war, the *Commercial Intelligence Journal* points out that 67 per cent. of the total value of Canadian copper exports was in the form of primary metal, mostly to the U.K. and other European countries; concentrates and matte accounted for 15 per cent., mainly to the U.S., Japan, Norway, and the Netherlands; 12 per cent. was in the form of rods, strips, etc.—again mostly to the U.K.—about 5 per cent. was in the form of blister copper (all to the U.S.); and about 1 per cent. as insulated cable and wire—an interesting feature being the sudden rise, in 1939, in U.K. imports of this type of material. It now appears as though the traditional European markets for Canadian copper were likely to resume their old importance—with the signal exception, of course, of Germany.

German Technical Reports

Particulars of Latest Publications

SOME of the latest technical reports from the Intelligence Committees in Germany are detailed below. Copies are obtainable from H.M. Stationery Office at the prices stated.

BIOS 523. *Carl Alexander Mine, Baesweiler, near Alsdorf*: The de-ashing of coal by froth flotation and acid extraction and the Ruhrwerks coal cleaning process (2s.).

BIOS 545. *Seifenfabrik Rose, Frankfurt Osthafen*: Soap substitutes (6d.).

BIOS 547. *Kalle and Co., A.G., Wiesbaden-Biebrich*: "Tylose" cellulose derivatives (2s.).

BIOS 569. *Glass or enamelled lined equipment on steel and iron for chemical food and allied industries* (2s.).

Peat

An Undeveloped Raw Material of Scotland

by

A. G. CLEMENT, B.Sc., A.R.I.C., and ROBERT H. S. ROBERTSON, M.A., F.G.S.

OF all the little-worked resources of Scotland peat is the most important, for it covers about one-tenth of the entire area of the country, may well exceed 1,000,000,000 tons (dry weight), and has many interesting varieties and potential uses.

In the table below is shown the estimated amount of peat which several countries possess and the amount of peat is also expressed in relation to the area and population of each country.

Country	*Peat area (sq. miles)*	*Population (million)*	*Acres per head of population*
Finland	38,000	3.8	6.4
Canada	37,000	10.4	2.28
Sweden	19,200	6.5	1.90
Eire	4,700	3.0	1.0
Norway	2,900	3.0	0.62
Scotland	3,100	4.8	0.415
Russia	65,000	184.1	0.225
Austria	1,500	6.7	0.143
England and Wales ...	6,300	41.0	0.098
Germany	9,900	65.3	0.097
Denmark	400	3.7	0.069
U.S.A.	11,200	135.6	0.053

It is clear then that the finding of profitable uses for peat concerns Canadians, Scandinavians, Irish, and Scots much more deeply than, say, the Americans or English. We find then that in Eire, Norway, and Sweden substantial Government funds have been devoted to the investigation of peat. In Scotland, however, we are not fortunate in having any research and development organisation which could develop industries using peat as a raw material.

Peat Winning

The uses to which peat can be put may be classified as those which require it in an air-dry form and those which do not (see diagram). The production of air-dried peat economically is the chief difficulty in the utilisation of peat; cutting and drying peat is not easy. Peat in the bog has about 19 parts of water to one part of solid, and the best draining will reduce this only to 11 or 12 parts to one. For fuel and many other purposes the ratio must not exceed 1 part of water to 3 parts of solid.

Hand-cutting is a costly and laborious method, but it is the only method known for dealing with certain types of light brown peat which contain a high proportion of fibre. The bulk of the peat cut in this country to-day is hand-cut. However, mechanical methods, which work very well, have been evolved for cutting black peat. Many such machines are at work in Germany, Sweden, Denmark, and Russia, and they work on the bucket dredger principle, delivering the peat into a hopper, from which it is extruded in briquettes ready for spreading in rows on the ground and air-drying. It is now some forty years since these machines were first developed, and none are in use in this country. With a crew of three, they do the work of about 100 hand-cutters.

Within the last decade a new method of cutting and drying peat has been evolved and put into use in Eire, Sweden, and Denmark. This involves milling a layer about ½-in. deep on the surface of the bog; the finely disintegrated peat thus produced dries in a matter of a day or two and is then collected, and a fresh lot milled. This method is more subject to weather conditions than the cutting in blocks, but it represents a definite advance in technique. There is believed to be a similar process for the production of milled peat in Russia.

As an efficient drier will not remove more than about 4 parts of water per part of dry peat burnt as fuel, some very cheap method of getting rid of 12 parts of water must be devised. Exposure to sun and wind is the cheapest known, and practically all peat-drying is therefore climatic. However, machines have been made which squeeze the water out of peat. These generally have a pair of heavy rollers or bands between which the peat passes. Colloidal types of peat cannot be treated by such machines, but the suggestion has been made that it might be possible to dewater these peats by endosmotic methods, and there are Russian claims to have reduced the water content to 25 per cent. by this means.

There seems a very good case, since such progress has been made in foreign countries, for carrying out an extensive research programme on these problems in this country. The high cost of making and testing machines makes it impossible for any one peat firm to finance such a programme. Most of the peat firms in this country do not have research facilities and their policy of marketing only one product and that, peat moss litter, a low-priced commodity, makes them financially unbalanced and incapable of sustained research. Hence it seems obligatory on the Government to take the initiative in developing our peat resources by initiating research along the lines indicated.

Peat has received Government recognition only spasmodically. On occasions, such as famines in Ireland, commissions were set up to see if they would recommend the development of the peat bogs as a means of enabling the Irish to earn enough to buy food. In the 1914 war shortage of fuel brought peat to the fore again, and the D.S.I.R. carried out some very valuable work, published in 1921-2, on the fundamentals of air-drying, and the extent of Irish peat resources. With the secession of Eire in 1921 the work stopped. Again, in the latest crisis, the possibility of using peat was revived, but the only official steps taken were to recommend it to be used in army camps in peat districts whenever possible. This policy, or lack of it, must be changed if our peat deposits are to become anything other than an unused national asset and a source of employment to a mere handful of men.

Peat as Fuel

Since peat has only about half the calorific value of coal, it is obvious that the greatest possible mechanical and thermal economy must be exercised in utilising it. This means that handling must be reduced to a minimum, and the conclusions of a number of workers in this line are that works making use of peat as a fuel must be situated on or near the peat moss. This is the case with power stations in Germany and Russia which are fuelled with peat, and the gasification of peat at Hamburg proved uneconomic only because of the long railway haul from East Friesland.

Very high thermal efficiency is a matter of design, and the Russians, who are the largest users of peat, have devoted considerable attention to this. It is estimated that their peat-fired power stations have a capacity of 1,000,000 kW., and the quantities of peat used as fuel in U.S.S.R. and Germany are as under:

	Year	*Tons*	*Per cent. of total fuel produced*
Germany ...	1928	700,000	0.4
U.S.S.R. ...	1913	1,675,000	1.7
U.S.S.R. ...	1927–28	5,310,000	4.3
U.S.S.R. ...	1940	29,000,000	—

Three types of furnace have been developed for burning peat: the Makarev chain grate, which makes use of lump peat only: the Shirshnev, in which milled peat is fed into the furnace; and the Ivanov system, in which peat in a finely powdered form is injected into the furnace with an air blast. Combustion is instantaneous and the furnace runs at such a high temperature that the ash is run off as a slag. The hot gases emerging from the furnace are used to dry the incoming peat and the heat passing through the furnace walls heats the air blast. A water-tube boiler is used, and with the low sulphur content of peat the tubes last many times as long as in a coal-fired furnace.

Distillation and Gasification

Large-scale distillation of peat was carried out by the Lewis Chemical Co., which was founded by Sir James Matheson in 1859. Dr. Paul, the engineer and chemist, was not very competent and for the first two years the gas was let out into the atmosphere, poisoning much of the surrounding vegetation. Later its calorific value was discovered and it was made use of. Peat gas has a peculiarly unpleasant odour. The Lewis works produced considerable amounts of charcoal and tar, but after running at a loss for a number of years—due, it is said, to mismanagement, and not to the commercial impracticability of the process—it closed down in 1874.

During the 1914 war the Government took over the firm of Wet Carbonising, Ltd., at Dumfries, and produced at great cost a quantity of peat coke briquettes, which it was intended to use in the trenches. The process was not successful and was closed down. The Fuel Research Station carried out some valuable work on the distillation of peat in 1922 and published their results, which showed that given peat at a suitable price (just over half the price of coal), distillation was quite a feasible proposition. The test, mentioned above, on gasification at Hamburg gasworks in 1938, confirmed these results, and one firm at Oldenburg carried on distillation of peat for over twenty years. The products are peat charcoal, used in gas generators, tar used for impregnating fire-lighters, and peat gas.

Agriculture

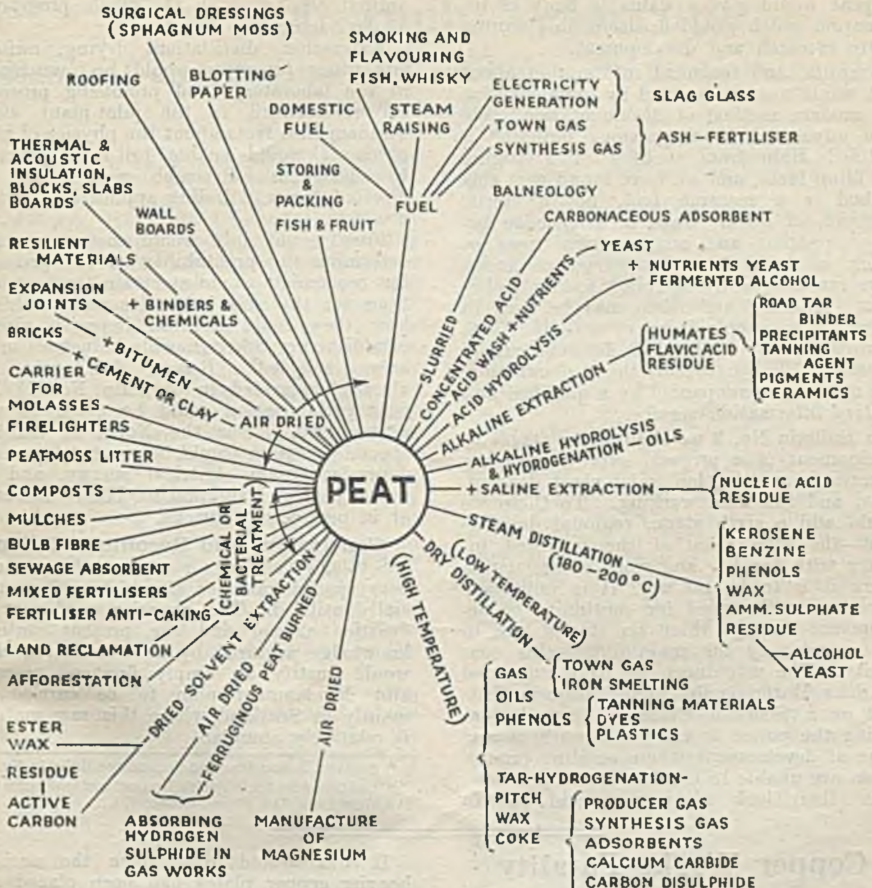
Although peat moss litter and granulated peat are important in horticulture and agriculture, there is room for the development of mixed fertilisers, treated peats, and sewage absorbents. Sphagnum peat is already being used as an absorbent for molasses, but can also be used as a substance for growing yeast fodder.

Where commercial utilisation of peat is unlikely, afforestation is often possible, and even after removing the peat the land can often be turned into agricutural land. If all the peat lands of Scotland were effectively drained there would be a noticeable increase in the average temperature of the atmosphere, and local improvements in climate would almost certainly be felt.

Building Materials and Other Uses

Light brown peat can be converted into thermal insulation for houses, factories, refrigerators, ships, and trains. It is very like cork-board in its properties. Hard boards can also be made. A Scottish chemist has made an internal brick from peat and cement. Other products are resilient materials, acoustic insulation, expansion joints, and roofing felts.

Peat is used in Scottish gas works for increasing the efficiency of iron oxide in desulphurising town gas. Ferruginous peats, known in Scotland, could be used in place of imported or synthetic oxide. During the



The Field of Peat Utilisation

war large quantities of light peat were used in the manufacture of magnesium.

Among the most interesting uses of peat are those which require little or no preliminary drying. Of these, one which should be tried in Britain is the late Professor Ernst Berl's process of converting carbohydrates to oils by alkaline hydrolysis and hydrogenation under pressure.

In Eire ester wax is extracted with solvents, and some British peats have been analysed for wax. The use of the residue presents a difficulty here.

Research and Development

A survey of peat is already being undertaken by the Geological Survey, with the collaboration of the Macaulay Institute for Soil Research, and the first publication is the Survey's War-Time Pamphlet No. 36. It will be clear that industrial development is not likely to arise from this work unless the geological and botanical surveying is accompanied by certain physical and chemical measurements which will be of interest to those contemplating using peat for certain specific purposes. Firms or individuals interested in the many uses of peat could be called together at intervals with members of the Research Station staff to discuss what tests would be of value, and the surveyors could send, from each deposit visited, samples to the Station for testing. As many as twenty or thirty standard tests may have to be done on each sample, but many of these tests would be mechanised and would not take long to carry out in a central laboratory.

Little progress can be made unless all the available knowledge about peat is collected together, so that research workers may have the benefit of knowing previous work. The scientific literature on peat is scattered in journals all over the world, and though much of the early work is quite valueless, a constantly maintained review of the literature on peat would give a valuable body of information which would be useful in planning future research and development.

