FOUNDRY TRADE JOURNAL

EST. 1902

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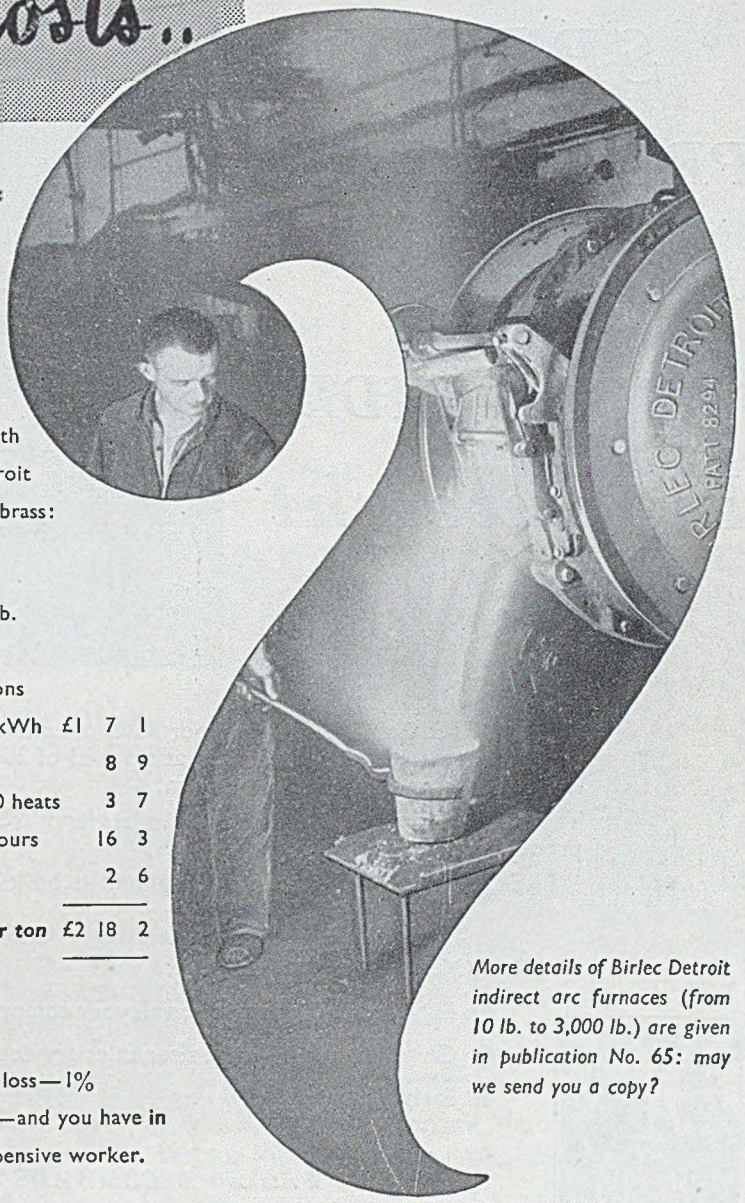
What are your melting costs..



Some metal founders never find out: too few know in advance. BIRLEC DETROITS, however, give reliable, predictable melting performances, producing sound metal at low operating costs.

Compare your present melting figures with these typical costs on a 500 lb. Birlec Detroit furnace (model LFY), working on 70/30 brass:

Average size of heat	500 lb.			
Heats per 8 hours	11			
Average output per 8 hours ...	2½ tons			
Electricity per ton @ 1d. per kWh	325 kWh	£1	7	1
Electrodes per ton @ 1/9d. per lb.	5 lb.		8	9
Refractories per ton	1,500 heats		3	7
Labour per ton @ 5/- per hour	3¼ hours		16	3
Water and miscellaneous ...			2	6
Direct operating cost per ton		**£2**	**18**	**2**

More details of Birlec Detroit indirect arc furnaces (from 10 lb. to 3,000 lb.) are given in publication No. 65: may we send you a copy?

Also reckon the advantage of low metal loss—1% can be assumed for budgeting purposes—and you have in the Birlec Detroit a hard, reliable, inexpensive worker.

BIRLEC LIMITED

ERDINGTON · BIRMINGHAM 24

Sales and service offices in LONDON, SHEFFIELD *and* GLASGOW

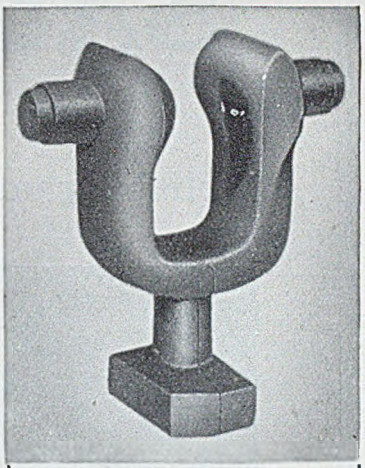
BIRLEC

sm/B. 948. 53b.

FORDATH'S WORD IS THEIR BOND

— *and GLYSO is their word*

GLYSO CORE BONDING COMPOUNDS combine a range with characteristics so varied as to meet exactly the requirements of any given job in the core shop. They have been in daily use in foundries large and small for many years.



Careful selection from the Glyso range of binders provides exactly the green and baked strengths required.

Semi-Solid Compounds give a high green bond covering a wide range of sand characteristics.

Creams combine a lower green bond and free-flowing mix with high baked strength; unsurpassed for core-blowing mixtures.

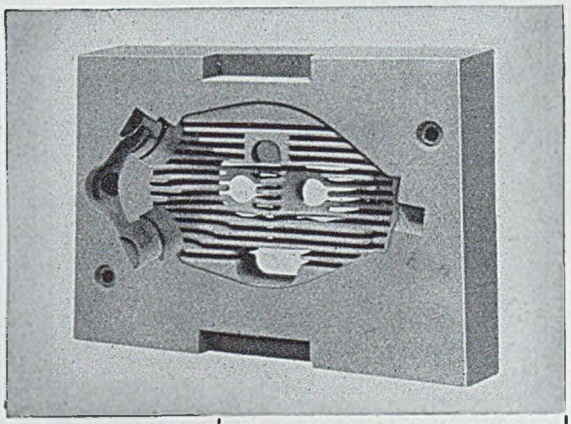
Dark Compounds provide a lower priced range giving excellent results for general work.

Permol Core Oils are in seven grades, selection being governed by relating dried strength requirements to binder cost. Permol bonded cores have good knock-out after casting.

Glyso XL Core Powder, a pure film-dried cereal, produces high green strength in the mix and is best used with Permol Core Oil.

Glyso—Exol Core Powders, a range of cereal powders impregnated with core oil in accurate quantities for different classes of core work.

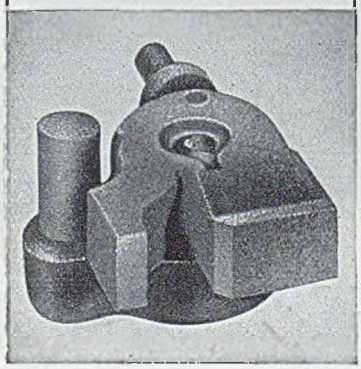
Glyso Airbond, quick drying without stoving, or stove-dried in half the usual time.



When Glyso is the bond the core makers skill is seen at its best.

PHOTOGRAPH BY COURTESY OF MESSRS. CENTRAL FOUNDRY CO. LTD.

The confidence with which the core maker uses a Glyso-bonded mix is amply justified in the finished core.



Glyso Resyns. A range of synthetic resin binders for quicker drying of cores by short-period stoving, or by dielectric heating. Excellent knock-out. Enquire also about Glyso Spray Oils, Fordavol, Fordath Parting Powder, Fordath Moulding Sand Regenerator and Fordath Paint Powders.

GLYSO CORE BINDERS

Full details obtainable from

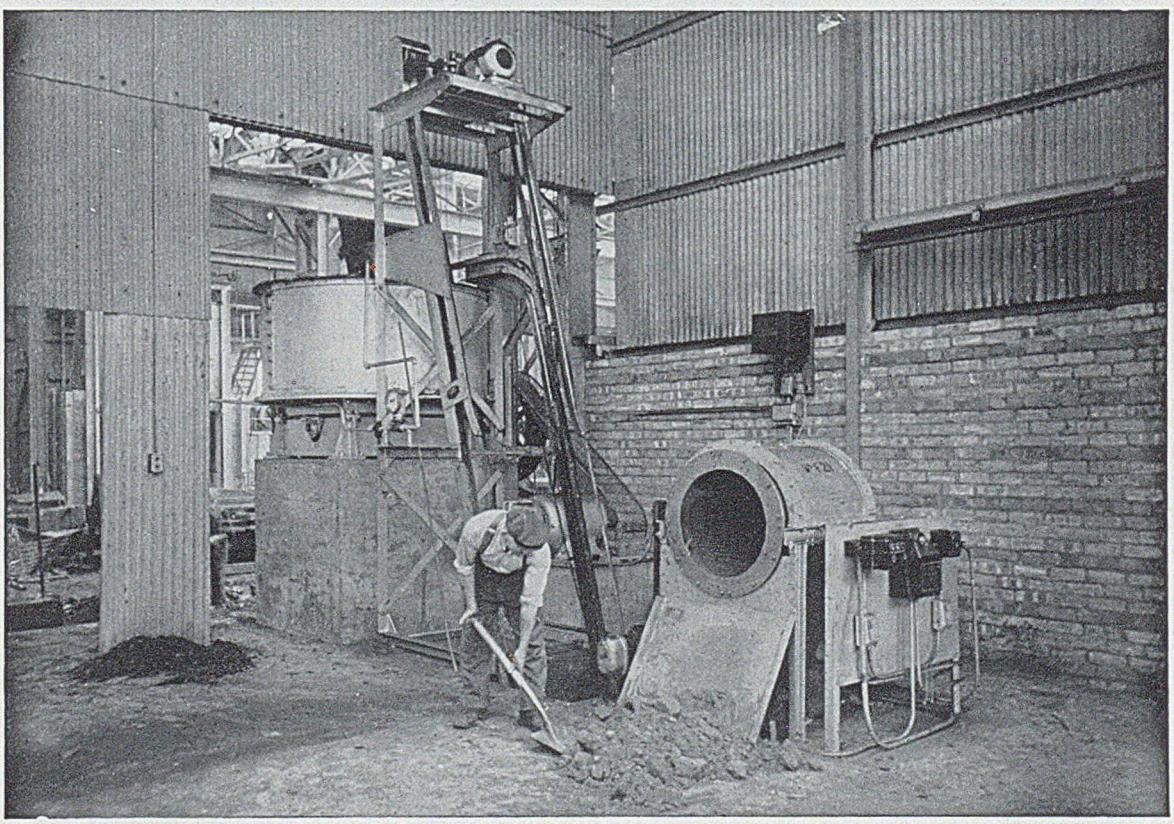
THE FORDATH ENGINEERING CO. LTD.