Scientific and technical information about peat would need to be filed by some effective and modern method of documentation. We have advocated in a previous bulletin* a modified Holmstrom method of arranging and filing facts, and we have found that this method is a research tool, not a sterile collection of facts. Gaps in knowledge become apparent and suggest new lines of attack in research. Summaries of knowledge can be quickly compiled from a Holmstrom "index" and these may be used in their turn to supply industry with the facts required for the industrial development of processes. To be useful, then, documentation must be accompanied by a qualified and positive information service.

In Bulletin No. 3 we showed the stages in development of a process, survey, analysis laboratory investigation, pilot plant development, and full-scale working. To these we should add a sixth stage, regional development—the integration of the proposed industry with the life and work of the region where it is to be set up. It is important to recognise the need for continuity of development through these six stages, and to have machinery for maintaining this continuity. The machinery we have suggested is a Raw Materials Research Station in Scotland or a Scottish Research Organisation, having the power to carry out work at any stage of development where existing organisation are unable to do the work for reasons other than lack of money, and to co-ordinate the work in the whole programme of development.

Extraction, distillation, drying, milling, and other processes would be investigated in the laboratory, and promising processes carried forward to the pilot-plant stage. Fundamental facts about the physics of these processes would enable full-scale plant to be designed. Research would also be directed towards finding applications for the products.

Finally, not only would cost accountants determine the profitability of the processes but economists would ascertain the best locations for the new industries and would see how they could dovetail in with already established or other possible industries in the areas selected. Robert Maclaurin has already suggested in Bulletin No. 9† how peat carbonisation could be fitted in with a gas grid. For the North of Scotland special attention would be given to processes dependent upon electrical energy, and the use of peat as insulation for Highland houses or in peat-cement bricks.

Conclusions and Recommendations

Scotland has large resources of peat, only very special varieties of which are commercially utilised. The experience of peat industries abroad and the present state of knowledge acquired by unco-ordinated effort would justify an amply financed research and development plan to be carried out mainly in Scotland where this raw material is relatively abundant.

* Scottish Reconstruction Committee Bulletin No. 7.

† Published by the Scottish Reconstruction Committee, 213 West Campbell Street, Glasgow, C.2.

Copper Works Fatality

Sequel to Bursting of Tank

THE bursting of a settling tank at McKechnie Brothers' copper works, Widnes, as a result of which an employee received fatal burns, was described at an inquest at Widnes recently, on William Ernest Melvin, aged 33.

Evidence given was to the effect that Melvin told a foreman that one of the liquor tanks was leaking. The tanks contained about 1350 cu. ft. of liquor, and were heated between 82-88° C. The foreman went into the shed and started to pump to take the liquor out of the settling tanks. By that time the liquor was all over the floor, and he was ankle deep in it. The pump was working at full pressure. Planks used to cover the pipes and sump were washed away. One of Melvin's fellow-workers saw him pull his left leg out of the sump. He took off Melvin's wellington boot, and carried him out of the shed into the ambulance room and left him in the care of the ambulance men. Melvin died later of shock, following burns of the left leg.

It was stated that since the accident heavier copper plates had been placed over the sump. A verdict of "Death by misadventure" was recorded.

The Moscow Steel Institute is reported to have developed a method for the manufacture of coloured steel, based on the addition of certain elements during the alloying process.

Demand for cobalt has, according to the chairman of the Union Minière, greatly increased during the war, the main applications being for special steel, alloys, and magnets. An alloy containing more than 70 per cent. of cobalt is at present being tested for compressors of diesel locomotives and this has already given remarkable results in efficiency and fuel consumption. Great hopes are also entertained for the application of cobalt alloys in lining the combustion chambers of motor engines requiring a metal capable of standing corrosion at high temperature, as well as for marine engines.

The 200-Inch Telescope

Chemical and Engineering Problems in its Construction

by R. L. WATERFIELD

THE great adventure of building the 200-inch telescope is nearing completion. It all started out of an article by the late Dr. George Hale, director of the Mount Wilson Observatory, California, in *Harper's Magazine* in 1928. Within a few weeks a gift of $6,000,000 had been promised and within a few more Hale had started the ball rolling. Experiments in making a quartz mirror were started in 1929, and ended in failure in 1931 after the expenditure of $600,000. The astronomers then switched over to Pyrex and by the autumn of 1935 the 200-inch mirror had been successfully cast and annealed. The grinding and figuring of the mirror had to be suspended when America entered the war in 1941; but by then the building and mounting for the instrument was well-nigh complete. Work on the figuring of the mirror was resumed this year and during the last few weeks has gone ahead so successfully that it is now confidently expected that the completed telescope will be ready to go into action by the autumn of next year.

Astronomical telescopes are of two sorts. In the refractor the image is formed by the main lens, or object glass; while in the reflector the same function is performed by a mirror with a parabolically curved reflecting surface. In both cases the image is examined with an eyepiece which is really a low-power microscope. In a refractor the lens is at the top end of the telescope as in an ordinary spy-glass. In a reflector the mirror is at the bottom of the tube which is thus open to the sky: the light from the star under examination is reflected back up the tube and deflected by a small flat mirror, set at 45 degrees, into the eye-piece which is thus fixed in the side of the tube near its upper end. Though the eyepiece can be changed to produce whatever magnification is required, the upper limit to the magnification is determined by the diameter of the object glass or mirror.

Effect of Atmosphere

Unfortunately, another limit is set by the earth's atmosphere. Theoretically, the 100-in. telescope now at Mount Wilson could magnify 10,000 diameters, but our atmosphere is seldom if ever steady enough to employ a magnification of over 1000 diameters with advantage. But the size of the mirror or object-glass determines something more important than magnification: it determines the *light-grasp* of the telescope. Every time the diameter is doubled we can see or photograph objects just four times as faint: we can in fact penetrate just twice as far into the universe.

An object-glass consists of two lenses set close together, and the light is refracted four times as it enters or leaves the four surfaces of the composite lens. Both discs of glass must be of the highest optical perfection, and each of the four surfaces must be figured to the correct curvatures to within a few millionths of an inch. A mirror consists of a single glass disc of which only the front surface has to be accurately figured. To ensure the perfect figure of this surface the glass disc must be of high optical quality throughout; but since the light is reflected, without penetrating the glass, from a thin silver film deposited on the *front* surface, the glass need not have the exquisite optical perfection required in a lens. Thus the difficulties in producing the glass and the labour involved in figuring are enormously less in the case of a mirror.

Size of Refractor Limited

To ensure rigidity the thickness of a lens or mirror must increase in proportion to its diameter. With a lens a point will ultimately be reached when the gain due to the increased light-gathering power of the surface is counteracted by the loss due to light absorption in passage through the glass. Again, when a lens reaches a certain size it will begin to bend appreciably under its own weight, for it can obviously be supported only round its edge. Neither of these limitations applies to a mirror; for the light does not penetrate the glass, and the weight of the disc can be taken by supports evenly distributed over its back surface. The largest refractor in the world, the 40-inch erected at the Yerkes Observatory, Chicago, in 1897—also due to the efforts of Hale—already approaches this upper limit. So the construction of appreciably larger refractors is not practicable.

Reflectors have one disadvantage: their figure is extremely sensitive to changes in temperature. During the greater part of the night the temperature is usually falling rapidly; but until the temperature of the mirror is approximately the same throughout its substance, the image will be distorted and the focus will be continually changing. This cannot be prevented by thermostatic control since the mirror has to be of the same temperature as that of the outside air. A lens, on the other hand, is practically unaffected by changing temperature;

so, for accurate measurement and most routine work, a refractor is preferable.

Until recent years astronomy was mainly concerned with the measurement of the positions of the heavenly bodies, and for this purpose great light-grasp was not important. On the other hand for most of the problems of the newer science of astrophysics, which deals with the structure of the universe and the nature of its component bodies, light-grasp is the essential requirement. Hale long ago realised this and was mainly responsible for the erection in 1908, at the newly-founded observatory on Mount Wilson, of the first of the great modern reflectors with a 60-inch mirror. The achievements of this instrument in the direct and spectroscopic photography of objects far beyond the range of lesser instruments so impressed astronomers, and Hale in particular, that he was soon pressing for a still larger aperture; and by 1918 he had erected at the same observatory the 100-inch telescope. Since then several other large reflectors, ranging from 60 to 80 in. in diameter, have been built, chiefly in America, Canada, and South Africa.

Overcoming Difficulties

The enormous step from 100 to 200 inches now contemplated involved great difficulties and uncertainties. The 100-inch mirror weighed over 3 tons; a similar 200-inch mirror would weigh 40 tons. The mechanical problem of mounting such a mirror to follow the stars with perfect smoothness and rigidity would be terrific. The 100-inch disc had taken a year to anneal, a 200-inch disc would require about eight years in the annealing oven; even then the mirror would probably be unusable, for there would never be time, even during the longest nights, for the temperature of its entire mass to reach equality with that of the night air. There seemed to be three possible ways of getting round these difficulties. First, to make the mirror of stainless steel, the high heat conductivity of which would ensure its rapid cooling. Secondly, to make the mirror of quartz, of which the coefficient of expansion is only one-twelfth that of glass. Or finally, to compromise between quartz and glass by using a special Pyrex with a coefficient of expansion of one-quarter that of glass. The great weight of a steel mirror decided against its adoption; but it is possible that in the future a light metal alloy may be found with the necessary high reflecting capacity.

It was therefore decided to try quartz: to cast a 200-inch disc of rough quartz and afterwards spray its surface with a thin layer of pure quartz. This was necessary because fused quartz is highly viscous and it is impossible to get rid of the large numbers of bubbles which become trapped within its substance. It was found that by spraying the surface of the rough disc with a rain of fine droplets of quartz a uniform thin layer of clear quartz could be produced which was capable of being satisfactorily figured and polished. Satisfactory mirrors up to 2 feet in diameter were made in this way, but the difficulties increased rapidly with the size, and all attempts to produce a 5-foot mirror ended in failure. It was realised that, although the 200-inch mirror might ultimately have been achieved, its expense would have been so great that there would have been no money left for the rest of the telescope. So in 1931 the astronomers switched over to Pyrex, a special Pyrex with an unusually low coefficient of expansion.

Weight of Disc Reduced

It was decided to cast the Pyrex in the form of a disc with a ribbed or honeycombed back and a comparatively thin continuous front surface. In this way the weight of the disc would be reduced from the 40 tons it would have had if it had been solid to about 14½ tons. Moreover, not only would there be a much smaller mass of glass to cool, but the honeycombed back would greatly increase the area of the cooling surface. It was hoped that the performance of such a mirror might at least approximate to that of the ideal quartz mirror.

The production of the disc was entrusted to the Corning Glass Works. They made in succession an experimental 26-inch solid disc and a series of ribbed discs 30, 60, and 120 inches in diameter, which were to form the various subsidiary mirrors for the completed telescope. It was soon found that the special Pyrex to be used, with its higher melting point, was much more difficult to pour than the ordinary plate glass. The high quality fire-brick used in the moulds for ordinary glass mirrors was quite useless. At the higher temperature the moisture imprisoned in the bricks was liberated, filling the Pyrex mass with numerous bubbles. It was found necessary to build the mould of pure white silica bricks which had been made from a mixture of ground-up cork, sand, and water, and fired in a kiln until the cork was burned out and the moisture expelled. The result was a brick which contained no moisture and was extremely porous. Thus no bubbles were liberated, and any that were carried in during the pouring process could escape through the pores.

Again, the usual method of allowing the molten glass to flow down a trough from the melting oven into the mould had to be abandoned, for the Pyrex rapidly chilled and the trough got blocked. Instead they had to revert to the ancient method of ladling by hand. In the mould first tried for casting the 30-inch ribbed mirror the cores projecting from its base to produce the honeycomb structure were held in place by a special furnace cement. But the cement was unable to withstand the heat, and the cores broke loose and floated to the surface of the molten mass. A second attempt was made with a mould in which the cores were anchored down by dowels fashioned out of the same silica brick, and a perfect result was obtained. It was noticed, however, that owing to the rapid chilling of the Pyrex it had not filled the mould quite evenly at the base of the cores. Though the defect in the present disc was too small to matter, it was clear that it would undoubtedly assume serious proportions in any attempt at a larger disc. So for the 60-inch disc they built a special casting oven to keep the mould hot during the process of ladling. At the first attempt the cores again came adrift. A second attempt was made after taking special precautions with the fitting of the dowels; but still one of the cores broke loose and floated to the surface. It was fished out and, after annealing, the missing hole was drilled out from the back. Despite this accident polarisation tests showed the disc to be optically satisfactory.

Before starting on the 120-inch disc the problem of the cores was again attacked. This time it was decided to make them hollow and build them up round steel bolts with large heads which would anchor them to the base. To save expense the casting and the annealing ovens were built large enough to house the 200-inch disc when required. In order to assist the ladling process the ladles were suspended from monorails running from the melting to the casting oven, though they still had to be controlled by hand. The casting of the 120-inch disc succeeded at the first attempt, and a perfect disc was removed from the annealing oven.

A Set-back

The casting of the 200-inch disc was planned for Sunday, March 25, 1934, and a preacher in Pennsylvania loudly forecast its failure. Towards the end of the ladling, when all appeared to be going well, several of the cores broke loose and floated to the surface. With great difficulty they were broken up into fragments; the ladling was then continued and completed ten hours after the start. It was decided to make another attempt, but meanwhile the present damaged mirror could be used to test the time required for annealing. It was therefore annealed at ten times the rate which calculation suggested ought to be perfectly safe, and was removed after only one month in the annealing oven. Polarisation tests showed that the strains which had developed in the glass were still well within the limits set by the astronomers. The core debris was then drilled out of the front surface and the disc reheated until its surface had melted smooth and then annealed again. It would at least serve as a spare mirror for the telescope.

The next and final attempt was made the following December. This time the cores were anchored down with bolts of chrome nickel, and each core was fitted with an internal air-ventilating system to keep it cool. This time the casting went off without a hitch. The mould for the great disc was supported on a circular steel table heated by electric coils; and this in its turn was carried on a heavy truck running on a wide-gauge railway track from beneath the casting oven to beneath the annealing oven. The table could be jacked up so as to fit into position beneath one or other of the two ovens. After the casting, the disc in its mould was transferred to the annealing oven, where it was kept at a constant temperature for two months and then cooled uniformly for a further eight months. All went well until three months before the end of the period, when the Chemung river, near by, flooded its banks and rose higher than it had done for 17 years. Despite every effort to stay the advance of the water, the electrical plant controlling the oven was partially flooded, and for three days the current had to be switched off. Fortunately, when the oven was finally opened and the decisive tests performed, the disc was found to be perfect.

Transporting the Disc

For the journey from the eastern seaboard to California the disc in its casing, weighing in all 35 tons, had to be carried in a vertical position in a truck constructed specially for the purpose. Though the well-truck carrying the mirror cleared the ground by only a few inches, the top of the casing stood 17 ft. 7 in. above the rails and the clearance of at least three bridges on the route was only 17 ft. 10 in. At Kansas City a last-minute detour had to be made: frost had raised the rails and the bridge clearance was insufficient. Again through the tunnel at Johnson Canyon, Arizona, the train had to travel through on the east-going line to ensure safe clearance. During the two weeks journey across the continent, only travelling in the daytime and never exceeding 25 miles per hour, the train took precedence over all other traffic. It was preceded by a scout train and accompanied by an armed guard, who during night-time halts at country sidings allowed nobody within 500 yards.

The grinding and figuring of the disc has been done at the optical shops of Mount Wilson in Pasadena. By the time America entered the war the rough grinding was over and the figuring was progressing rapidly. When work was resumed early this year there remained to be levelled a peripheral zone and a central hillock of a few thousandths of an inch. That has now been accomplished, and the final figuring to within a few millionths of an inch is well under way. The method is very slow and must proceed by trial and error: after a brief period of polishing, hours must elapse for the temperature of the glass to settle down and permit the tests to be done. Though it is impossible to say how long it will take to achieve the required perfection, everything indicates that the mirror will be ready in about a year's time.

The telescope tube is about 60 ft. long and 22 ft. in diameter. Complete with the mirror at one end and the small chamber suspended in the middle of the mouth of the tube to carry the observer, the whole telescope tube weighs 125 tons. The yoke in which the telescope swings to point to any part of the sky weighs about 300 tons; of this, 170 tons is accounted for by the huge horseshoe bearing at the upper end of the yoke which is no less than 46 ft. in diameter—the biggest bearing ever made. Thus the total weight of the moving parts of the telescope is about 425 tons. The steel structures supporting the upper and lower bearings of the yoke add a further 75 tons, making about 500 tons for the weight of the whole instrument. The revolving dome of the building which houses the telescope is 137 ft. high and 135 ft. in diameter. It stands on Mount Palomar, about 125 miles from Pasadena and about 100 from Mount Wilson, at an altitude of 5600 feet.

It would now seem that all the problems have been solved and that no further serious difficulties can arise. But one doubt still remains: how will the telescope perform? Will the low coefficient of expansion of the special Pyrex and the ribbed structure of the disc suffice to overcome the tendency to distortion of figure due to the ever-varying night temperature? Certain astronomers still keep their fingers crossed.

Silicophosphate

Experiments in East Africa

THIRTY tons of silicophosphate have been made by the East African Industrial Research Board for supplying agricultural authorities with material for field trials and it is hoped that by the end of the 1945 season a considerable volume of evidence will be available on its yield effect on annual crops.

This is recorded in the recently-published annual report of the Board. An account is given of extensive surveys carried out by Departments of the Government of Uganda leading to the opening of a rock-phosphate mine near Tororo, which produced supplies of several thousand tons of a slow-acting fertiliser—a factor, incidentally, which contributed to the spectacular war-time expansion of the Kenya wheat crop.

The Research Board undertook the development of a process for converting the raw rock into a more available form of fertiliser which could replace superphosphates. The soda-calcination process developed in the Research Board's Laboratory, partly on the basis of a German process of the 1914-18 war, now offers the prospect of converting the Uganda phosphate into fertiliser of perhaps even greater suitability for East African soils than superphosphates.

The name silicophosphate was recently adopted in the U.K. for a phosphatic fertiliser made by the calcination of a mineral phosphate with silica and soda ash. Although the process for soda-calcination treatment of the Uganda rock phosphate developed by the Board differs in some ways from the British process, the final product is from a practical point of view closely similar.

A Unique Deposit

The special character of silicophosphate rests on the fact that its contained phosphoric oxide is largely insoluble in water, but soluble in dilute acids. In accordance with modern agronomic thought, phosphoric oxide in this form is likely to be readily taken up by plant roots. It is probable that no mineral phosphate deposit exactly similar to that at Tororo is exploited elsewhere in the world unless the Kola deposits of North Russia may be regarded as similar.

The Kenya Agricultural Department carried out a limited number of field trials on small grains in 1945. All indicated a considerable increase from silicophosphate over the controls and some increase over the other forms of phosphatic fertilisers.

LETTER TO THE EDITOR

Inert Spindle-Oil

Sir,—I was very pleased to see an excellent review of our booklet on the above subject in your issue of July 27. There is one point which I would like to bring to your notice, *i.e.*, in the third paragraph of the column I see that you state that our non-carcinogenic white oils have "improved lubrication properties showing a drop in 'bolster' temperature of up to 70° F. over old-type oils."

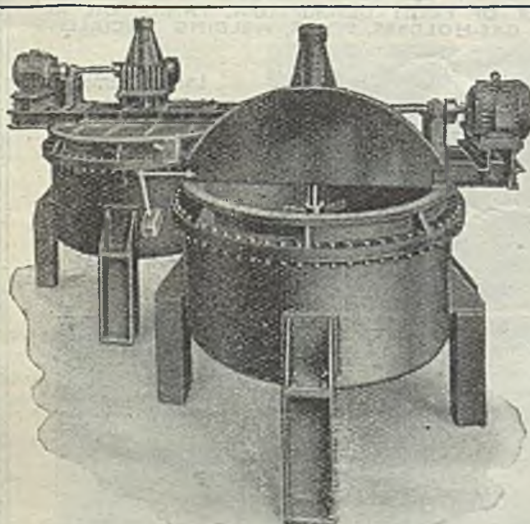
The figure 70° F. is obviously a printer's error, as in our publication we stated that the drop in "bolster" temperature was up to 7° F. I thought I had better bring this to your notice, as although it is only a minor printing error, it is of some importance, as we never like to make exaggerated claims for our products.—Yours faithfully,

for Manchester Oil Refinery, Ltd.
D. Brook Hart.

London, E.C.4.
July 29, 1946.

Metallurgical Section

Published the first Saturday in the month



Metallurgical Section

August 3, 1946

Forming of Aluminium Alloys

Use of the Rubber Die Press

A COMPARATIVELY new process that should be of particular interest because of its possibilities to the post-war user in simplifying many problems in the production of aluminium and aluminium alloy components is described in A.D.A. Information Bulletin No. 11, "Forming of Aluminium Alloys by the Rubber Die Process."*

Since its introduction to industry in 1935, the use of the rubber die press has developed rapidly. The Ministry of Aircraft Production quickly recognised the possibilities of the process, and at once designed and put into production a series of presses capable of meeting the requirements of the aircraft industry speedily and economically.

The process will aid manufacturers who need to produce quickly components varying in size and shape, but are not required in quantities that warrant the use of hardened steel tools and dies. The rubber die process is normally carried out with simple and relatively inexpensive tools, which can be produced without elaborate tool-room plant and craftsmen.

An introduction in the bulletin explains that the rubber press consists essentially of a thick rubber pad housed in a steel container strong enough to withstand the maximum pressure exerted on the press platen. The thickness of the rubber is about two-thirds the depth of the container. Dies made from harwood, zinc or steel are placed on the surface of the platen, the sheet material to be formed being positioned on the dies by suitable location pegs. As hydraulic pressure is applied, the movement of the platen forces the dies and the sheet material against the rubber pad, which, when deformed, compels the metal to shear, bend or form to the shape of the die.

Until recently it was generally accepted that the use of rubber in conjunction with press tools was dependent on the ability of the rubber to flow, *i.e.*, that when pressure was applied to a quantity of rubber placed in a closed vessel or container a resultant reaction was set up on every surface with which the rubber came into contact. At the same time, it was noted that, in contrast with a purely fluid medium like water, rubber possesses the property of cohesion, or resistance to "free flow." Now, however, it is believed that the fluid-like flow of rubber is almost inappreciable and that it is the frictional properties of rubber that are decisively important in forming components by the rubber die press. In other words, the ability of the rubber under pressure to react to and form sheet metal parts is due to the resistance of the rubber to deformation.

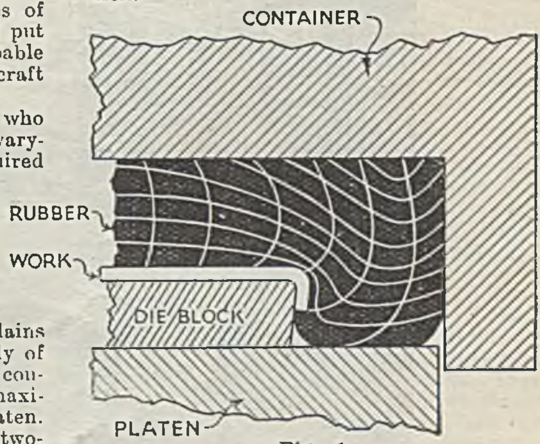


Fig. 1.
Action of rubber pad under compression.

The pressure obtainable is limited by the shear strength of the rubber, once the rubber begins to shear, the pressure concentration falls so rapidly that completion of the operation is impossible. The frictional properties of the rubber also have considerable influence on the working action of the rubber pad since the process is a dry one, achieved by a combination of stretching and displacement. Very little slip takes place, and what does is over vertical surfaces, never over horizontal, as may be shown by placing spots of wet paint upon the metal to be deformed; it will be found that they are transferred to the face of the rubber pad without appreciable smearing. The face of the rubber clings by friction to the metal blank at the point at which it first touches the blank and remains at that spot even when full pressure is obtained, the

* Published by the Aluminium Development Association, 67 Brook Street, London, W.1.

more distant parts of the rubber pad being displaced and stretched over the work and the dies on which it is being formed. This action of the rubber is shown in Fig. 1.

Although most modern rubber die presses have been designed for use with high pressures, a considerable amount of work on sheet of from 14 to 20 s.w.g. is produced on presses with which low pressures are used. These presses require a slightly more complicated die design than those employing high pressures, but for many applications the saving in power may make them more economical.

Good pressings may be produced on small presses with as little as 150 tons capacity, but most normal hydraulic presses of this type use between 300 to 600 tons pressure, with a platen pressure of 0.7 tons/sq. in. reinforced by mechanical means. An ironing plate made of ½-in. boiler plate, cut away in the centre so that it just clears the finished shape of the component, is located on top of the blank material. When the pressure is applied the rubber comes into contact with the surface of the plate and is forced into the space cut out of it. The rubber thus compressed forces the material to the shape of the die. The ironing plate itself greatly helps in preventing the formation of wrinkles at the corners of the part. Unless large parts of heavy gauge are required, these low-pressure types of press with moderately soft rubber will form all standard parts of normal size. Working on a single large ram, they have a very rapid cycle, particularly when designed to accommodate four loading tables.

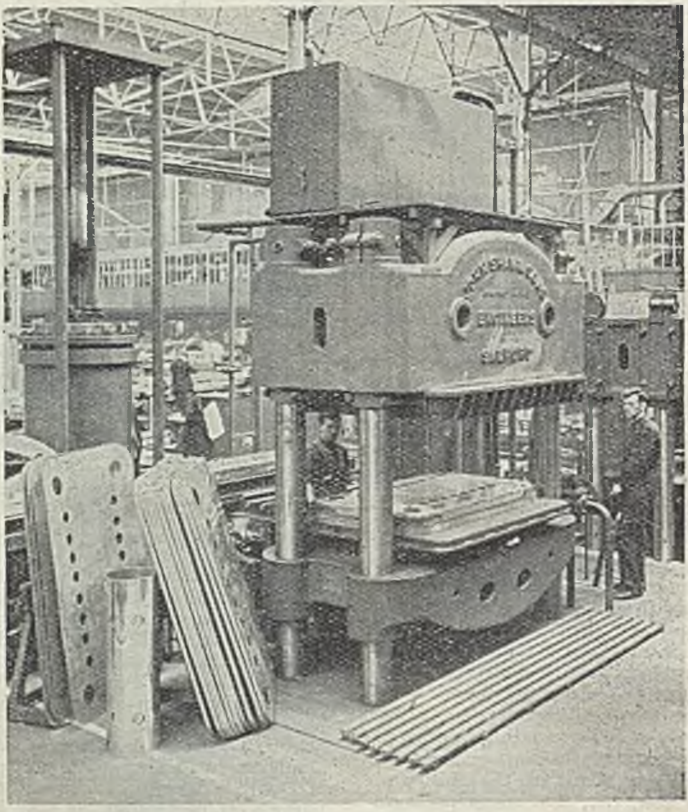


Fig. 2. Small 500-ton rubber press after the forming stroke

The rubber pads used on these low-pressure presses are either solid or built up from 1-in. laminations of 50 to 55 Shore hardness. The internal pressure of this soft rubber is not always adequate to complete all forming operations, in which case it is

Two types of press, standardised by the Ministry of Aircraft Production during the war, are in general use in this country, one a high-power type of cast steel unit construction, the other a low-power type of mild steel plate construction. In the high-power type units each of about 2670 tons rating, with a platen area of 3 ft. by 4 ft., are coupled together to form presses rated at 5340, 8000 and 10,700 tons respectively, with a maximum pressure of 1½ tons/sq. in., working dimensions being respectively 6 ft. by 4 ft., 9 ft. by 4 ft., and 12 ft. by 4 ft. The low-power type is built in sizes ranging from presses of 500 tons capacity with platen dimensions of 3 ft. by 2 ft. (such as that illustrated in Fig. 2), to machines of 2600 tons capacity with platen dimensions of 6 ft. by 4 ft., the pressure in all cases being 0.5 tons/sq. in.