Hamblet Works, West Bromwich, Staffs.

PHONE: West Bromwich 0549, 0540, 1692. GRAMS: Metallical, West Bromwich

PNEULEC *facing sand plant unit*

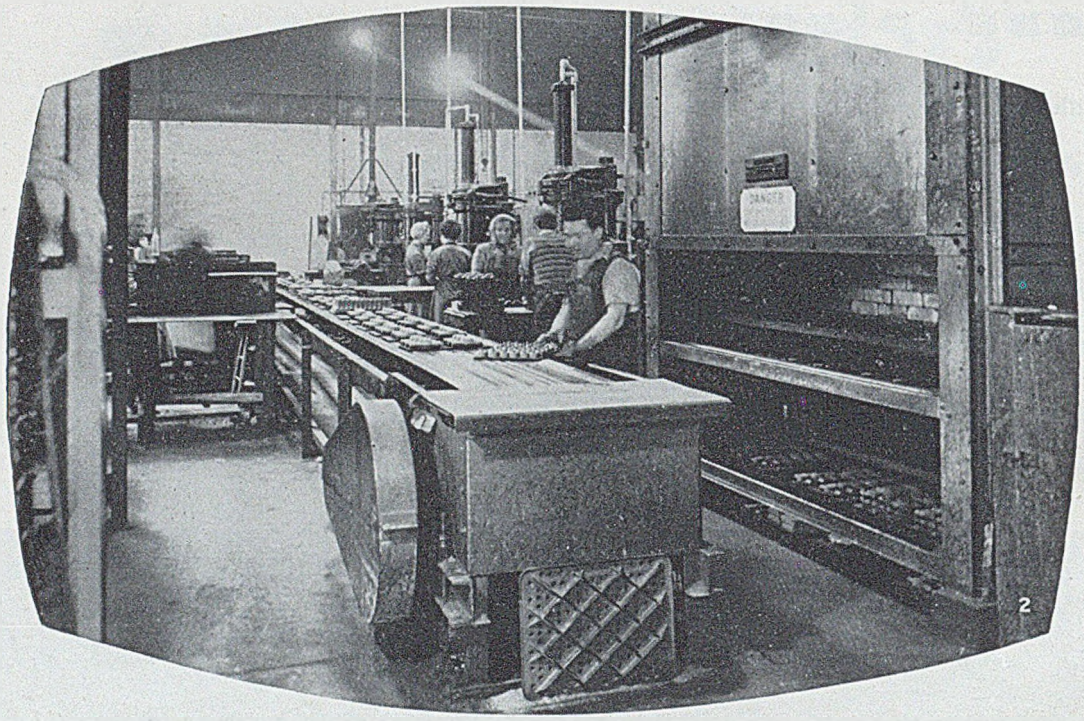
The illustration shows our facing sand plant unit which includes shovel fed rotary screen, collecting belt conveyor, magnetic pulley, loader and 6ft. 0in. diameter mill with disintegrator. The recommended batch capacity of the plant for facing is 6 cwts. and the normal batch cycle 6 minutes. This is a standard layout and there are many successful installations operating in all parts of the world. Further information will be gladly supplied on request.



Built in England by

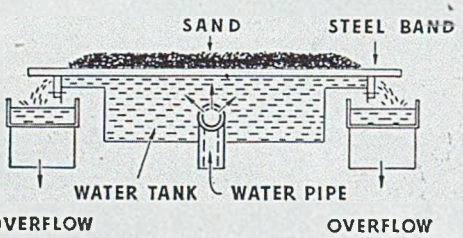
PNEULEC LIMITED, SMETHWICK, Nr. BIRMINGHAM

MODERNISE YOUR CORE SHOP . . .

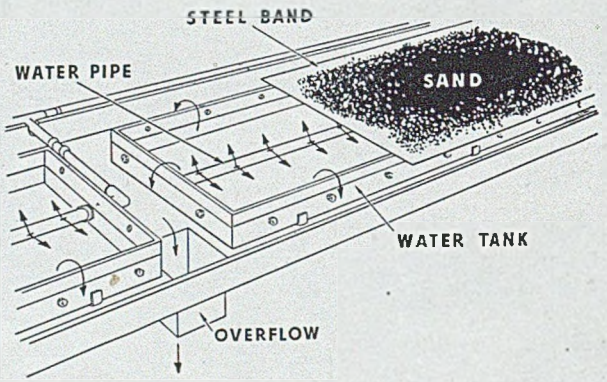


This photograph shows one of our many conveyors conveying cores from the benches to the drying stove.

WITH STEEL BAND CONVEYORS



If you have difficulty with your warm sand adhering to patterns why not cool it on our patented water-cooled steel band conveyor as illustrated by diagrams above and on right.



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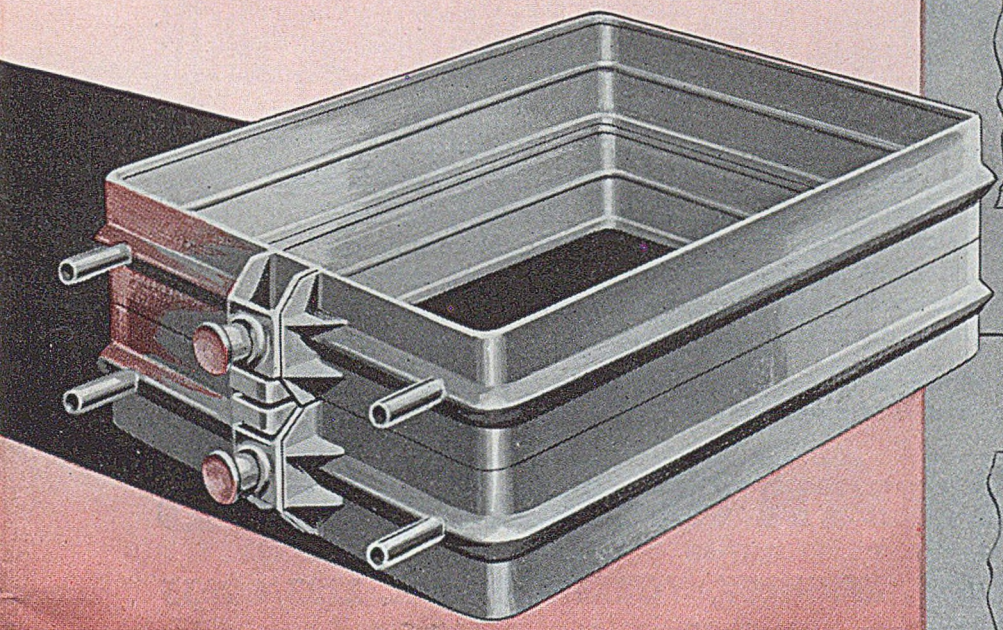
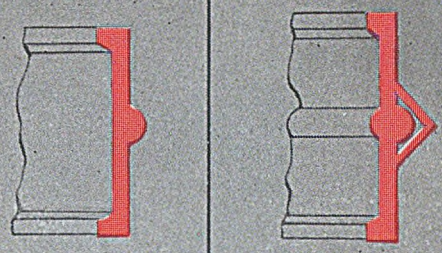
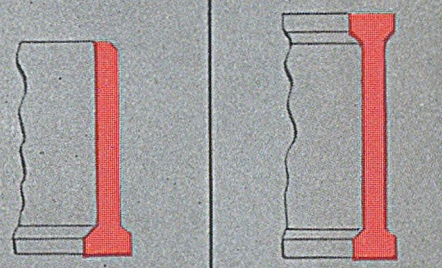




STANDARD



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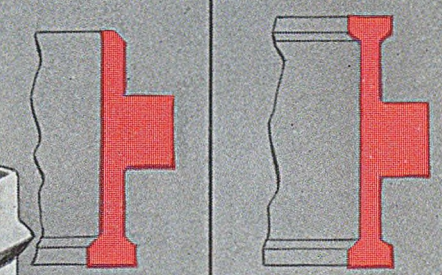
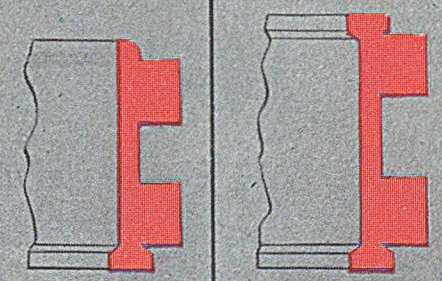


ALL FOUNDRY



CONDITIONS

STERLING FOUNDRY SPECIALTIES LTD. BEDFORD

Latest designs of mains frequency core type

Induction Melting Furnaces

for normal and special irons

The furnace can melt cold charges or be fed with molten metal previously melted in a cupola. In either case, alloying additions can be made to produce high duty irons, the mechanical motion of the bath ensuring complete alloying and homogeneity of product. The furnaces are particularly suitable for thin wall castings (automobile cylinder blocks, etc.).

For Normal and Special Cast Irons, standard G.W.B-A. Tagliaferri Furnaces give an output of 140 to 2,000 lbs. per hour. Other data of their performance in relation to cast irons are shown in the panel alongside.

Among the many advantages of the

GWB-A.TAGLIAFERRI furnaces

are the following:—

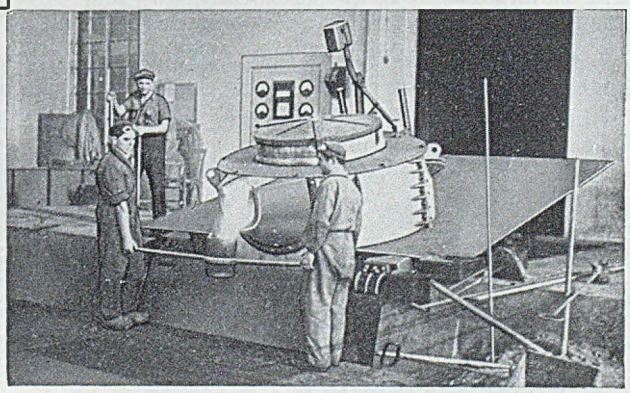
1. Initial starting without using hot metal.
2. Positive metal circulation without turbulence gives maximum refractory life.
3. The refractory lined casing is easily exchanged with the relined spare without removing electrical connections or inductors.
4. Clear indication is given when end of lining life is approaching.
5. Refractory lining of melting duct can be repaired without dismantling the furnace.

Full details of standard units suitable for all normal foundry requirements may be had on request.

Melting Furnaces for Normal and Special Cast Irons

TYPE	G 50	G 100	G 150	G 200	G 300	G 400	G 500
CAPACITY LBS. TOTAL	550	990	1760	3300	4400	6600	11,000
USEFUL	440	770	1320	2200	3300	4840	8800
RATING kW	37.5	75	110	150	225	300	450
kVA	50	100	150	200	300	400	550
OUTPUT LBS. PER HR.	143	286	396	660	990	1430	1980
CONSUMPTION kWH/TON	558	558	538	508	478	467	437
TILTING METHOD	Hand	Hand	Hydr	Hydr	Hydr	Hydr	Hydr
HOW CONNECTED	1 phase	1 phase	1 phase	3/2 phase	3/2 phase	3/2 phase	3 phase

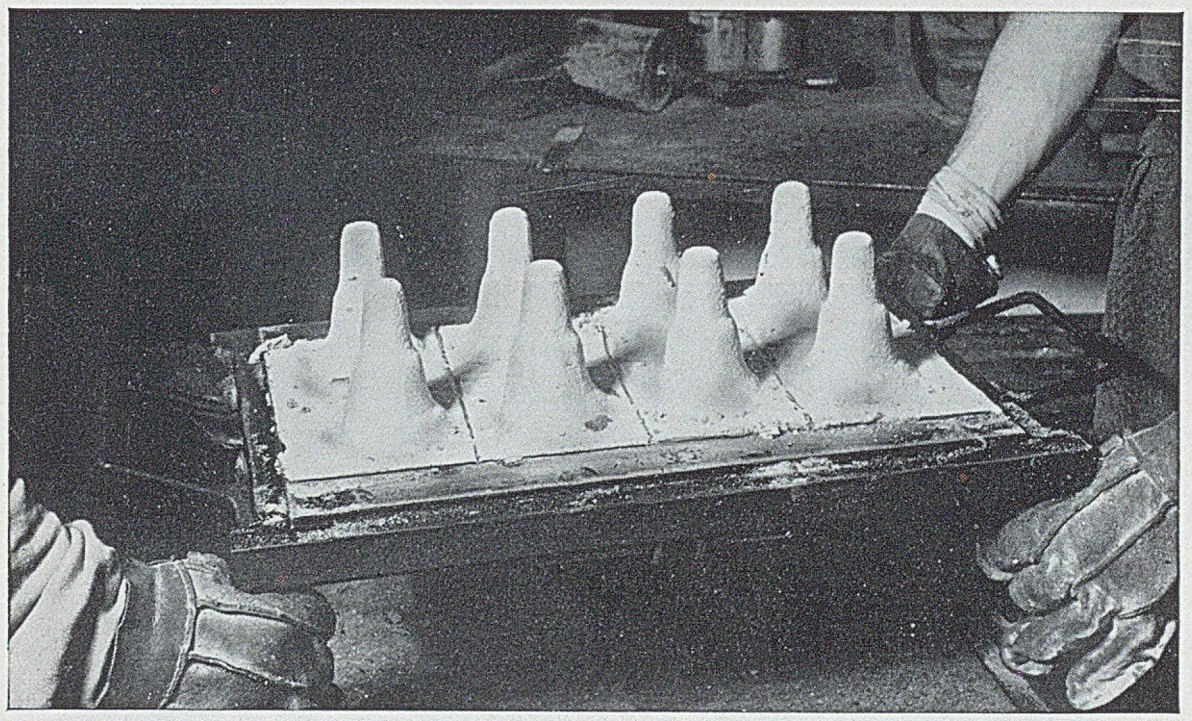
The above figures which are for cold metal charges are not binding and will vary according to the product and the quality of the metal charged.



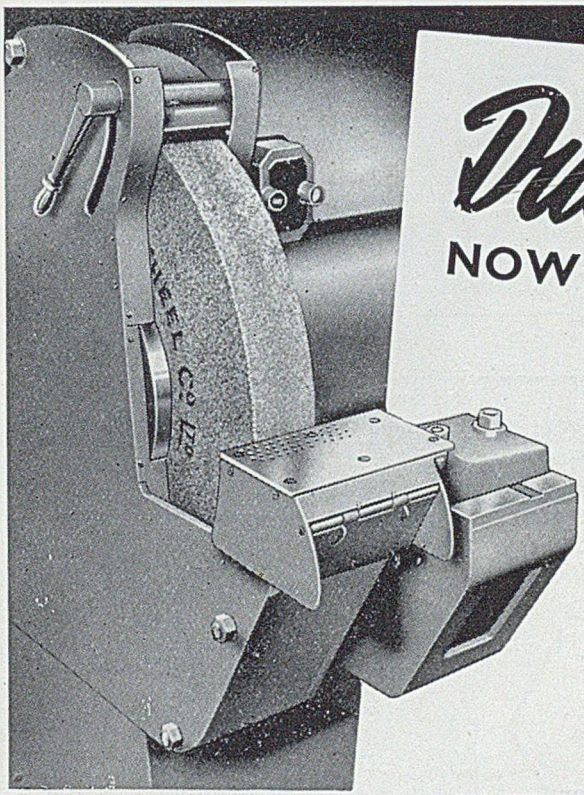
Two model G.400 induction furnaces, supplying molten cast-iron to a foundry manufacturing motor-car parts.

Proprietors: Gibbons Bros. Ltd., & Wild-Barfield Electric Furnaces Ltd.

G.W.B. ELECTRIC FURNACES LTD.
Dibdale Works, Dudley, Worcs. Phone: Dudley 4284



Photograph by courtesy of Gillett & Johnston Ltd., Croydon



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Dust control..

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ROWLAND

FLOOR GRINDERS

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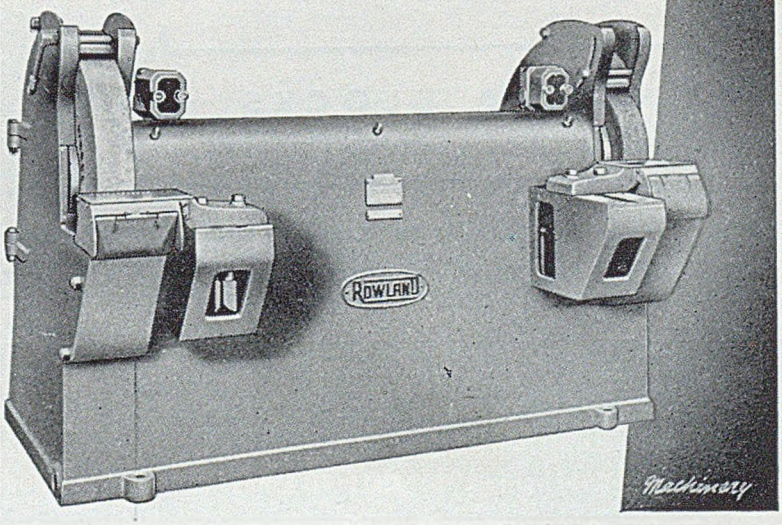
NOTE THE POINTS :

1. Patent Work Rest unit with shrowding, automatically adjusts for wheel wear and rest height. Perforated Rest Wear Plate assists extraction without interfering with Wheel Dressing.
2. Gaps between sides of Wheel and Guard effectively closed by special Baffle Plates.
3. Hinged Nosepiece at top with side wings is readily adjustable close to the wheel by hand lever instead of spanner and is of same strength as the Guard.

Special conversion sets may be supplied for fitting to existing Rowland Machines. Quote Machine Serial Numbers of Machines in all cases.

Illustration shows the 30in. Machine with one new wheel and one worn to 20in. diam. showing range of adjustment.



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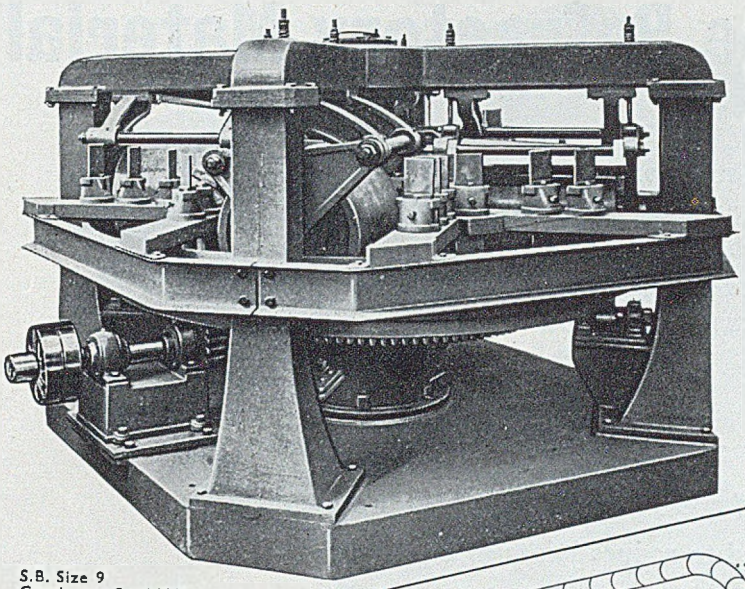