In a description of the method of using the rubber die press, the bulletin states that the rubber pad is housed in a steel container strong enough to withstand the total bursting pressure exerted by the platen, the thickness of the rubber being about two-thirds the depth of the container. The dies are grouped upon the surface of the platen and the blanks placed upon them, located with pins. The dies and blanks are brought into contact with the rubber pad and pressure applied. The steel container prevents lateral movement of the rubber, thus forcing it against the blanks and dies. Due to its elasticity the rubber deforms as pressure increases, forcing the metal blanks to assume the shape of the dies. On removing the pressure, the rubber goes back to its original form ready for the next operation.

If separate blanks are used for each component they are placed in position by location pins on the dies. Provided that dies of approximately the same height are grouped together, the gauge of metal need not be the same for all the components. When a single sheet is being formed into blanks, the dies should be grouped economically and the sheet placed over them. Pressure is applied to all blanks simultaneously so that they are formed with one stroke of the ram. When blanks for large numbers of components are to be sheared, the shearing dies should be grouped over the loading table so that they occupy the entire area of a sheet of stock size. The sheet is then placed over the dies and pressure applied.

Technique of Press Work

Dies and tools are described in detail and a considerable portion of the booklet is devoted to the technique of rubber die press work. The methods detailed are: blanking and piercing (together with the essential press requirements); flanging in its various forms, with graphs showing the respective concave and convex flanges that are permissible without wrinkling or splitting; how moderate drawing operations can be achieved with the aid of supplementary rubber pads; and means of overcoming springback in heat-treated alloys, together with useful tables of springback angles for simple straight flanges.

Shortage of Metals

Need for Empire Survey

REFERENCE to the shortage of some metals in the British Empire was made during the Empire Scientific Conference in London, in a discussion on the need for a co-ordinated survey of the mineral resources of the Empire.

It was pointed out that the situation with regard to lead, for instance, is serious, and its price is about four times what it was a few years ago. Even more grave than a temporary shortage is the fact that within 20 years the Empire's proved lead resources will not be able to meet the demand at the present rate of consumption and the same is true of zinc. It is probable that intensive geological work would reveal the presence of hitherto unknown deposits and thus amply repay the cost. In addition, active research is necessary to enable processes for the treatment of what are now regarded as unworkable deposits to be developed for the recovery of their useful contents.

Speakers from the Dominions and Colonies made it clear that geological staffs are at present totally inadequate. In some parts of Australia, for example, there is only one State geologist to 100,000 sq. miles, while some of the Colonies have not a single Government geologist, so that over large parts of the Empire the mineral resources are unknown. This contrasts very strongly with what happens with some mining companies; in Northern Rhodesia, for example, private companies employ about 80 geologists. They proved the existence of one of the largest copper fields of the world, and at that time there was not a single Government geologist in Northern Rhodesia. There is at present a great shortage of trained geologists and it would take at least five years to make up this shortage even under the most advantageous circumstances.

In former days mineral deposits were discovered on the surface by the old-time prospector, but henceforward it will be the concealed deposits missed by the untrained prospector which will contribute to the Empire's prosperity. These can only be discovered by scientific and systematic investigations based on the geological map.

It was resolved that the need for a co-ordinated survey was of paramount importance and detailed recommendations are now being prepared.

The Orure smelting plants in Bolivia, where experiments have been carried out during the last decade with low-grade tin ores, are now for the first time producing pig tin of 99.5 per cent. at less than $60 per ton initial smelting costs, which will be reduced as operations progress.

The Protection of Stainless Steel

Retention of Surface Polish

IN polishing stainless steels to a finish, extreme care is exercised at the mill to obtain a flawless surface free from pits, scratches, and similar defects. For certain applications of polished sheets, no fabrication is necessary. In such cases, only careful handling is required to preserve the lustrous finish. Many applications of polished sheets, however, such as restaurant, hospital, and kitchen equipment, dairy and meat packing equipment, and many architectural uses, require brake or press work, followed by welding or soldering, and the necessary grinding and polishing at welds. It is essential in these instances that precautions be taken to eliminate the possibility of scratches, dents, and other marks on the polished surface.

It is difficult to match by hand, on a formed object, the finish that was obtained on polishing machines at the mill. Hence, it is to the advantage of the fabricator to protect the polished surface before any work is begun rather than to be faced with the job of polishing out marks that may have appeared through improper protection in forming. While it is not maintained that it is possible to prevent scratching and rubbing entirely on all types of work, the fabricator will save trouble, time, and money by exercising every precaution against damage to a polished surface.

The Adhesive Tape Method

Several methods of lubrication are being used, from among which the fabricator should select the method best adapted to his particular operations. The first consideration should be given to the condition of the dies. They should be well polished and at the first sign of any pick-up of the metal the press brake should be stopped and the dies stoned and polished.

A satisfactory method for preserving polished finish is the application of adhesive tape to the dies. This method can be used where the work applied to the metal is not severe, such as in bends on hand brakes. Its use is not recommended for deep drawing. The merit of this type of protection is that it prevents direct contact between the polished surface of the sheet and the hardened steel of the dies. Similarly, the use of thin paper between the polished metal and the die is working well in some cases. Wax paper, oiled paper, cellophane, and in some cases even ordinary newspaper have been used with marked success in the elimination of die scratches. The paper is used as an adjunct to the lubricant.

Another method of protecting the surface of polished sheets both in shipping and handling is to apply ordinary wall-paper with wheat paste—allowing about 12 hours to dry. Also adhesive paper and tape up to 36 in. in width are obtainable from several sources. If soldering or welding is necessary after the sections have been formed into various shapes, the protective paper may be removed with hot water where the parts are to be joined. The protective paper may either be removed before shipping the parts, or on the other hand the surfaces may be permitted to remain covered, especially in building construction, until ready for the final cleaning. The proper time for removal is governed, therefore, entirely by the application.

Dealing with "Building Filth"

The use of polished stainless steel for exterior decorative purposes in building construction has made necessary the means of protecting it from what may be termed "building filth," i.e., plaster, cement, concrete, ashes, rust from steel work, and other contaminations with which it may come in contact during the erection of a building. Several of the large paint manufacturers have developed special lacquers which will protect the sheet for a year or more from the effects of "building filth." The lacquer can be removed at the completion of the building, or it may be allowed to wear off from the effects of the weather.

The need of passivation has not been stressed in this discussion. Whenever steel rolls, steel dies, or shears come in contact with stainless, there is a possibility of discoloration due to a film of iron being abraded on its surface. This film should be removed either with the nitric acid passivation treatment or by buffing with approved compounds.

In many fabrication operations it is often necessary or desirable to employ a lubricant to avoid excessive scratching, especially where high finishes are concerned. Under such conditions, and even when dry forming is involved, the accumulated surface deposit must be removed before the equipment is shipped. If the lubricant or deposit has a grease base, it is best to wash first with a good solvent and wipe dry. This, while removing all the grease, will leave a thin oily surface film which can be removed by absorbing with finely bolted whiting. The whiting, or precipitated calcium carbonate, should be sifted on to the surface and wiped off with a soft cloth, a method which will bring out the true colour and lustre of the metal.

If the material is to be used for building trim, either interior or exterior, it will very likely be further polluted during the building period from other products, such as cement, dust, paint, lacquer, etc. It can be covered, of course, with a heavy Kraft paper applied with ordinary paper-hangers' paste and washed off when completed with warm water. If not thus protected, the surface should first be washed with benzol, turpentine, paint remover, etc., depending on the deposit in question, to remove heavy dirt. Never use steel wool, metal scraper, or any other mechanical method, as scratching and contamination of the surface are almost certain to result. Steel or iron particles may thereby become embedded in the surface and eventually oxidise to brown iron rust, making it appear as though the stainless were becoming discoloured, when, actually, the stainless is not affected in any way.

Final Washing

Follow this preliminary cleaning with a final washing, using half-and-half powdered 00 pumice and whiting on a soft rag wet with either plain water or water to which a little ammonia has been added. Always rub in the direction of the polishing lines—never with a circular motion or across the grain, as light scratches or light and dark areas may result. Remove excessive powder with a clean, wet rag, and allow the remainder to dry, then wipe off with a soft, dry cloth, preferably flannel.

LETTER TO THE EDITOR

Scarcity of Raw Materials

Sir,—The representations which are being received in increasing numbers from members of the Engineering Industries Association complaining of the scarcity of essential raw materials disclose a very disturbing situation.

It would appear from a study of the trade and navigation accounts for May that one of the contributory factors is the remarkable rate at which the export of raw and semi-manufactured materials has been increased, as the following representative figures (from pp. 156 and 164) show:

mitting the immensely increased exports of raw and semi-manufactured materials, rather than the much more valuable finished articles, the product of British skill in manufacture, of which those materials form an essential part, engineers are entitled to know what it is. Can it be that the Chancellor of the Exchequer and the Treasury are not aware of the loss to the national revenue which the policy of the President of the Board of Trade entails If exports of these materials are to continue on a rising scale to the detriment of the manufacturing

Exports (Produce and Manufactures of the United Kingdom)

	Monthly average, 1938	*May* 1946	*Five months to* 31/5/38	*Five months to* 31/5/46
Group C—Iron and Steel	*Tons*	*Tons*	*Tons*	*Tons*
Wire rods and bright steel bars	814	7,384	4,070	22,305
Angles, shapes and sections	5,617	16,533	28,085	67,390
Hoop and strip	3,115	7,469	15,574	34,994
Group D—Non-ferrous	*cwt.*	*cwt.*	*cwt.*	*cwt.*
Aluminium and alloys :—				
Sheets, strip, etc.	4,872	25,083	24,359	97,565
Brass and alloys of copper :—				
Plates, sheets, strip, etc.	12,482	40,699	62,412	170,300
Rods, sections, etc.	3,076	30,146	15,480	99,066
Copper :—				
Plates, sheets, strip, etc.	7,275	32,868	36,376	137,894
Tubes	2,165	6,060	10,824	37,271

The comparative figures for 1938 and 1946 above speak for themselves.

All these materials are in such short supply for the urgent needs of the home market that manufacturers who use them are being compelled to refuse further orders for weeks and months ahead, with the inevitable prospect of unemployment in some sections of the engineering industries. If there is a reason for the Government's action in permitting the immensely increased exports of raw and semi-manufactured materials, rather than the much more valuable finished articles, the product of British skill in manufacture, of which those materials form an essential part, engineers are entitled to know what it is. Can it be that the Chancellor of the Exchequer and the Treasury are not aware of the loss to the national revenue which the policy of the President of the Board of Trade entails If exports of these materials are to continue on a rising scale to the detriment of the manufacturing engineer, it is difficult to see how unemployment at home and loss of markets abroad can be avoided.—Yours faithfully,

Davidson,
President.

Engineering Industries Association,
9 Seymour Street, London, W.1.
July 29.

European Zinc Production

Progress in Italy and Norway

REPORTS which have recently come to hand concerning the output of zinc in European countries formerly occupied by the enemy, relate mainly to the progress made in Italy and Norway.

In Italy the Marghera zinc foundry, near Venice, came into operation again at the end of April, and it is expected that the production of electrolytic zinc will soon be started again at the Crotone plant in Southern Italy, now that the requisite electric power is once more available. An output of 500 metric tons per month is expected. In 1939 the aggregate production of zinc in Italy was 36,000 tons, sufficient to meet home demands and at the same time provide a considerable margin for export.

The Norwegian company, Norsk Zink Kompaniet A/S, of Odda, which has the largest capacity for electrolytic zinc in Europe, is working at two-thirds capacity—present annual production being about 36,000 tons as against nearly 50,000 in 1936. Exports of zinc in 1945 fell to the low figure of 7157 tons (9391 in 1944), but the 1946 exports show a tendency to rise, the January amount being 1410 tons compared with 250 in January, 1945. Competition from British Empire sources has caused the selling price to fall, and considerable difficulty is being met with in arranging for the import of zinc ores from abroad. The company exports mainly to other Scandinavian countries, the Netherlands, and France.

Heat-treatment of Metals

New Developments in Russia

IN an article published in *Moscow News* of June 19, Dr. M. Lozinsky, winner of a Stalin Prize, describes the latest developments that have taken place in the Soviet Union in the heat-treatment of steel surfaces by the use of high-frequency current. This method, which is outlined below, is being introduced on a wide scale in Russian industry, a series of successful tests having been carried out.