S.B. Size 9
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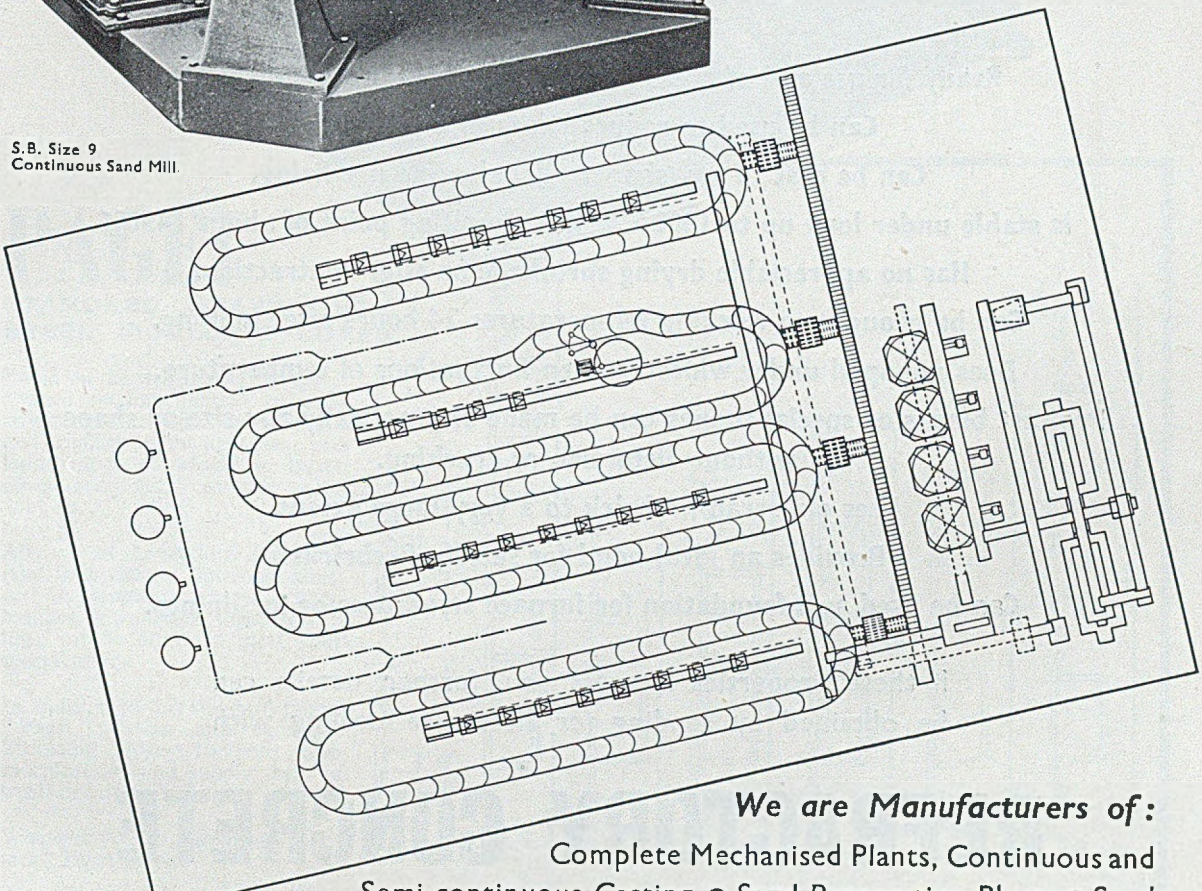

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Complete Mechanised Plants, Continuous and Semi-continuous Casting ● Sand Preparation Plants ● Sand Mills, Continuous and Batch ● Disintegrators ● Screens ● Belt Conveyors ● Elevators ● Mould Conveyors ● Moulding Machines ● Sand Dryers, etc.

FOUNDRY MECHANISATIONS (BAILLOT) LTD

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Established 1902
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Eighty Years Ago

There having been of late so many enquiries for "Guide to the Iron Trade of Great Britain" by Samuel Griffiths and published in 1873 by the forerunners of the Iron and Steel Trades Journal (now incorporated in the FOUNDRY TRADE JOURNAL), that after a short search a copy was found in our own library. It is obviously the basis upon which *Ryland's Directory* was built, but whilst it contains lists and statistics, it also tells the story of the iron trade of the time and moreover does so in the most interesting manner. To-day it makes fascinating reading. Moreover, it has an underlying policy, which is, that the greatest factor in industrial matters is quality, both of the goods made and of leadership. The former, whilst stressed throughout the book, receives a section of its own sandwiched in between the "Introduction" and the "Contents." There being no British Standards Institution, but many fatal breakdowns of boilers and engine parts, the writer was honest in recommending the use of the best brands of wrought or pig-iron. The desirable quality in leadership can be given by quoting from the case of Mr. Foster of John Bradley & Company. "He was in the works continually, and in the early days did not hesitate to put his hand to a bar of iron if necessary. He was a most able and farseeing man, divested entirely of consequential airs and assumed superiority, endowed in a very remarkable degree with common sense; being afflicted with deafness, his manner sometimes appeared brusque owing to his prompt and decisive answers. He was a decided liberal in politics and a truly good kind-hearted man." This happened to refer to a person no longer living, but similar phraseology was used about contemporaries.

The year 1873 was one of good trading conditions, as the depression consequent upon the American Civil War and the German invasion of France had passed and the ironfounders were reported to have bought 1,770,000 tons of pig-iron from the 980 blast furnaces of which 715 were working. It is interesting to note that there were about half-a-dozen charcoal furnaces in operation. The make of pig-iron in those far-off days was of the order of 7,250,000 tons per annum, so that, at three-quarters of the current production, business was undoubtedly booming. Of course, the nature of the trade was different. Bessemer had launched his great invention a decade or so earlier and there were then 17 works engaged on heavy steel production. "The new trade of steel castings" was reported to have made rapid progress in this country. It was a Sheffield speciality and Vickers were making larger crucible steel castings than the originators—Krupp of Essen. Hadfield's Steel Foundry Company had just completed a large plant, covering two acres, especially for the making of smaller components, but for large ones also, for they had just received an order for 14 hydraulic cylinders each weighing over a ton.

What we like most about this book are the intimate descriptions of industrial towns and individual works. Willenhall in 1872—a town of 20,000

Eighty Years Ago

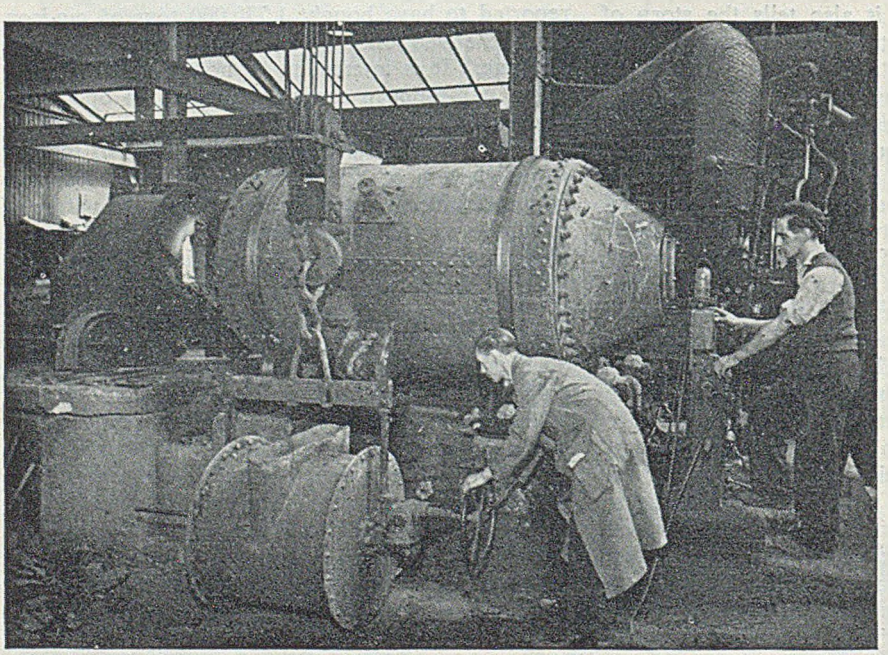
inhabitants—was one of rapid growth, for "The writer can well remember when three to four thousand was the extent of its population. In those happy old days of the past there was one church, with a blaspheming drunken parson, who spent six times more of his time in the public-house than in the church, the only one the place possessed. In those days there was no Methodist or Dissenting resident minister; and, what is more, no magistrate, no lawyer, no police, and not an inhabitant (except the parson) but what was engaged in some kind of business. At the present time there are . . . [19 places of worship] which represents one place for every 1,000 of the population." The Albion works was visited, then in the hands of the second and third generation of the Harper family. They employed some hundreds of workpeople and the mass production of door-bolts was undertaken, no fewer than 17,280 being manufactured each week. The author was inclined to be sceptical of the statement of Sir William Fairburn that Bessemer steel could show 30 to 32 tons per sq. in. tensile strength. With the exception of makers of puddled iron, many of the works which were praised for high quality and integrity of management are still flourishing to-day.

PETER HASTINGS, a Falkirk foundry worker who was attacked and robbed in Torwood Foundry, Larbert, more than a fortnight ago, died in Killearn Hospital on August 6, from head injuries. He was struck by an iron bar and never regained consciousness. The police are seeking a man of 19-25 with light brown hair and a dark striped suit in connection with the attack.

Conference Paper Author

MISS M. E. WHITAKER, B.SC., A.I.M., Author of the paper "Mould-reaction in Aluminium-alloy Castings," which appears on the adjoining pages, is an investigator at the British Non-Ferrous Metals Research Association. After graduating from the University of London, King's College, she was on the headquarters staff of the Department of Scientific and Industrial Research for three years and then joined the information department of the B.N.F.M.R.A. In 1944, she was transferred to the research department. She is the Author of a number of literature reviews, and has carried out experimental research on vitreous enamels for aluminium and on mould-reaction in aluminium/magnesium alloys. It is believed that this is the first occasion on which a lady has presented a paper for consideration at an annual meeting of the Institute of British Foundrymen.

AMONG THE LATEST dollar orders secured by George H. Alexander Machinery, Limited, Birmingham, is one from the headquarters of the United States Air Force in Germany for engraving machines, the contract being obtained in competition with German makers of similar machines. The firm entered the dollar market in 1946 and so far has sold 500 of its specialized machines in the United States. The die-sinking machines are used to make moulds for plastics, and dies for die castings. The firm's agent in America is a former Birmingham man, Mr. J. Arthur Deakin.



Radiation Loss is considerably reduced at the foundry of S. Russell & Sons, Limited, Leicester, by using 1-ton drum-type lades, as illustrated. These represent the full capacity of the melting unit, which is immediately re-charged. Time per heat-cycle is thus reduced by 10 per cent. —a daily saving of 40 to 50 min.—enough to permit one extra melt. (Courtesy "Target.")

Mould-reaction in Aluminium-alloy Castings*

By Marjorie Whitaker, B.Sc., A.I.M.

When cast in sand moulds, aluminium alloys containing magnesium react with the moisture in the mould. The reaction increases with increasing magnesium content and with the time taken by the casting to solidify. It is therefore greatest in heavy sections of alloys with high magnesium content. The reaction may result in severe and often deep oxidation of the surface of the casting, and absorption of hydrogen. The hydrogen thus absorbed is liberated within the casting during solidification, causing porosity. This Paper is a summary of ten years' experimental foundrywork on problems related to the inhibition of the reaction. It is largely concerned with 90/10 aluminium/magnesium alloy. Measurement of the distribution of gas porosity resulting from the reaction showed that it was concentrated beneath the surface and decreased rapidly towards the interior. The reaction was not prevented by drying the mould, nor did the addition of various corebinders have any effect on it. From examination of the influence of minor constituents in the metal it was found that additions of beryllium largely inhibited this reaction, 0.004 per cent. addition of this element being most effective within the composition range 0.0001-0.1 per cent. This addition by itself was found adequate for thin sections up to 1 in. dia. or about ½ in. plate thickness, provided contamination with sodium was avoided, but for thicker sections, taking longer to solidify, an inhibitor in the moulding sand is also necessary. By adding boric acid or ammonium bifluoride to the sand, sections up to 4 in. dia. or 2 in. plate thickness can be made sufficiently free from mould-reaction for most practical purposes. Experiments showed that the loss of beryllium on remelting the alloy containing 0.004 per cent. was small, and it was confirmed that beryllium does not coarsen the grain. Special moulding sands containing boric acid or sulphur have harmful effects on certain alloys for which they are not intended and the Paper includes a few observations on this subject.

I.—Introduction

A reaction occurs at the metal surface when certain alloys containing highly-oxidizable elements are poured into sand moulds. The oxidizable element, such as phosphorus in tin bronzes or magnesium in aluminium alloys, reacts with the steam vaporized from the mould, reducing it to hydrogen, and forming a film or layer of oxidation product on the casting. Some of the hydrogen is dissolved by the metal and during solidification is rejected, giving rise to gas porosity near the surface of the casting. Aluminium alloys containing as little as 0.5 per cent. magnesium may exhibit signs of mould-reaction, but the problem there is not serious. With higher magnesium contents, however, there is more reaction, and at 10 per cent. magnesium it is so severe that its control is one of the major features of foundry practice.

The oxidation of the casting, frequently described as sand attack, has often been described in the literature but the equally, or more important, effect of the accompanying gas-absorption has received little attention, except in earlier work on copper-base alloys[1]. The present work was primarily concerned with this aspect of mould-reaction in light metals. Among other things, it is shown that marked gas-absorption and resultant gas porosity may result from this reaction even in cases where the oxidation products are not visible on the surface or with fracture of the castings.

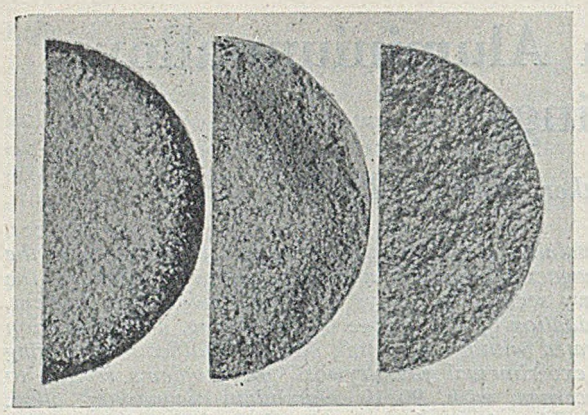
The present Paper is an account of experimental foundrywork, mainly on 90/10 aluminium/magnesium alloy, carried out in the laboratories of the British Non-Ferrous Metals Research Association during the past ten years. Successive investigators working on the problem were D. C. G. Lees, B. W. Peck, A. L. Mincher, A. J. Swain, N. B. Rutherford and the Author. With the exception of Mincher's[2] work on the effect of beryllium on grain-size and tensile properties, none of the results of the foundrywork has been published until now. Swain[3] carried out a laboratory investigation of the reaction of aluminium/magnesium alloys with pure steam. His results indicated that the reaction reached a maximum rate at a temperature between the liquidus and solidus. For the 10 per cent. magnesium alloy, this temperature was 580 deg. C.

The effects of mould-reaction are described first in what follows, and then an account is given of work on the inhibition of the reaction, which was the main purpose of the research. Subsequently, shorter sections deal with the influence of beryllium on grain size, melting loss of beryllium, segregation of special moulding sands in foundries, and the possibility of using a controlled amount of mould-reaction to improve the properties of certain castings.

II.—Effects of the Reaction

Mould-reaction is represented by the equation $Mg + H_2O = MgO + H_2$. The hydrogen is released in atomic form and part of it dissolves in the outer layers of the metal and is subsequently

* Paper presented to the fiftieth annual meeting of the Institute of British Foundrymen at Blackpool. It represents a communication from the British Non-Ferrous Metals Research Association. The work described in this Paper was made available to B.N.F.M.R.A. members in reports R.R.A. 691, 724, 806, 890, 981, issued during the period 1945-53.



FIGS. 1, 2 AND 3.—*Fractures of 2-in. dia. Castings of 90/10 Aluminium/Magnesium Alloy showing Severe Mould-reaction (Fig. 1), Partial Inhibition (Fig. 2) and Complete Inhibition (Fig. 3).*

rejected from solution in the later stages of solidification. The rate of reaction increases with increasing magnesium content and at any one magnesium content its extent increases with the time taken by the casting to solidify. The effects are therefore most severe in heavy sections, particularly those made in alloys of high magnesium content.

Gas porosity beneath the surface of heavy-section sand castings containing as little as 0.5 per cent. magnesium has been recorded, and a similar effect, but more noticeable, occurs in Y-alloy, which contains about 1.5 per cent. magnesium (see Section V). In this case there may also be a grey or black oxide film on the surface. In alloys containing 10 per cent. magnesium the effects are unmistakable. Patches of grey/black oxide occur on the surface and extend to a depth of $\frac{1}{4}$ in. or more in heavy sections, with accompanying severe gas porosity. A typical fracture is illustrated in Fig. 1. For comparison, Fig. 2 shows the effect of partial inhibition of the reaction while Fig. 3 shows complete inhibition.

The effect of severe mould-reaction on the distribution of porosity in the 10 per cent. magnesium alloy was examined in detail by Peck[4]. Sand castings in this alloy always contain a small amount of shrinkage porosity, which, in the absence of mould-reaction, is concentrated towards the central part of the casting because this is the last part to solidify and therefore less well fed. This is demonstrated by the broken line in Fig. 4, obtained by measuring the densities of successive thin slices from a casting made in a non-reactive mould. The continuous curve in the same figure was obtained from similar measurements on a casting made in a green-sand mould. It shows how the slope is reversed, rising steeply towards the outer surface as a result of severe mould-reaction.

Even when the reaction has been partly inhibited, so that the surface and fracture of the casting are clean, there may yet be fine cavities beneath the surface, which are only revealed by the microscope or by measuring the density of sections of the casting. An example of this is given in Fig. 5, which is a photomicrograph at low magnification of a section taken from a casting with surface and fracture free from discoloration. There was 4.5 per cent. porosity in the outer, $\frac{1}{4}$-in. thick, layer of the casting. Quite clearly, the surface oxidation and sub-surface voids resulting from severe mould-reaction are undesirable. In certain circumstances, with a well-fed casting, even slight reaction may cause a deterioration in mechanical properties, but with a poorly-fed casting a little mould-reaction may be an advantage, as is discussed in Section IX.

III.—Assessment of Mould-reaction

For research purposes, the gas absorption following from mould-reaction can be used to provide a quantitative measure of the extent of the reaction. Thus, a figure for the porosity is obtained by comparing the density of a sand casting made from gas-free metal with that of a similar casting made in an unreactive mould, and this gives a measure of the reaction. For a more detailed exploration, the casting can be sectioned for measurement of the distribution of porosity. In most of the present work, the method of sectioning illustrated in Fig. 6 was employed. This diagram shows a cylindrical test casting from which a lateral slice is cut at the position indicated. The slice is bored out in steps, as shown, and the density is measured before and after each step. If the density is lower at the outside than at the centre this shows that mould-reaction has occurred. The extent of the difference gives a measure of the extent of the reaction.

For example, in a 2-in. dia. casting, 6.6 per cent. porosity in the outer ring and 2.2 per cent. in the central cylinder indicates severe mould-reaction, corresponding values 2.6 and 0.7 per cent. indicate moderate reaction, and values 0.5 and 0.6 per cent. show that the reaction has been inhibited. The test casting is made in four sizes, from 2 to 5 in. dia., and in addition to sectioning for density measurements, it is fractured at the position indicated in Fig. 6. The fracture is examined visually for indications of mould-reaction.