The method consists in the immersion in water of both the metal to be heat-treated, and of the inductor. By the use of high-frequency currents, it is claimed that more durable surfaces have been produced than by previous methods. The new Russian method is described as a development of an invention made by V. Vologdin, Dr. G. Babat and the author a few years ago, the underlying principle of which has been the increase in the depth of the electric field passing through a metal with increasing frequency of the current. The introduction of this method has made it possible to achieve a remarkable standardisation and a speed-up of the whole heat-treatment process. Pinion gears, for instance, can now be treated in a mere fraction of the time formerly required. The Moscow Machine Tool Works have thereby reduced spoilage in heat-treatment to about 1 per cent., and at the same time they have saved 1000 tons of fuel oil per month. As a result of further improvements, the most complicated steel parts may be treated and the thickness of the tempered surface can be adjusted to a fraction of a millimetre.

Indian Aluminium

Progress Report

FROM the time when aluminium was first produced in India by the Indian Aluminium Co., Ltd., at its Alupuram reduction works, near Alwaye, Travancore State (*see* THE CHEMICAL AGE, 1945, *52*, 125), spectacular progress has been made in this industry, according to a recent report in the *Bombay Evening News*. To satisfy the country's war-time requirements, the company's rolling mills at Belur, Calcutta, and the fabricating units, produced a wide range of articles, from aircraft parts to hospital equipment. It is claimed that this factory, from the technical point of view, compares favourably with large American and Canadian plants, and, when its power needs have been completely met, will attain an annual output of 5000 tons of aluminium. Arrangements are now being made for production of alloys of the duralumin type.

The construction of the company's alumina works at Muri, Bihar (*loc. cit.*), is nearing completion, and these will have a capacity of 40,000 tons per annum, while it is further stated that the Aluminium Corporation of India, Ltd., Asansol, Bengal, has now started production with an annual capacity of 1000 tons, which is to be increased shortly.

Review of Chemical Finance—II

Trends of Earnings, Dividends and Share Values

by S. HOWARD WITHEY, F.Comm.A., etc.

(*Continued from "The Chemical Age," July 6, 1946, p. 12*)

SOME manufacturers of pharmaceutical products and fine chemicals propose to increase their capital to restore the drainage of E.P.T. which has run away with large sums in the war years, and owing to insufficient labour, containers and materials, and shipping space for exports, the leading firms have reported a decline in gross earnings for the past year.

B.D.H.

In the case of British Drug Houses, Ltd., the trading profit amounted to £351,921 in 1945, compared with £467,219 for 1944, but owing to a saving in taxation the balance of net profit was £5125 higher at £42,284, enabling the ordinary dividend to be restored to the pre-war 6 per cent. level. The company's products are supplied for the use of the medical profession, pharmacists, research workers, educational establishments and industrial laboratories throughout the world, and new capital requirements are connected with widespread plans. The present issued capital of £750,000 is made up of £350,000 in the form of 5 per cent. cumulative preference shares of £1, and £400,000 in ordinary £1 shares, and after adding £20,000 to reserve the forward balance is £334 higher.

	£
Brought forward from 1944 ...	19,447
Net profit: 1945	42,284
Disposable balance	£61,731
5 per cent. dividend on £350,000 cumulative preference £1 shares, *less* tax	8750
6 per cent. dividend on £400,000 ordinary £1 shares, *less* tax ...	13,200
Transferred to reserve	20,000
Carried forward to 1946	19,781
	£61,731

After adding additional expenditure during the year, and deducting depreciation, the fixed assets total £552,540, and interests in subsidiaries amount to £122,141. The current assets aggregate £1,532,912, providing a surplus of £328,332 over current liabilities. The highest and lowest market prices of the shares over the past four years are given below:

5 per cent. cum. pref. £1 shares	1943	1944	1945
Highest	25s.	25s. 1d.	26s.
Lowest	22s. 6d.	23s. 9d.	24s. 6d.
Ordinary £1 shares			
Highest	25s.	29s. 6d.	51s. 3d.
Lowest	19s.	21s. 6d.	28s. 9d.

Recently, the preference were quoted at 27s. 6d. and the ordinary at 70s.

Griffiths Hughes

During the financial year ended March 31 last, record profits were earned by Griffiths Hughes Proprietaries, Ltd., which controls E. Griffiths Hughes, Ltd., makers of Kruschen Salts and numerous other proprietary medicines, etc. After providing for foreign and Dominion taxation, the combined profits of the group amounted to £555,557, representing an increase of £118,780. Provision for taxation is £42,534 higher at £264,890, and the net profit balance after charging depreciation, etc., is £75,505 higher at £276,855. The parent company's income of £156,530 after tax compares with £11,695 for 1944-45, and the net profit balance of £151,773 represents an increase of £44,726, which enabled the ordinary dividend to be raised from 10 per cent. to 15 per cent. The company has a capital of £2,500,000, composed of £1,000,000 in the form of 5½ per cent. cumulative preference £1 shares and £1,500,000 in ordinary £1 shares, and the forward balance is slightly increased.

	£
Brought forward from 1944-45 ...	3606
Net profit: year ended March 31, 1946	151,773
Disposable balance	£155,379
5½ per cent. dividend on £1,000,000 cumulative preference £1 shares, *less* tax	28,875
15 per cent. dividend on £1,500,000 ordinary £1 shares, *less* tax ...	120,750
Carried forward to 1946-47	5754
	£155,379

The consolidated balance sheet shows current assets totalling £1,414,661, giving a surplus of £840,646. Highest and lowest market prices of the shares are shown below:

5½ per cent. cum. pref.	1943	1944	1945
Highest	22s. 4d.	24s. 3d.	26s. 3d.
Lowest	19s. 6d.	22s.	23s. 3d.
Ordinary £1 shares			
Highest	26s.	36s. 3d.	50s. 7d.
Lowest	18s.	22s. 3d.	31s. 3d.

At the recent price of 26s. 6d. the preference yield over 4 per cent., and at 61s. 6d. the ordinary return nearly 5 per cent.

Greeff-Chemicals

Including profit on the sale of property, the aggregate profits realised by Greeff-Chemicals Holdings, Ltd., in 1945 was £37,765. This compares with £24,967 for 1944, and after providing £6500 for taxation and placing £7500 to reserve, the balance of net profit is £22,578, or an increase of £2421. The company owns all the issued shares of R. W. Greeff & Co., Ltd., merchants and distributors of industrial chemicals and other products, and the capital of £250,000 comprises £125,000 in the form of 5½ per cent. cumulative preference stock, and £125,000 in ordinary stock the dividend on which is now 12½ per cent.

	£
Brought forward from 1944 ...	15,042
Net profit: 1945	22,578
Disposable balance	£37,620
5½ per cent. dividend on £125,000 cumulative preference stock, gross	6875
12½ per cent. dividend on £125,000 ordinary stock, gross	15,625
Carried forward to 1946	15,120
	£37,620

Goodwill stands on the consolidated balance sheet at £167,672, and the current assets amount to £358,203, the floating surplus being £161,845, which compares with £148,779 a year earlier. At the recent price £148,779 a year earlier.

Profits from vegetable oil extraction and seed crushing are governed by the margins paid for processing, and the United Premier Oil and Cake Co., Ltd., receives payments from subsidiary companies under management agreements. In 1945 the trading profit and other income of the company amounted to £183,831, representing a decline of £5668 in relation to the previous year, and although the provision for depreciation and obsolescence is greater, the charge for taxation is smaller, and the balance of net profit is £5985 higher at £42,895. The company directly controls Alfred Smith, Ltd., and the Premier Soap Co., Ltd., and has a capital of £688,749, consisting of £491,874 in 7 per cent. cumulative preference £1 shares, and £196,875 in ordinary shares of 5s. on which a dividend of 15 per cent. has been paid for the past three years. After allocating £10,000 to reserve, the forward balance registers an increase of £94, thus:

	£
Brought forward from 1944 ...	47,306
Net profit: 1945	42,895
Disposable balance	£90,201
7 per cent. dividend on £491,874 cumulative preference £1 shares, *less* tax	17,216
15 per cent. dividend on £196,875 ordinary 5s. shares, *less* tax ...	15,585
Transferred to reserve	10,000
Carried forward to 1946	47,400
	£90,201

Fixed assets are shown on the consolidated balance sheet at £810,130, and the current assets at £813,923, the floating surplus being £357,097. The following are the highest and lowest market prices of the shares and of the 4¾ per cent. debenture stock over the past three years:

	1943	1944	1945
4¾ per cent. debenture stock			
Highest	103	103	105½
Lowest	100	103	103
7 per cent. cum. pref. £1 shares			
Highest	28s. 3d.	29s.	30s. 9d.
Lowest	25s.	26s. 3d.	28s. 9d.
Ordinary 5 shares			
Highest	12s.	15s. 4d.	18s. 7d.
Lowest	10s.	11s. 4d.	14s. 0d.

B. Laporte, Ltd.

As most of the products of B. Laporte, Ltd., chemical manufacturers, were needed during the war, transition difficulties have not been great, and during the financial year ended March 31 last both gross and net earniings increased. The trading profit of £168,190 compares with £155,108 for 1944-45, and other income brought the total up to £195,144, or an increase of £13,265. At £130,000 the provision for taxation is £5000 up, and the pension fund receives £3000 more at £10,000, the balance of net profit being £7390 better at £52,644. The company has an issued captal of £476,000, divided into £6000 in the form of 6 per cent. "A" cumulative preference stock, £145,000 in 7½ per cent. "B" cumulative preference stock, and £325,000 in ordinary stock which receives a victory bonus of 2½ per cent., bringing the total distribution for the year up to 17½ per cent. After allocating £10,000 to general reserve, the carry forward shows an increase of £6329.

	£
Brought forward from 1944-45 ...	58,804
Net profit: year ended March 31, 1946	52,644
Disposable balance	£111,448
Dividends on preference stocks, at	5711
17½ per cent. dividend and bonus on £325,000 ordinary stock, *less* tax	36,604
Transferred to general reserve ...	10,000
Carried forward to 1946-47	65,133
	£111,448

Fixed assets appear on the balance sheet at £341,811, while the current assets amount to £684,398, the liquid surplus over current liabilities being £247,754, or £17,894 higher than a year ago. The market prices of the ordinary £1 stock units over the past three years are as follows:

Ordinary £1 stock units	1943	1944	1945
Highest	80s. 7d.	86s. 10d.	91s.
Lowest	73s. 1d.	75s.	82s. 6d.

Recently they were quoted at 96s., on which basis the yield is 3.6 per cent. At 35s. 6d. the "B" preference units return 4.2 per cent. An agreement to purchase a minimum 90 per cent. of the capital of John Nicholson & Sons, sulphuric acid manufacturers, has been announced.

British Alkaloids

For the twelve months ended March 31 last, the gross earnings of British Alkaloids, Ltd., manufacturing chemists and manufacturers of T.C.P., the well-known antiseptic, were returned at £169,810, this figure being arrived at after charging all general expenses and a proportion of the advertising expenditure. Although this represents a decline of £4916 in relation to the previous year, the provision for taxation is on a smaller scale, and the net profit balance of £56,911 compares with £51,144 for 1944-45, enabling the dividends on both ordinary and preference capital to be raised. The company has an authorised capital of £150,000, of which £91,002 has been issued and only £77,604 called up. This comprises £30,829 in the form of 8 per cent. non-cumulative participating preference £1 shares—which are entitled to one-quarter of the profits after the ordinary shares have received 8 per cent.—and £46,775 in ordinary shares of 1s.—the dividend on which is raised from 30 per cent. to 60 per cent. The balance of £29,075 is debited for advertising, and after charging £4682 for directors' additional remuneration, and allocating £2000 to staff pensions and £3000 to reserve, the forward balance is only £2592 smaller.

	£
Brought forward from 1944-45 ...	3831
Net profit: Year ended March 31, 1946	56,911
Disposable balance ...	£60,742
Advertising expenditure written off	29,075
Directors' additional remuneration	4682
Allocated to staff pensions	2000
Dividends distributed	20,746
Transferred to reserve	3000
Carried forward to 1946-47 ...	1239
	£60,742

After depreciation, the fixed assets have a balance-sheet value of £65,986, and the current assets total £234,574, the surplus of working capital being £55,857. Since the stocktaking date an E.P.T. refund to March 31, 1945, amounting to £38,237 has been received, and at the recent price of 14s. the ordinary 1s. shares yield over 4¼ per cent.

British Industrial Plastics

The demand for moulding powders made by British Industrial Plastics, Ltd., exceeded the company's capacity, and during the year ended September 30 last the productive capacity was increased. The trading profit and receipts from subsidiaries amounted to £280,681, which is an increase of £40,574 over the 1943-44 figure, but after charging £120,440 for normal expenditure, abnormal expenditure, and provision for taxation, the net profit balance was only £1811 better at £23,576. The company owns all the shares of the Beetle Products Co., Ltd., and the Streetly Manufacturing Co., Ltd., and has a capital of £444,712, made up of £14,820 in 10 per cent. tax-free cumulative preference shares of 2s., and £429,892 in ordinary 2s. shares, which for the past four years have received a dividend of 8 per cent.

	£
Brought forward from 1943-44 ...	10,163
Net profit: year ended September 30, 1945	23,516
Disposable balance ...	£33,679
10 per cent. dividend on £14,820 cumulative preference 2s. shares, tax free	1482
8 per cent. dividend on £429,892 ordinary 2s. shares, *less* tax ...	18,915
Directors' percentage on dividend	688
Carried forward to 1945-46 ...	12,594
	£33,679

Properties and plant have increased, and the current assets have expanded, and the company will benefit from the reduction of E.P.T. During the past three years the ordinary shares have fluctuated between the following limits:—

Ordinary 2s. shares:—	1943	1944	1945
Highest	7s. 8d.	8s.	7s. 6d.
Lowest	4s. 11d.	6s. 3d.	5s. 9d.

At 7s. the shares return 2-3 per cent., and at the recent price of 5s. 6d. the preference yield about 6½ per cent. gross.

Although there was a sharp fall in the gross earnings of Lacrinoid Products, Ltd. during 1945, due entirely to enemy action, the balance of net profit was £3828 higher at £9350, and the rate of dividend has been raised from 9 per cent. to 10 per cent. The trading profit of £18,988 contrasts with

£53,855 for 1944, but taxation absorbs only £8125 as against £47,000, and the increased dividend was earned with a margin of £2200, equal to a further 3.8 per cent. The company specialises in the manufacture of plastic accessories for the clothing, housing, and furnishing industries, and has increased its capital from £100,000 to £130,000 in the form of 2s. shares.

	£
Brought forward from 1944 ...	2633
Net profit: 1945	9350
Disposable balance ...	£11,983
10 per cent. dividend	7150
Transferred to reserve	506
Carried forward to 1946	4327
	£11,983

Freehold land and buildings, plant and fixtures are shown on the balance sheet at £71,107, while the current assets amount to £122,032 and provide a surplus of £62,220 over current liabilities.

British Xylonite

In 1945, the turnover of the BRITISH XYLONITE CO., LTD., was again more than double the 1939 figure, and the consolidated trading profit of the group was returned at £707,050. This compares with £618,876 for the preceding year, and after debiting depreciation, pensions, fees, and taxation, a consolidated net profit of £89,479 compares with £74,410. The dividends and interest received by the parent company, less administrative expenses, advanced from £77,415 to £97,475, and after charging pensions, fees and taxation the net profit balance was £7414 higher at £40,773, enabling the ordinary dividend of 10 per cent. to be repeated. The company's operations are conducted through B.X. Plastics, Ltd., Halex, Ltd., and Cascelloid, Ltd., and the paid-up capital of £700,000 consists of £400,000 in the form of 5 per cent. cumulative preference shares, and £300,000 in ordinary shares, all of £1, and the forward balance registers an increase of £15,773.

	£
Brought forward from 1944 ...	77,751
Net profit: 1945	40,773
Disposable balance ...	£118,524
5 per cent. dividend on £400,000 cumulative preference £1 shares, *less* tax	10,000
10 per cent. dividend on £300,000 ordinary £1 stock, *less* tax ...	15,000
Carried forward to 1946	93,524
	£118,524

The fixed assets are down at £770,595, while the floating assets total £2,136,712. This provides a working surplus of £1,082,523 over the current liabilities and provisions, compared with £1,069,870 previously. The ordinary shares are not quoted, but at the recent price of 24s. 6d. the preference shares yield more than 4 per cent.

Pinchin, Johnson

Satisfactory results were obtained in 1945 by PINCHIN, JOHNSON AND CO., LTD., the big paint combine, and the rate of dividend on the ordinary capital has been increased from 10 per cent. to 15 per cent. The trading profit of £583,116 compares with £555,756 for 1944, and after debiting £150,000 for E.P.T. and £132,000 for income tax, the net profit was £270,380. This compares very favourably with 1944 when the operations resulted in a deficit of £71,718 after providing an extra £180,000 for income tax. The company's capital of £2,626,250 is unencumbered by debentures and comprises £500,000 in the form of 6½ per cent. first cumulative preference shares of £1, £300,000 in 4 per cent. second cumulative preference £1 shares and £1,826,250 in ordinary shares of 10s., and as no special allocation is made to reserve the forward balance is £98,245 higher, as indicated below:

	£
Brought forward from 1944 ...	43,526
Net profit: 1945	270,380
Disposable balance ...	£313,906
Dividends distributed	172,135
Carried forward to 1946	141,771
	£313,906

Investments in subsidiary undertakings have a book value of £908,357, and other investments appear at £366,098. Altogether, the fixed assets aggregate £2,254,530, while the current assets amount to £2,244,254. The current liabilities and provisions total £749,125, so that the floating surplus is £1,495,129, which compares with £1,470,847 a year earlier. During the past three years the first preference £1 shares have fluctuated between 30s. and 35s. 9d., and the ordinary 10s. shares between 29s. 9d. and 42s. 9d., as follows:

	1943	1944	1945
6½ per cent. cumulative preference £1 shares.			
Highest	33s.	34s. 6d.	35s. 9d.
Lowest	30s.	30s. 6d.	33s.
Ordinary 10s. shares.			
Highest	38s.	42s. 9d.	42s. 3d.
Lowest	29s. 9d.	32s. 3d.	34s. 3d.

At the recent price of 35s. the first preference return 3.7 per cent., and at 43s. the ordinary yield 3½ per cent. The second preference were recently quoted at 22s. to produce 3.6 per cent., and are a well-secured investment.

International Paint

Fresh high records for turnover and output were established by the INTERNATIONAL PAINT AND COMPOSITIONS CO., LTD. in 1945, and the distribution on the ordinary capital has been raised from 20 per cent. to 23 per cent. The trading profit of £231,886 compares with £210,895 for 1944, and income from investments brought the total up to £319,550 as against £291,638. The net profit balance after providing more for E.P.T. was £5871 higher at £150,474, and after meeting the dividend the surplus enabled £10,000 to be allocated to general reserve and £3000 to the development fund, and the carry-forward to be increased. The company specialises in the manufacture of anti-corrosive and anti-fouling compositions, paints, varnishes, etc., and has a capital of £734,500 and no debenture indebtedness. The capital consists of £200,000 in the form of 6 per cent. cumulative preference £1 shares and £534,500 in ordinary £1 shares, and the company has no serious reconversion problems to solve.

	£
Brought forward from 1944 ...	27,568
Net profit: 1945	150,474
Disposable balance ...	£178,042
6 per cent. dividend on £200,000 cumulative preference £1 shares, gross	12,000
23 per cent. dividend on £534,500 ordinary £1 shares, gross ...	122,935
Transferred to general reserve ...	10,000
Allocated to Development Fund ...	3000
Carried forward to 1946	30,107
	£178,042

Including a general fund of £370,000, the reserve aggregate £530,000, and goodwill has been written off. The balance sheet shows subsidiary and other trade investments at £491,225, while the current assets amount to £1,337,134. The highest and lowest market prices of the shares over the past three years are tabled below.

6 per cent. cumulative preference £1 shares.

	1943	1944	1945
Highest	32s.	32s. 9d.	33s. 6d.
Lowest	28s. 9d.	30s. 6d.	31s.
Ordinary £1 shares.			
Highest	6 3/32	6 7/32	6 11/32
Lowest	5¼	5⅜	5 11/16

Recently, the ordinary were quoted at 6¼ to yield 3.7 per cent., and at 33s. the preference return 3.6 per cent.

Trading and other profits of AULT AND WIBORG, LTD., and its subsidiaries were returned at £134,887 for the year to March 31 last, the amount attributable to the parent company being £121,853, as compared with £100,581 for 1944-45. At £63,575 the net earnings are nearly £20,000 higher, and the ordinary dividend has been raised from 12½ per cent. to 18 per cent.

	£
Brought forward from 1944-45 ...	33,786
Net profit: year ended March 31, 1946	63,575
Disposable balance ...	£97,361
Preference service	4000
18 per cent. dividend on ordinary capital	21,549
Allocated to staff account ...	9537
Transferred to reserve fund ...	20,000
Carried forward to 1946-47 ...	42,275
	£97,361

Joseph Crosfield

For 1945 the trading profit of JOSEPH CROSFIELD AND SONS, LTD., soap and chemical manufacturers, is shown at £1,166,055, which represents a decline of £42,085 in relation to the preceding year, but after charging depreciation, deferred repairs, fees, and taxation, the net profit balance is £4657 higher at £675,660. For the third successive year the ordinary shareholders received a tax-free dividend of 25 per cent., and the forward balance has been increased by £73,160. The company has a capital of £4,900,000 which comprises four preference issues totalling £3,400,000, requiring an aggregate dividend of £227,500, and £1,500,000 in ordinary shares.

	£
Brought forward from 1944 ...	302,131
Net profit: 1945	675,660
Disposable balance ...	£977,791
5 per cent. dividend on £400,000 cumulative preference shares, gross	20,000
6 per cent. dividend on £500,000 cumulative preference shares, gross	30,000
6½ per cent. dividend on £1,000,000 cumulative preference shares, gross	65,000
7½ per cent. dividend on £1,500,000 "A" cumulative preference shares, gross	112,500
25 per cent. dividend on £1,500,000 ordinary shares, tax free ...	375,000
Carried forward to 1946	375,291
	£977,791

The ordinary shares are owned by Lever Brothers and Unilever, Ltd.

A CHEMIST'S BOOKSHELF

Les Radiations. By Professor Charles Fabry. Paris: Armand Colin. Pp. 220. 60 fr.

It is pleasant to welcome on to the bookshelf once again the neat little volumes of the Collection Armand Colin, the present publication (No. 243 in the series) being the posthumous work of Dr. Fabry, honorary professor at the Sorbonne and the Ecole Polytechnique. With his great specialised knowledge, he has brought system into the vast mass of accumulated facts concerning radiation of all types; and he has contrived to do so without artificial complications and without undue resort to abstruse mathematics. The book includes a critical study of the most up-to-date methods for producing, analysing, and measuring rays, as well as a detailed description of the necessary apparatus. The final section deals most usefully with the applications of radiation, not only on the biological side, in which so many important advances have been made in the last twenty years, but also from the point of view of chemical analysis and photochemistry.

Industrial Experimentation. By K. A. Brownlee. London: H.M.S.O. Pp. 116 2s.

This book, derived from a monograph written for the use of those concerned with pilot-plant experiments or chemical manufacturing processes in Royal Ordnance Factories (Explosives), will be generally welcome as a guide to both the planning and the interpretation of experiments on an industrial scale. The methods described can easily become part of the everyday technique of all who carry out similar experiments. The subject is treated entirely from a practical point of view and the book deals mainly with statistical methods, largely developed by Professor R. A. Fisher, expounded in his *Statistical Methods for Research Workers* and *The Design of Experiments*. Each method discussed is illustrated with examples and its practical use is facilitated by five appended tables.

In the author's opinion the masses of data accumulated by automatic recorders on modern chemical plants should prove a profitable source of information if analysed by these methods. Although such statistical designs have hitherto been employed in the chemical industry only to a very limited extent, their development has been pursued in agricultural science, where there is now a body of experience available stretching over twenty years. Certain aspects will need to be developed in the chemical industry, and others perhaps modified, but they will surely lead to useful conclusions. The book is written for the general reader and is welcome as a transition from war-time investigations to general industrial application.

Science News, 1. Edited by John Enogat. London: Penguin Books. Pp. 208. 1s.

The dissemination of scientific information to the general public is a much-debated question at the moment, and the present volume is not a bad way of starting such dissemination. The "Penguin" public is still pretty general, though it has a tendency to drift leftward and upward; and *Science News, I*, which is remarkably topical considering the inevitable delays of book-manufacture, and at the same time sufficiently varied, should reach quite a large proportion of the really "general" public Apart altogether from the informative value of the contents, which is high, an important point is the revelation provided of the scientific attitude of caution—what the Foreword describes as "mild hedging"—a corrective to the categorical statements often appearing in the popular press.

Anyone interested in chemistry cannot fail to be fascinated by Sir Lawrence Bragg's famous lecture on "Metals," here reprinted, though it is unfortunate that Plates 4 and 5 have been transposed. Dr. D. D. Eley goes a long way towards providing a popular exposition of chemical reactions—a far from simple task; and there are fascinating chemical details in "Danger! Dirt!", "Biological Front," and, of course, "Chemical Front," all of which are apparently anonymous collections of up-to-date facts. It seems a little hard, however, to describe the development of DDT, as an insecticide, as a "lucky guess," especially in view of West and Campbell's latest account of the work involved. Still, a most remarkable shillingsworth.

Parliamentary Topics

Paraffin Supplies

In the House of Commons last week, the Minister of Fuel, replying to a question by Mr. Spence, said he had endeavoured to improve the supply of paraffin, but it was in short supply and he was unable to announce any relaxation of the restrictions.

Insulin Priorities

The Chancellor of the Duchy of Lancaster, in reply to a question by Mr. Pritt, stated that in the British zone of Germany insulin was supplied both to civilian internees and the general public through the German authorities. The Control Commission had laid down no priorities for its supply, nor was he aware of any adopted by the Germans. His information was that supplies were adequate to meet hospital demands in full; limited quantities were available for sale to the public in chemists' shops.

Personal Notes

Dr. E. Gregory, chief metallurgist to Edgar Allen & Co., Ltd., has been elected president of the Institution of Engineering Inspection.

Miss Anne Templeton Lambie was awarded the Vans Dunlop prize in Physics and Chemistry by the University of Edinburgh at the graduation ceremony on July 24.

Mr. R. H. S. Robertson and Mr. A. G. Clement, the authors of the article on peat which appears in this issue, have been in Germany on a BIOS team which is to report on the peat industry in that country.

Dr. W. C. Newell, who was on the staff of the Brown-Firth Research Laboratories, Sheffield, until recently, has been appointed head of the steel castings division of the British Iron and Steel Research Association.