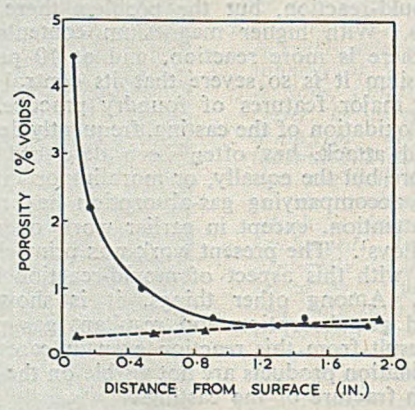


FIG. 4.—*Distribution of Porosity resulting from Unrestrained Mould-reaction in 90/10 Aluminium/Magnesium Alloys cast in Synthetic Sand. (Broken Line represents results obtained with a Non-reactive Mould and full line those from a Green-sand Mould.)*

IV.—Inhibition of the Reaction in 90/10 Aluminium/Magnesium Alloys

It is now well known that the most effective method of inhibiting mould-reaction in 90/10 aluminium/magnesium castings is to add beryllium to the metal and boric acid or ammonium bifluoride to the moulding sand. A reference to beryllium additions appeared in a German Patent in 1918[5] Little information has been published since then. In 1938 Gauthier[6] recommended that the amount of beryllium added should be 0.02 per cent. and this was the basis upon which work was started by Lees in the laboratories of the B.N.F.M.R.A. about ten years ago.

(a) Early Work on Factors Affecting the Reaction

Lees[7] investigated mould-reaction in 2-in. dia. test castings of 90/10 aluminium/magnesium alloy made from materials of commercial purity. He found that there was less dross formation during melting when beryllium had been added to the melt, which is an advantage in itself. Uninhibited castings showed severe mould-reaction and contained about 4 per cent. porosity. Porosity was reduced to 2 to 3 per cent. by adding 0.025 per cent. beryllium to the metal, and further reduced to about 0.5 per cent. by also adding 2 per cent. boric acid to the moulding sand. The porosity in these latter castings was slightly greater at the centre than at the outside, indicating that, in castings of this size, mould-reaction had been inhibited by these measures. Addition of 2 per cent. ammonium bifluoride to the sand had an effect similar to that of 2 per cent. boric acid.

The next stage of the work, done by Peck[4], was an examination of the effect of drying the mould and of adding various mineral oil, vegetable oil, cereal and resinous corebinders, using a washed silica sand of medium grain-size (Parish's No. 1) as base. Non-reactive moulds, made of sillimanite bonded with hydrolyzed ethyl silicate, and baked at 1,000 deg. C., were used as blanks for comparison: they were pre-heated to 150 deg. C. immediately before use; details and results are given in Table I. A plain 90/10 aluminium/magnesium alloy was used, the charge being melted in a gas-fired injector

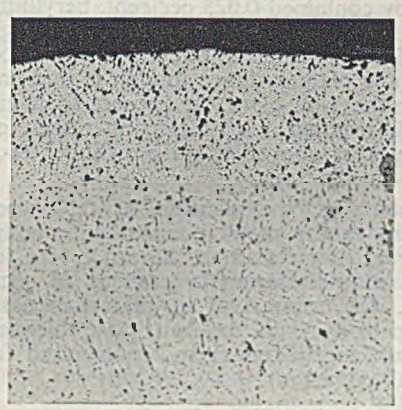


FIG. 5.—*Photomicrograph of a section of a Casting in which Mould-reaction was Partly Inhibited.* (×7½ *dias.*)

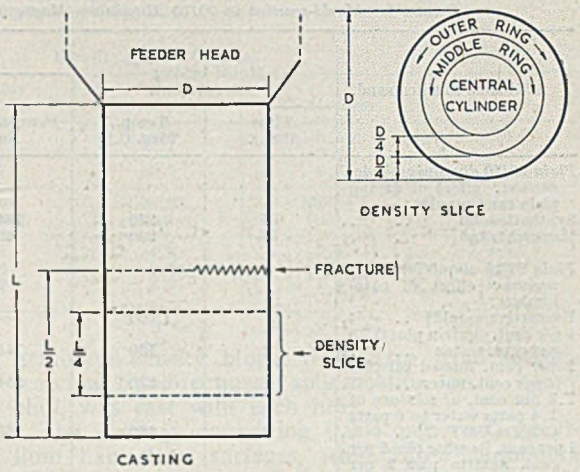


FIG. 6.—*Test Casting and Method of Sectioning for Density Measurements.*

furnace, degassed with chlorine and poured at 700 deg. C. All the castings made in the various sands had discoloured surfaces and fractures of the type illustrated in Fig. 1, indicating that severe mould-reaction had occurred in all cases. Table I shows that drying the mould at 230 deg. C. did not prevent mould-reaction, nor was it prevented by any of the corebinders in dry moulds. Presumably the reaction takes place with the moisture combined in the bonding clay, which is not removed by drying the moulds. Drying the mould before use is thus not a solution to the problem of mould-reaction with these alloys. The last three castings listed in Table I were made from an alloy with nominal 0.12 per cent. beryllium added. Clean surfaces and clean fractures showed that mould-reaction had been largely inhibited by the beryllium.

(b) Influence of Casting Size

At this point, Rutherford[4] organized co-operative works' trials, which took place in several foundries. The optimum beryllium addition was not known at that time (1949) but 0.025 per cent. gave good results and there was a suggestion, from Peck's work recorded earlier, that 0.1 per cent. might be more effective, though the larger addition would increase production costs. With regard to the sand, addition of 2 per cent. boric acid had given good results, while 6 per cent. boric acid was generally considered to be more effective but had the disadvantage of hardening the sand: ammonium bifluoride was effective but produced objectionable fumes. For Rutherford's works trials, therefore, two beryllium contents were selected, 0.025 and 0.05 per cent., and the sands contained 2 per cent. boric acid.

Each foundry made a set of castings of the following dimensions:—

Diameter (in.).	Length (in.).	Diameter of head (in.).	Depth of head (in.).
1	7	3	2½
2	4	3½	3½
3	6	4½	4½
4	8	6½	6½
5	10	8	8

TABLE I.—*Mould-reaction in 90/10 Aluminium/Magnesium Alloys Cast in Various Sand-base Moulding Materials.*

Additions to silica sand.	Mould baking treatment.		Sand.			Appearance of Casting.	
	Time (hrs.).	Temp., (deg. C.).	Permeability No.	Strength (lb. per sq. in.). "green."	dry.	Surface.	Fracture.
Plain 90/10 aluminium/magnesium: effect of drying plain sand moulds:—							
Synthetic sand	16	230	184	—	—	dirty	dark ring*
Mansfield sand	16	230	40	—	271	,,	,,
Plain 90/10 aluminium/magnesium: effect of core-binders:—							
Unreactive mould†		1,000	—	—	—	clean	clean‡
4 per cent. dextrin plus 0.75 per cent. water	2	160	145	—	723	dirty	dark ring*
2 per cent. linseed oil plus 2 per cent. water	2	220	254	—	521	,,	,,
7.3 per cent. of mixture of 1.4 parts water to 6 parts Cellofas UWF/C	2	180	205	—	41	,,	,,
1 per cent. Resolite plus 2 per cent. dextrin plus 2 per cent. water	2	160	358	—	86	,,	,,
1 per cent. linseed oil plus 1 per cent. mineral oil plus 2 per cent. water	2	220	266	—	723	,,	,,
0.8 per cent. Edmor 15 plus 1.2 per cent. linseed oil plus 0.7 per cent. water	2½	190	170	—	637	,,	,,
0.8 per cent. Edmor 22 plus 1.2 per cent. linseed oil plus 0.8 per cent. water	2½	190	200	—	846	,,	,,
2.5 per cent. Sternocore SSB	2½	190	180	—	1,354	,,	,,
2 per cent. Sternocore A	2½	190	135	—	1,111	,,	,,
5 per cent. bentonite plus 15 per cent. silica flour and 2½ per cent. water	Used "green"		71	11	—	,,	,,
Alloy containing nominal 0.12 per cent. Beryllium:—							
4 per cent. dextrin plus 0.75 per cent. water	2	170	—	—	—	clean	clean‡
2 per cent. linseed oil plus 2 per cent. water	2	190	—	—	—	,,	,,
2 per cent. Sternocore A	2	190	—	—	—	,,	,,

* As in Fig. 1. † Sillimanite bonded with ethyl silicate. ‡ As in Fig. 3.

Eleven sets of castings were made, from melts which had been degassed with nitrogen using a flux† cover, chlorine, or tablets of hexachlorethane. The usual examinations of fracture and lateral distribution of porosity were made. Taking the difference between the porosity in the outer and central regions as the criterion (see Fig. 6), there was no significant evidence of mould-reaction in the 2- and 3-in. dia. castings. With two exceptions, one in each size, they were all more porous at the centre. Larger castings, however, were more porous in the outer regions than at the centre, the difference being in the range 0 to 2.3 per cent. voids in the 4-in. dia. sections (average 1.1 per cent.) and 0.3 to 2.5 per cent. voids in the 5-in. dia. sections (average 1.5 per cent.). These results were confirmed by the appearance of the fractures, in that fractures of the 2- and 3-in. dia. castings were clean, while at 4-in. dia. a few grey/brown patches occurred round the circumference and at 5-in. dia. there was a continuous light grey/brown ring. The discoloration was accompanied by visible gas porosity. The different degassing treatments did not appear to interfere in any way with the inhibiting action of the beryllium and boric acid, nor did there appear to be any significant difference, as shown by these few tests, in the effect of increasing the beryllium content from 0.025 to 0.05 per cent.

Rutherford completed this work by comparing the inhibition of mould-reaction in plate and cylinder castings. Plates 9 in. long, 6 in. wide, and 1, 1½ and 2 in. thick were cast in sand containing 2 per cent. boric acid, and were sectioned for measurement of distribution of porosity. Cylindrical castings 2, 3 and 4 in. dia. were also cast. The alloy contained 0.025 per cent. beryllium. The results for the distribution of porosity, given in Table II, showed that a little reaction had occurred in all three plate castings, though it was only very slight in the 1-in. plate. It appears that, in regard to mould-reaction, a plate section rather less than 1 in. thick is equivalent to a cylinder section of about 3 in. dia.

To sum up, the addition of 0.025 per cent. beryllium to the metal coupled with addition of 2 per cent. boric acid to the sand, was found to prevent mould-reaction in castings of section up to 3 in. dia. or nearly 1 in. plate thickness. Sections up to 4 in. dia. or 2 in. plate thickness were made sufficiently free from the reaction for most practical purposes.

(c) *Optimum Beryllium Content*

Rutherford observed in the work described above, that a low residual beryllium content (0.014

† Flux based on carnallite.