Mr. M. W. Thring, who has been appointed head of the physics department of the British Iron and Steel Research Association, has been with the British Coal Utilisation Research Association since it began.

Mr. A. Harvey, F.R.I.C., acting hon. secretary of the International Society of Leather Trades' Chemists, has been appointed to represent the society on the National Committee for Chemistry of the Royal Society.

Wing Commander R. S. W. Le Fevre, D.Sc., Ph.D., F.R.I.C., who has been head of the chemistry department at the Royal Aeronautical Establishment, has been appointed Professor of Chemistry in the University of Sydney.

Sir Henry Dale, past president of the Royal Society, is to succeed Sir Richard Gregory on January 1, 1947, as president of the British Association. Other appointments already effective are: Mr. M. G. Bennett, treasurer; Dr. E. Hindle and Sir John Lennard-Jones, general secretaries; Mr. D. N. Lowe, secretary.

Professor Albert Szent-Gyorgi, of the Chair of Medical and Organic Chemistry in the University of Szeged, Hungary, has been awarded the Cameron prize in Practical Therapeutics by the University of Edinburgh for his work in connection with vitamin C. Dr. Szent-Györgi is already a Nobel Laureate for his work on the vitamins, and his studies of muscular contraction are regarded as one of the major contributions to biochemistry.

Mr. G. G. Ibbotson, general manager of the heavy constructional division of Newton, Chambers & Co., Ltd., Sheffield, has accepted the board's invitation to become a local director.

Dr. Gwyn Williams, D.Sc., Ph.D., who is now a lecturer in chemistry at King's College, London, will succeed Professor T. S. Moore as professor of chemistry at the Royal Holloway College in the University of London, when the latter retires on October 1.

Colonel R. G. Dawson is resigning from the board of Metal Industries, Ltd., as he is taking up permanent residence abroad. The vacancy will be filled by Mr. T. McKenzie, managing director of Metal Industries (Salvage), Ltd.

Mr. T. Makemson, director of Iron Castings in the Iron and Steel Control, has been released by the Ministry of Supply and has returned to his post as secretary of the Institute of British Foundrymen. He is, however, continuing to act as honorary adviser on iron castings to the Ministry.

Mr. F. Twyman, F.Inst.P., F.R.S., has resigned his position as managing director of Adam Hilger, Ltd., which he has held since 1902, to become technical adviser to the firm and to their associates, E. R. Watts and Son, Ltd. He remains chairman of Hilger's. His place as managing director is taken by Mr. G. A. Whipple, M.I.E.E., F.Inst.P., managing director of Watts, who is the son of Mr. R. S. Whipple, chairman of the Cambridge Instrument Company. Mr. Twyman came to Hilger's in 1898; became manager of the firm on the death of Mr. Otto Hilger in 1902; and managing director on the incorporation of the company in 1904. Mr. G. A. Whipple, after graduating at Cambridge, carried out research work in Germany and in this country. He has served on the council of the Institution of Electrical Engineers and has been hon. secretary of the Scientific Instrument Manufacturers' Association for the last six years. He is a member of the boards of governors of Northampton Polytechnic and the National College of Horology.

Obituary

From Luxembourg is reported the death, at the age of 69, of Mr. Gaston Barbanson, chairman of ARBED (Aciéries Réunies Burbach-Eich-Dudelange), and one of the principal founders of the iron industry in Brazil.

Mr. Arthur Frederick White, whose death has occurred at Heysham, at the age of 86, was a director of William White & Son, Ltd., manufacturing chemists and druggists, Bradford. Despite his advanced age, he took an interest in the firm right up to his death.

General News—From Week to Week

A telephone service with the U.S.S.R.—at present limited to Moscow—is now available between 10 a.m. and 1.45 p.m. daily.

The new College of Technology at Carlisle, to which will be attached a junior technical school, is to be given priority in the city's educational development plan.

Extensive new research laboratories, now in course of construction at the works of Edgar Allen & Co., Ltd., will, it is expected, be completed by the autumn.

The London Rubber Secretariat, formed by the U.K., French, and Netherlands Governments, is to begin publication of a new monthly statistical bulletin, of which the first issue is to appear shortly.

Details are given in the *Board of Trade Journal* for July 27 of the facilities which now exist for a limited number of business men to visit Germany for the purpose of looking into their property there.

Fierce heat from a fire at the Lancashire Tar Distillers, Ltd., Bootle, on Wednesday last week, split a 20-ton still, causing hundreds of gallons of tar to spill. Using spray jets exclusively, Bootle N.F.S. had the outbreak under control in 30 minutes.

Visits to chemical, metallurgical and other works will be arranged for those attending the International Technical Congress which is being held in Paris on September 16-21. Full details are obtainable from Mr. Robert Lowe, 82 Victoria Street, London, S.W.1.

Letters and packets up to a maximum weight of 1 lb., and printed papers, commercial papers, and samples up to the same weight limit, may now be sent to Austria. Correspondence must still be limited to business information.

A two-day conference on Design, which will be held under the joint sponsorship of the Council of Industrial Design and the Federation of British Industries, in the Central Hall, London, on September 26 and and 27, will be the first of a series in association with the "Britain Can Make It" Exhibition.

Damage estimated at £2000-£3000 was caused by flooding at the Bradford premises of the Sandoz Chemical Co., Ltd., during torrential rain which fell incessantly for five hours on Friday last week. The rise of water—which had been turned a deep violet due by contact with hundreds of kegs of powdered dyes—was stemmed by between 20 and 30 employees, who, working for about four hours, swept it into the well of a lift shaft, whence the N.F.S. pumped it to street level and into the beck.

Gall nuts and shellac consigned from any country may now be imported without a separate import licence. The Board of Trade announce that they have issued an open general licence to this effect.

The first number of a new periodical, *Austrian Science and Engineering Bulletin*, has been issued by the Association of Austrian Engineers, Chemists and Scientific Workers in Great Britain. The main article in this issue is the paper *Six Fundamental Principles of Modern Ceramics*, by Dr. Felix Singer.

Delegates of the countries represented at the Atomic Scientists' Association conference at Oxford last Tuesday agreed each to appoint one of their number as liaison officer for the exchange of information and ideas. Invitations are to be sent to countries not represented (including Russia) to nominate liaison officers.

Although it is estimated that 183 H.E. bombs—to say nothing of V1's and V2's—fell within a short distance of their works at Bromley-by-Bow during the war, the works entirely escaped a direct hit, according to a booklet just issued by Kemball, Bishop & Co., Ltd., with the title "A Miracle at the Crown Chemical Works." It is a plain, unvarnished tale of fortitude and valour, but one that must make all who played a part in it feel rightly proud.

Foreign News

A Spanish firm is planning to erect an aluminium factory, in the Avilés district, for processing imported bauxite and for the production of a wide range of articles.

Extensive deposits of iron ore, with a metal content of 60 per cent., have recently been discovered by a Russian geological expedition in the southern parts of the Karelian-Finnish republic.

Magnesite from the deposits in the Sierra de Guadarrama is soon to be processed at Valladolid, Spain, where an annual production of 300 tons of magnesium is envisaged.

A monthly output of 40,400 tons of rolled products has been achieved by the Vítkovice Iron Works in Czechoslovakia, an increase of 19 per cent. over the monthly average of 1938.

Output of metal powder in the United States will amount to about 200,000,000 lb. next year, according to a statement made by the president of the U.S. Metal Powder Association. This quantity is about equal to the war-time annual rate. The present year's output, however, will not exceed 90,000,000.

The Government of India has removed the import duties on lead scrap, copper scrap, brass ingots, and brass scrap. The decision is subject to revision on receipt of the tariff board's report on the non-ferrous metals industry.

Large deposits of low-grade nickel are reported to have been found at Sibwesa in the Western Province of Tanganyika. The situation of the find is about 30 miles from Mpanda, where considerable quantities of lead, gold and silver are known to exist.

By the delivery of pyrites and sulphur from Italy, trade relations between that country and Czechoslovakia have been resumed. Italy is to receive cellulose and china clay for the ceramic industry of Tuscany.

The Norwegian Parliament has recently accepted the proposal, submitted by a Government commission, to erect ironworks at Mo in Rana, to produce about 200,000 tons of rolled iron products per annum. Construction costs are estimated at about 207,000,000 kroner, while 17,500,000 kroner are to be spent on the completion of the Glomfjord power station and on transmission lines.

According to official trade statistics for the first half of 1946, Switzerland exported chemical and pharmaceutical products valued at 174.6 million francs, as compared with 92.3 million in the first half of 1945. Exports of industrial chemicals totalled 21.5 (5.2) million francs, those of dyestuffs and indigo 75.3 (44.8), while pharmaceutical and cosmetic products rose from 42.3 to 77.8 million francs.

The Chilean Government has promulgated a decree whereby the Chilean State Railways are to take possession of the Nitrate Railway Co.'s railway system, thus implementing the expropriation degree of August, 1941. Valuation for indemnity purposes has been assessed at 79,383,877 Chilean dollars, and bonds to that amount, carrying 4 per cent. interest and 2 per cent. amortisation, will be due to the company.

A modern oil refinery, the first of its kind in Australia, is to be built at Paisley, near Altona, Victoria, by the Vacuum Oil Company at a cost of £A750,000, capable of treating over 15,000,000 gallons of crude oil yearly. With a few exceptions, equipment and plant will be manufactured in the Commonwealth, and large supplies of Australian-made chemicals will be used in the refinery processes. The plant has been designed so as to make it possible to treat crudes which might still be discovered in Australia, or as the result of exploratory work in New Guinea.

The Swedish iron concern, Avesta Jarnverks A/B, intends to erect plants in the neighbourhood of Avesta and Krylbo, at an estimated outlay of about 32,000,000 kronor. An alloy mill, a steel plant, and a pressing mill are to be constructed.

Russian scientists report the discovery of deposits of copper, lead and zinc over a large area of the Altaisk region of Siberia. In the Northern Caucasus, lead and zinc ores have been found, and extensive tin deposits in Central Asia. Some of these deposits will be exploited next year. Over 500 geological expeditions are, at present, searching for non-ferrous metals in various parts of the country.

Industrial reconversion in the United States has brought about the greatest production of boron minerals since 1937. Production has steadily been increasing since the war-time low level of 226,723 tons in 1942, and last year's aggregate output was 325,935 tons. The United States is the world's main source of boron minerals, exporting, in normal times, one-third to one-half of the production.

The Mexican review, *Archivos Médico-Quirúrgicos y del Trabajo*, for April, has published a full-length translation of the Annual Report of the Inspector-General of Factories as abridged in THE CHEMICAL AGE on December 8, 1945. We are not fully informed about factory conditions in Mexico, but this is at least a proof of the interest of the local medical profession in their improvement.

The reconversion to peace-time activities of certain industries in Belgium appears to have caused some instability and friction in cases where the increase of output increases or of new establishments has gone so fast as to occasion an "embarras de richesse." Among the industries which are applying to the Brussels Board of Trade for permission to establish maximum rates of output is the "Association d'Acide Carbonique, Solide et Gazeux (Carbocide)," which is asking for authoritative measures to forbid any increase of productive capacity above that which existed on February 11, 1937, as well as any increase of output above the rate at the said date.

The July issue of *Aero Research Technical Notes*, published by Aero Research, Ltd., Duxford, Cambridge, describes Resin 70 and Resin 350 for wet strength paper.

"Alloy Structures Illustrated and Explained," and "The Production of Sound Copper Castings" are among interesting articles in the latest number of *Foundry Practice*, published by Foundry Services, Ltd., Long Acre, Nechells, Birmingham, 7.

Beecham Group

Expansion Policy

THE 18th ordinary general meeting of the Beecham Group, Ltd., was held in London on July 26.

Sir J. Stanley Holmes, M.P. (chairman and managing director), said that the trading profit for the year ended March 31, 1946, earned by the companies of the Group operating in almost all parts of the world amounted to £2,784,729, compared with £2,491,581 in the previous year.

Last year he stated that the Group, which consisted of over 100 companies and branches, had its plans laid for a rapid expansion of export business all over the world in the immediate post-war years. The increase in the profit on the export trade showed that that plan was already in operation and that they were making their contribution to the national export drive.

Throughout the world, and particularly in the British Commonwealth, they were strengthening their organisation and developing their trade. They believed that the result of their deliberations and decisions would considerably increase their overseas and export trade.

Last year it had been reported that they had recently entered the food market and had acquired the equity of C. & E. Morton, Ltd. During the past year the shares of further food companies had been acquired at a total cost, including Morton's, of approximately £1,000,000. They had registered a new company with a capital of £1,000,000, styled "Beecham Food Products, Ltd.," to which the shares of all the food companies had been transferred. They believed that they had not only acquired businesses soundly established and with great prospects but that they had through them attached to the Group a number of men of great experience in the food trade. They were satisfied that the organisation of that new enterprise was proceeding on right lines and would be progressively successful.

The research investigations of the company covered four main fields—food, pharmaceutical, veterinary, toilet and cosmetics. The research department was proving its value more and more every day. The considerable increase in the sales of many of their products made further factory accommodation necessary. After conferring with the Board of Trade they had secured a site at St. Helens, where they already had their Beechams Pills factory, prepared plans and accepted a tender for the erection of a new factory, which they hoped would be completed by the end of 1947. They were also erecting a factory at Newcastle-on-Tyne and had purchased in the neighbourhood of London a factory used for war purposes.

The report was adopted.

New Companies Registered

Rylatt & Co., Ltd. (414,327).—Private company. Capital £1000 in £1 shares. Objects and directors similar to Organic Dyestuffs, Ltd. (*See below*). Registered office: 64 Fountain Street, Manchester.