TABLE II.—*Comparison of the Inhibition of Mould-reaction in Plates and Cylinders of 90/10/0.025 Aluminium/Magnesium/Beryllium Alloy. (Sand Moulds contained 2 per cent. Boric Acid.)*

Reference No.	Plate thickness (in.).	Porosity (per cent. voids).				
		Total for whole plate.	Block for sectioning.	Central block.	Middle slice.	Outer slice.
NMZ 279.1 ..	1	0.4	0.5	0.4	0.5	0.7
NMZ 280.1 ..	1½	0.6	0.7	0.6	0.6	1.1
NMZ 282.1 ..	2	0.9	0.7	0.5	0.7	1.0
	Cylinder dia. (in.).	Total for whole cylinder.	Slice for sectioning.	Central cylinder.	Middle ring.	Outer ring.
NMZ 279.2 ..	2	0.4	0.3	0.6	0.3	0.2
NMZ 280.2 ..	3	0.5	0.6	0.6	0.6	0.5
NMZ 281.1 ..	4	1.0	0.9	1.0	0.4	1.1

per cent.)‡ in one set of castings was as effective as 0.025 per cent., and no greater benefit appeared to result from increasing the beryllium content to 0.05 per cent. This called for further investigation and the present Author[9] devised a laboratory technique which eliminated the interference of foundry variables, giving more accurate results in a shorter time. Beryllium contents in the range 0.0001 to 0.15 per cent. were examined and it was found that within the commercially-practicable range 0.0001 to 0.1 per cent. the optimum addition was 0.004 per cent., smaller or larger additions being less effective. Furthermore, it was found that, with the exception of sodium, none of the common impurities, grain-refining elements or degassing treatments had any harmful effect on the inhibiting action of beryllium. An attempt to find another element, for use instead of beryllium, or in conjunction with it, did not meet with any success. This laboratory work will be described elsewhere.[9]

To test the effectiveness of 0.004 per cent. beryllium in the foundry, a series of castings was made by the present Author, employing a technique similar to that of Rutherford described above. Beryllium contents 0.004 and 0.025 per cent. were compared, in castings of 1, 2, and 4 in. dia., using plain sand for the moulds. Boric acid in the sand would have enhanced the action of the beryllium, making the castings sounder, but it was not used as it would have introduced another variable. Enough castings were made for statistical analysis of the results. The initial magnesium content of the charge was made up to 11½ per cent. to allow for melting loss. The metal was melted without flux in a gas-fired injector furnace, using an alumina-washed plumbago crucible. Melts were degassed with nitrogen bubbled through carbon tetrachloride, which is a convenient and reliable method for experimental work. Freedom from dissolved gas was checked by allowing a small sample to solidify under reduced pressure. The maximum temperature of the melt was in the range 720 to 750 deg. C. and the pouring temperature 690 ± 5 deg. C. Castings from the first twelve melts were coarse-grained (2 to 3 mm. dia.) and the remaining six were refined to 0.3 mm. by adding 0.01 per cent. titanium plus 0.005 per cent. boron. Beryllium contents were determined spectrographically. As a basis for determining porosity, a maximum-density block, made free from mould-reaction by directional solidification on a heavy chill, was cast with each heat.

The castings containing 0.004 per cent. beryllium had clean surfaces, while those containing 0.025 per cent. were discoloured with patches of oxide. Fractures of 2- and 4-in. dia. castings revealed faint subsurface greyness which penetrated a little further into the castings with the higher beryllium content. The difference in porosity is illustrated by the two photomicrographs of 4-in. dia. castings reproduced in Figs. 7 and 8. Fig. 8 (0.025 per cent. beryllium) shows more severe porosity, extending to a greater depth; large subsurface holes in this casting caused the surface to break away during polishing. The results of density determinations are given in Table III. In spite of careful control of foundry operations, there was considerable scatter in the results, which is characteristic of densities of castings of this alloy, and was the reason why so many castings were made. The results were analysed statistically and the level of significance of the difference between the means is given in the Table. This analysis § shows that, as far as porosity is concerned, 0.004 per cent. beryllium is more effective than 0.025 per cent. in producing sound castings of thin section. The results of measurements of distribution of porosity were scattered, and the level of significance of the difference between the means was greater than 10 per cent. With regard to gas porosity, it appears that, as the section thickness increases, the difference becomes masked by other factors.

(*d*) *Joint Use of* 0.004 *per cent. Beryllium and* 2 *per cent. Boric Acid*

A further set of 1-in. dia. castings containing 0.004 per cent. beryllium was made. Six were cast in plain sand and six in sand containing 2 per cent. boric acid. The castings were denser than those listed in Table III, the average porosities being 0.3 per cent. (plain sand) and 0.07 per cent. (boric-acid sand). This result suggests that for castings of thin section (1-in. dia. or about ½-in. plate thickness) the addition of 0.004 per cent. beryllium to the metal probably gives adequate inhibition for many purposes. The improvement conferred by adding boric acid to the sand would not always be worthwhile for

‡ Residual beryllium content was inadvertently low in one set of castings.

§ In statistical practice it is usual to regard results as significant if the probability that they could have arisen by chance is less than 5 per cent.

TABLE III.—*Comparison of 0.004 and 0.025 per cent. Beryllium in 90/10 Aluminium/Magnesium Alloys cast in Plain Sand.*

	Reference No.	No. of duplicate tests.	Density of max.-density blocks (gr. per c.c. at 17 deg. C.).	Porosity of castings (per cent. volds).		
				1-in. dia.	2-in. dia.	4-in. dia.
Coarse-grained Castings.						
0.004 to 0.005 per cent. Be*	PZR 1—6	6	2.554 to 2.558	0.4 to 0.8	2.5 to 4.4	3.3 to 5.3
Mean: PZR Series				0.6	3.0	4.1
0.02 to 0.03 per cent. Be*	PZS 2—7	6	2.555 to 2.558	0.5 to 1.5	2.3 to 4.7	4.1 to 5.8
Mean: PZS Series				0.9	2.8	4.8
Level of significance of the difference between the means of PZR and PZS Series				<0.1 per cent.	>10 per cent.	>10 per cent.
Fine-grained Castings.						
0.004 to 0.005 per cent. Be*	QDJ 2—4	3	2.554 to 2.561	0.9 to 1.0	3.0 to 3.9	2.7 to 4.5
Mean: QDJ Series				0.8	3.4	3.7
0.02 to 0.03 per cent. Be*	QDK 2—4	3	2.554 to 2.561	1.3 to 1.9	4.1 to 5.5	4.2 to 4.8
Mean: QDK Series				1.6	4.8	4.5
Level of significance of the difference between the means of QDJ and QDK Series ..				<0.1 per cent.	between 2 and 5 per cent.	>10 per cent.

* Beryllium contents were determined spectrographically

those small sections. With castings of 2-in. dia., however, the joint use of 2 per cent. boric acid reduced the porosity from 2.5 to 0.5 per cent. It is clear, therefore, that the use of boric acid in conjunction with 0.004 per cent. beryllium is most desirable when heavy sections are being cast.

V. Mould-reaction in Y-Alloy

Y-alloy was selected to represent alloys in which magnesium occurs to the extent of 1 to 2 per cent. Lees[7] examined mould-reaction in 2-in. dia. test castings in this alloy and found that, when no steps were taken to restrain the reaction, the fracture was discoloured round the periphery and the porosity was concentrated towards the surface. Taking the average of four castings, the porosity in the outer ring was 5.5 per cent. and in the central cylinder 1.6 per cent. Thus the castings showed all the characteristic effects of mould-reaction.

Another set of 2-in. dia. castings was made, using sand containing 2 per cent. ammonium bifluoride. These had clean fractures and the porosity was uniformly distributed, being 0.5 per cent. both in the outer ring and in the centre. Clearly, this inhibitor had prevented mould-reaction.

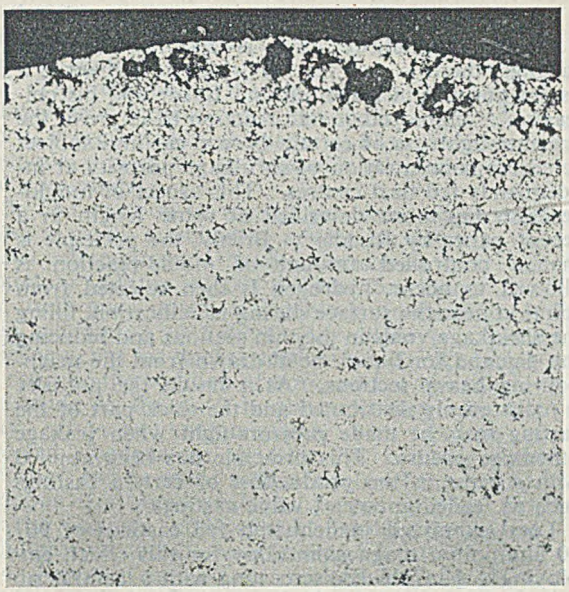
VI. Effect of Beryllium on Grain Size

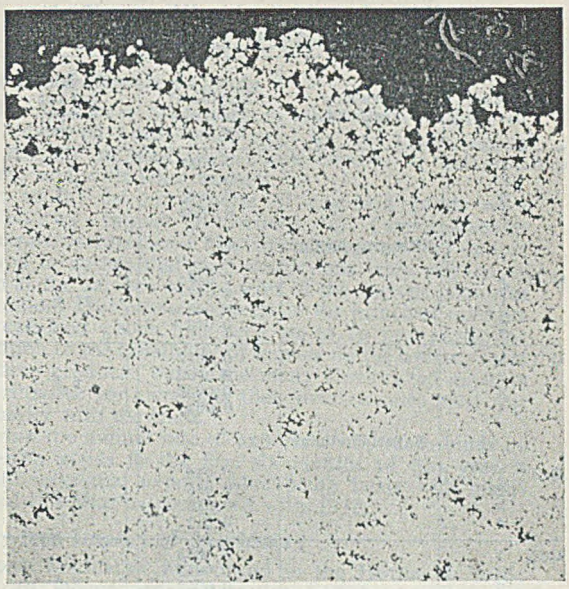
A recent French paper by Calvet and Potemkine[10] refers to a persistent belief in France that beryllium additions coarsen the grain of aluminium/magnesium castings. This belief was originated in 1938 by Gauthier[6] in one of the first papers on this subject, and it has since been disproved by Mincher,[2] who showed that beryllium additions had no adverse effect on either grain size or tensile properties. It was not known at the time when Gauthier published his paper that overheating causes grain-coarsening in these alloys, and he may have been misled by this into thinking that the coarsening was caused by beryllium.