Invex, Ltd. (414,663).—Private company. Capital, £510 in £1 shares. Chemical and general engineers, etc. Subscribers: A. S. Wadsworth; G. A. Bailey, "Grangehurst," Bardsey, nr. Leeds.

English Overseas & Continental Foodproducts, Ltd. (415,427).—Private company. Capital £100 in £1 shares. Objects and other particulars similar to those of Anglo-European Overseas, Ltd. (*See below*).

Anglo-European Overseas, Ltd. (415,394). Private company. Capital £100 in £1 shares. Manufacturers, importers, exporters and dealers in chemicals, fertilisers, oils, plastics, etc. Director: A. Schwartz. 77 St. Gabriels Road, N.W.2.

M. & J. Chemicals, Ltd. (414,310).—Private company. Capital £100 in £1 shares. Manufacturers of and dealers in chemicals, disinfectants, etc. Director: Mrs. M. Braley. Registered office: 6 Broad St. Place, E.C.2.

Vermex Chemical Co., Ltd. (413,818).—Private company. Capital, £2000 in £1 shares. Manufacturers of and dealers in chemicals, salts, acids, alkalis, etc. Directors: A. Walker; H. Quinn; J. Shaw. Registered office: 20 Queen Street, Blackpool.

G. M. File, Ltd. (414,821).—Private company. Capital, £100 in £1 shares. Manufacturers of and dealers in chemicals, gases, drugs, etc. Directors: G. M. File; A. F. File; R. L. Heard. Registered office: 1 Station Parade, Cherry Tree Road, Buckhurst Hill, Essex.

Marnisales, Ltd. (414,753).—Private company. Capital, £100 in £1 shares. Manufacturers, agents for and dealers in chemical and allied products, etc. Directors: N. W. Holmes; A. S. Holmes. Registered office: Chapel Works, Chapel Street, Beeston, Notts.

Organic Dyestuffs, Ltd. (414,317).—Private company. Capital £1000 in £1 shares. Manufacturers of dyestuffs, pigments, chemicals and chemical auxiliary products for the textile, paint, rubber and leather industries. Directors: T. Rylatt, L. R. Wilkinson. Registered office: Pendleton Mills, Croft Street, Pendleton, Manchester.

Weed Control, Ltd. (414,080).—Private company. Capital, £2000 in £1 shares. Manufacturers of and dealers in insecticides, disinfectants, agricultural and other chemicals and fertilisers, etc. Directors: J. C. Gifford; E. M. Gifford; M. T. Gifford. Registered office: 53 Forest Road East, Nottingham.

Shell Chemical Distributing Co., Ltd. (415,699).—Private company. Capital £100 in £1 shares. Merchants, manufacturers and concessionaires of chemical and scientific preparations, etc. Subscribers: A. K. Gambier, L. G. E. Prime. Solicitors: Waltons & Co., 101 Leadenhall Street, E.C.3.

Accurti Maultasch, Ltd. (415,384).—Private company. Capital £1000 in £1 shares. General import and export merchants and agents, general chemists, etc. Subscribers: L. A. Evans; Miss B. Kesselman. Solicitors: Arbeid & Co., 53/55, Piccadilly, London, W.1.

Surrey Chemical Co., Ltd. (414,588).—Private company. Capital £5000 in £1 shares. To acquire the business of a chemical merchant, etc., carried on by Geo. P. Page at 59 Cleveland Road, South Woodford, Essex, as "Surrey Chemical Company," and "S. F. Matthews & Co." Directors: Geo. P. Page, Mrs. E. E. Page. Registered office: 59 Cleveland Road, South Woodford, Essex.

D. K. (Chemicals) Ltd. (415,418).—Private company. Capital £4000 in £1 shares. To carry on business of dealers in the primary products of diketene; to adopt an agreement with Genatosan, Ltd., and John W. Leitch & Co., Ltd., and to carry on business of manufacturers of and dealers in dyes, chemicals, etc. Directors: A. G. Barthel; A. E. Everest; G. M. Dyson; M. Briscoe. Registered office: 43 Regent Street, Loughborough.

Company News

Bede Metal & Chemical Co., Ltd., earned net profit of £4,220 for 1945, as against £3,560 the previous year. The dividend of 6d. per share compares with 9d. previously.

Net revenue of £129,893 for the year to June 30 is reported by **Consolidated Tin Smelters, Ltd.** The figure for the previous year was £121,727. The ordinary dividend is unchanged at 2½ per cent.

The Zinc Corporation, Ltd., reports that gross revenue from products for 1945 was £2,136,132, as compared with £1,855,145. The total distribution on the ordinary shares for the year was equivalent to 1s. 6.75d. net per share, compared with 1s. 5.7d. per share.

The directors of **Benn Brothers, Ltd.**, proprietors of The Chemical Age, have declared the following dividends, less tax, for the year ended June 30: 3 per cent. on preference shares, making 6 per cent. for the year; 15 per cent. on ordinary shares, making 20 per cent. for the year (last year 17½ per cent.); 4s. per share on the deferred shares (last year, 3s. 6d.).

Reagent Discoveries, Ltd., chemical manufacturers, etc., 75/77, Shaftesbury Avenue, London, W.1, has changed its name to Bryson Processes, Ltd.

Trading profit of **Morgan Crucible Co., Ltd.**, to March 31 last totalled £693,331, as compared with £618,514 for the previous year. The amount paid in ordinary interim dividend was unchanged at £40,462 and the final payments totalled £89,017, as against £80,925.

Commercial Intelligence

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

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

CHEMO-PLASTICS, LTD., London, W.C., manufacturers of plastics. (M., 3/8/46.) July 8, £3240 mortgage, to Credit for Industry, Ltd.; charged on land with garage and other buildings thereon at Wrecclesham. *Nil. December 12, 1945.

SHEPHERD'S AEROSOLS, LTD., (formerly SHEPHERD'S BACTERICIDAL AEROSOLS, LTD.), London, E.C., manufacturers of machinery for air-disinfecting, etc. (M., 3/8/46.) June 29, £10,000 debentures; general charge. *Nil. December 31, 1945.

SOUTH WALES PLATING, LTD., Bridgend, chromium, etc., platers. (M., 3/8/46.) May 31, series of £1000 (not ex.) debentures, present issue £700; general charge.

Satisfaction

ANODISING & PLATINGS, LTD., London, S.W. (M.S., 3/8/46.) Satisfaction July 10, of mortgage registered April 25, 1942.

Chemical and Allied Stocks and Shares

THE opening of the Peace Conference tended to increase the waiting attitude in stock markets, business remaining at a low level in the absence of buying interest. Although there was again little selling, prices in most sections receded despite the firm undertone maintained by British Funds.

Sentiment in regard to industrial shares was affected by the serious coal situation, also by uncertainty as to dividend policy, the prevailing belief being that only a small proportion of benefits arising from E.P.T. reliefs and from the abolition of E.P.T. at the end of the year will be used for dividend purposes. The Chancellor of the Exchequer has previously indicated that in his opinion income arising from these sources should be placed to reserve; and he may not have abandoned the idea of a new tax to take the place of E.P.T. The impression in the market, however, is that in cases where dividends are below pre-war levels, there would be no objection to the latter being restored.

As was to be expected, shares of chemical and kindred companies have reflected the easier trend of markets. Imperial Chemical were 42s. 6d., Turner & Newall 90s., and Lever & Unilever moved down to 53s. 3d. Borax Consolidated have been steady at 47s. 9d., and the units of the Distillers Co. showed firmness at 135s., but, on the other hand, British Plaster Board declined to 33s. 3d., and Associated Cement to 68s. 10½d. British Match eased to 49s. 9d., and Dunlop Rubber receded to 72s., although the new debentures have strengthened to 4½ premium. United Molasses fell back to 53s. 10½d.

Movements among iron, coal and steel shares were small, but a few good features developed, notably Thomas & Baldwins 6s. 8d. ordinary, which rose to 10s. 9d. on the increased profits, the results being the first to cover a full twelve months of the merger represented by the company. William Cory strengthened to 95s. 3d., and, after an earlier decline, Ruston & Hornsby firmed up to 58s. 9d. Shipley eased to 34s. 3d., but Sheepbridge were better at 40s. 3d. Powell Duffryn, which continued to benefit from the statements at the recent meeting, were 23s. 7½d. In other directions, De La Rue at £12½ have receded following their recent advance, and British Industrial Plastics 2s. ordinary were 7s. 6d. Goodlass Wall 10s. ordinary came back to 30s. 7½d., Pinchin Johnson were 43s. 6d., and International Paint to £7 1/16. Paint shares generally showed moderate declines owing to news of the extent to which the industry is suffering from shortage of materials. British Aluminium were 42s. 10½d. Textiles remained dull, with few outstanding movements on balance. Bleachers at 14s. 6d. strengthened in anticipation of the forthcoming capital scheme, while Calico Printers were steady at 23s. 6d. awaiting the financial results. Courtaulds were 55s. 1½d.xd. and British Celanese 35s. Wall Paper Manufacturers deferred were 47s., and Triplex Glass steady at 41s., but Nairn & Greenwich eased to 83s. 9d. and Barry & Staines to 58s. 6d. British Drug were 56s. 3d., and W. J. Bush marked 89s. 4½d. British Thermostat changed hands at 24s. and B. Laporte at 98s. 9d.

Following their recent rise, Boots Drug eased to 63s. 9d., but Sangers were firm at 34s. 6d. on the victory bonus, and Timothy Whites active around 48s. 6d. Beechams deferred, however, came back to 25s. 9d. Oil shares recorded small movements, Anglo-Iranian being 98s. 9d.xd., Shell 92s. 6d. and Burmah Oil 71s. 3d. Mexican Eagle Oil at 13s. 4½d. lost an earlier improvement.

British Chemical Prices

Market Reports

REPORTS from the London industrial chemical market show that the general position with regard to supplies and prices is practically unchanged. The holiday season has not been entirely without influence and there has been a slight curtailment in deliveries. At the same time a moderate volume of new business has been in circulation, and the demand on export account has not slackened. There are no items which call for special mention. The coal tar products market is comparatively quiet, with quotations very firm.

MANCHESTER.—Firm price conditions obtain in virtually all sections of the Manchester market for both light and heavy chemicals. In spite of the influence of holiday conditions on deliveries to textile and other industrial consumers on the home market, reasonably active trading has been reported during the past week, replacement business coming forward freely as the need arises. The alkali products and other leading products are all finding a ready outlet among domestic users and a fair number of export inquiries have been dealt with during the past few days. A number of the tar products are in brisk demand, and there is a full absorption of supplies of creosote oil, carbolic crystals and certain other lines.

GLASGOW.—Business has been maintained at a steady level in the home and export markets during the past week, with all classes of chemicals in considerable demand. Inquiries and orders have continued for both spot and forward deliveries at a normal rate. The export market continues to be brisk, with a considerable volume of inquiries which can hardly be met with the available supplies. Prices over the whole range have tended to increase. The present production is not in a position to meet the increasing demands.

Price Changes

Ammonia Bicarbonate.—MANCHESTER: £40 per ton d/d.

Oxalic Acid.—MANCHESTER: £5 per cwt.

Calcium Acetate.—MANCHESTER: Grey, £25 per ton.

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 apparatus.—N.V. de Bataafsche Petroleum Mij., and P. van't Spijker. 18912.

Hydrocarbons.—N.V. Internationale Hydrogeneeringsoctrooien Mij. 18901.

Nitro-anilines.—N.V. Polak & Schwarz's Essencefabrieken. 18844.

Starch preparations.—N.V. W. A. Scholten's Chemische Fabrieken. 18588.

Emulsifying materials.—L. M. Parr and R. J. Jay. 18507.

Fluid-flow governors.—A. Peet. 18564.

Thermoplastic sheet welding.—L. Rado. 18879.

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Imidazole compounds.—Ciba, Ltd. Dec. 21, 1944. 29975-6/45.

Resinous compositions. E. I. Du Pont de Nemours & Co. Jan. 4, 1945. 370/46.

Solid and semi-solid polymers and interpolymers of ethylene.—I.C.I., Ltd. Jan. 16, 1943. 853/44.

Solid and semi-solid polymers and interpolymers of ethylene.—I.C.I., Ltd. Jan. 19, 1943. 1014/44.

Shaped polyamide products.—I.C.I., Ltd. Jan. 4, 1945. 369/46.

Production of powder or sponge from metals or metal alloys by electrolytic reduction of metal oxides or other reducible metal compounds.—E. H. E. Johansson. Jan. 5, 1945. 521-2/46.

Distillation of heat-polymerisable compounds.—Mathieson Alkali Works. Oct. 9, 1942. 16643/43.

Copolymers and process of producing same.—Mathieson Alkali Works. Jan. 9, 1945. 33669/45.

Catalytic oxidation process.—Shell Development Co. Jan. 4, 1945. 14424/45.

Catalytically cracked gasoline.—Shell Development Co. Jan. 8, 1945. 31891/45.

Resin-coated articles.—Shell Development Co. Jan. 8, 1945. 31892/45.

Polymerising unsaturated organic compounds.—Shell Development Co. Jan. 9, 1945. 31893/45.

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Derivatives of pantothenic acid. — G. Swain, F. L. Rose, and I.C.I., Ltd. Dec. 8, 1944. 578,251.

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Manufacture of expanded thermoplastic resinous compositions.—Expanded Rubber Co., Ltd., A. Cooper, and D. E. Partington. Jan. 10, 1944. (Addition to 578,513). 578,525.

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