In the absence of a grain-refining element, sand castings of 90/10 aluminium/magnesium are in any case coarse-grained. To refine the grain and obtain the best tensile properties the industrial practice is to add grain-refiners. If any confirmation of Mincher's work be needed, it is given by the present Author's work on castings containing 0.004 and 0.025 per cent. beryllium. These castings contained 0.01 per cent. titanium plus 0.005 per cent. boron, to refine the grain, as recommended by Cibula,[11] and the average grain diameters were in the range of 0.28 to 0.33 mm. with no difference at the higher beryllium content. This is the grain size occurring in similar castings free from beryllium.

VII. Beryllium Melting Losses

The mechanism of the protective action of small additions of beryllium to aluminium/magnesium alloys is not yet fully understood, but all the evidence suggests that the beryllium oxidizes preferentially to both aluminium and magnesium and promotes the formation of a more protective oxide film. Thus beryllium might be lost by oxidation of the melt and, if this is so, the beryllium may need replenishing when scrap is remelted. To examine this point, the present Author determined the effect of remelting on the beryllium content of alloys initially containing 0.005 per cent. and 0.025 per cent. beryllium. Starting with 15-kg. charges containing 10½ per cent. magnesium, each alloy was melted, degassed at temperatures between 710 and 750 deg. C., skimmed and poured into ingot moulds four consecutive times. At each pouring a stick (0.3-in. dia.) was cast for spectrographic determination of beryllium content.





FIGS. 7 AND 8.—*Mould-reaction in Heavy-section Castings (4 in. dia.) of 90/10 Aluminium/Magnesium Alloys Cast in Plain Sand, showing (left) that 0.004 per cent. Beryllium has a greater inhibiting effect than 0.025 per cent. (right), the latter showing more severe Porosity, extending further from the Surface; Large Sub-surface Holes caused the Edge to break away in polishing.* (×2½ *dias.*)

Three different degassing treatments were employed:—(*a*) Chlorine was passed through at 30 litres per hour for 15 minutes, with no flux, but with 1 per cent. magnesium added at each remelting to compensate for loss; (*b*) nitrogen was passed at 30 litres per hour for 20 min., using a flux* cover and a half of one per cent. magnesium added at each remelting, to compensate for loss; and (*c*) hexachlorethane was used, three one-ounce tablets being plunged one at a time and held at the bottom of the melt; no flux was used, but 1 per cent. magnesium was added on each remelting as in (*a*). The results, given in Table IV, show that on each remelting there was an average loss of 6 per cent. of the beryllium when 0.005 per cent. was initially present. At the higher initial beryllium content, the average loss, 18 per cent. on each remelting, was greater. There was no detectable difference between the effects of the three different degassing methods upon beryllium loss, which suggested that the loss was caused by concentration of beryllium in the dross, rather than by the formation of gaseous beryllium chloride, since nitrogen caused as much loss as chlorine.†

Under these conditions, the beryllium content of the alloy of industrial interest fell from 0.005 to 0.004 per cent. as a result of three consecutive remeltings. Since the beryllium content necessary for inhibition of mould-reaction is not highly critical, a charge of this small size could be remelted three or four times without the need to add beryllium. There is likely to be a wider margin of safety with charges in industrial practice, since metal losses are generally lower with larger melts. The total amount of metal lost as a result of drossing was about 10 per cent. each time the 15-kg. charge was remelted and degassed with either chlorine or hexachlorethane, but it was only 3 per cent. when the melt was degassed with nitrogen under a flux cover. These figures are higher than would occur in large industrial melts, but they indicate that, of the three methods of degassing for aluminium/magnesium alloys, nitrogen plus flux gives greater economy of metal. Unfortunately, this method has the well-known disadvantage that many types of refractory crucibles are attacked by the flux.

Calvet and Potemkine[10] have carried out melting-loss tests with aluminium/beryllium alloys degassed with chlorine and hexachlorethane. These authors were disturbed because they lost nearly all the beryllium when the melt was degassed with chlorine and they concluded that chlorine should not be used for degassing aluminium/magnesium/beryllium alloys for that reason. The explanation for their high losses probably lies in the fact that there was no magnesium in the melt; when magnesium is present magnesium chloride is formed in preference to chlorides of beryllium or aluminium as its free energy of formation is greater.

VIII.—Segregation of Special Sands in Foundries

It is well known that mould-reaction in magnesium alloys is prevented by adding about 5 per cent. sulphur to the sand. Lees[7] therefore tested the effect of adding sulphur to the sand for aluminium/magnesium alloys. He found that in the absence of beryllium and boric acid there was a small inhibiting effect, but, paradoxically, when beryllium was

* Pre-fused flux, based on carnallite, with low content of alkali and alkaline-earth metals other than potassium.

† The nitrogen was not passed through carbon tetrachloride for this section of the work.

TABLE IV.—*Melting Losses in Aluminium/Magnesium/Beryllium Alloys.*

Reference No.	Degassing treatment.	Beryllium‡ content, per cent.	Beryllium loss per remelt, per cent.
QCG 1		0.0052	
2		0.0045	6.9
3		0.0045	
4		0.0042	
	Nitrogen plus flux		
QCH 1		0.023	
2		0.017	17.4
3		0.013	
4		0.013	
QCI 1		0.0057	
2		0.0052	6.9
3		0.0052	
4		0.0046	
	Hexachlorethane		
QCJ 1		0.018	
2		0.015	15.1
3		0.015	
4		0.011	
QCK 1		0.0055	
2		0.0053	5.1
3		0.0052	
4		0.0047	
	Chlorine		
QCL 1		0.025	
2		0.014	21.9
3		0.011	
4		0.012	

‡ Spectrographic determination: accuracy ±10 per cent.

present, sulphur in the sand was harmful, as little as 0.2 per cent. sulphur reducing the inhibiting action of the beryllium. When the alloy containing beryllium was cast in sands containing sulphur and boric acid together, the castings were discoloured and porous, even a small amount of sulphur (0.5 per cent.) having a harmful effect on the inhibition. In foundries where both magnesium-base and aluminium/magnesium alloys are cast, it is therefore essential, to get the best results, that sulphur-bearing sands be strictly segregated from the aluminium/magnesium section of the foundry.

While on the subject of segregation of sands in foundries, it is also important to keep sands containing boric acid away from the part of the foundry where moulds for modified aluminium/silicon alloys are being prepared. This alloy does not exhibit mould-reaction in the ordinary way, but it was observed in industry that if the sand was accidentally contaminated with boric acid violent reaction occurred and the castings were porous. This was confirmed experimentally by Peck[4], who found also, that if the aluminium/silicon alloy had not been modified by the addition of sodium, boric acid did not cause mould-reaction. Some reaction occurred when sodium was added to plain aluminium and the melt poured into a sand mould containing 2 per cent. boric acid, but it was much less than the reaction when modified aluminium/silicon was similarly poured. No explanation for this has been found, but it is evident that boric acid, silicon and sodium all play a part in the reaction.

IX.—Possible Use of the Reaction

Although mould-reaction is harmful in most castings, there is one way in which it can serve a useful purpose in some alloys. Baker and his colleagues[1,12] employed mould-reaction to improve the pressure-tightness of certain bronze castings subject to severe concentration of shrinkage porosity at inadequately-fed heat centres. This aspect of mould-reaction has been described at some length in a recent paper by Ruddle[13]. Briefly, the principle is that a controlled amount of mould-reaction is allowed to occur, hydrogen is then rejected from solution near the surface during solidification, filling the shrinkage voids in the thin sections and reducing the demand for liquid metal drawn from the neighbouring heavy sections. As a result, the porosity is more evenly distributed and the thick part of the casting may be made pressure-tight when leakage otherwise occurs. This principle has been applied with success in the production of certain castings such as leaded-gunmetal valve castings.

Lees[7] examined inadequately-fed castings of 90/10 aluminium/magnesium alloy for this effect, employing a ½-in. thick disc casting with a central rib ½ in. thick and 1½ in. high, so designed that, as a result of poor feeding, there was a severe concentration of shrinkage-porosity in the rib. This casting was intended to represent, in exaggerated form, the conditions prevailing in many commercial castings in which pressure-tightness is essential. Discs were made from gas-free melts of plain 90/10 aluminium/magnesium cast in plain sand, *i.e.*, with unrestrained mould-reaction, and from 90/10/0.025 aluminium/magnesium/beryllium cast in sand containing 2 per cent. boric acid, *i.e.*, reaction inhibited. The results of micro-examination and density measurements showed that there was greater concentration of porosity under the rib of the inhibited casting and the mechanical properties of specimens which included that part of the casting in their gauge lengths were correspondingly lower than for the uninhibited castings. However, this observation was not pursued further because, in the aluminium/magnesium alloys, the porosity from mould-reaction is concentrated immediately beneath the surface of the casting and falls off steeply with distance from the surface (see Fig. 4), whereas in bronzes, cast at a higher temperature, the hydrogen has time to penetrate more deeply into the metal and therefore to produce a more even distribution of porosity. It therefore seems unlikely that controlled mould-reaction could be employed as usefully in the production of strong and pressure-tight castings of 90/10 aluminium/magnesium alloys as in the production of phosphor-bronze and gunmetal sand-castings.

Conclusions

1. When aluminium/magnesium alloys are poured into sand moulds the metal surface is oxidized by the moisture in the mould and hydrogen is absorbed causing sub-surface gas porosity, which is concentrated beneath the surface of the casting and decreases rapidly towards the interior. The reaction increases with magnesium content and with the time taken by a casting to solidify, and

is therefore most severe in the heavy sections of castings made in alloys of high (10 per cent.) magnesium content.

2 The reaction in the 10 per cent. magnesium alloy is neither prevented by drying the sand mould, nor is it prevented by the presence of various cereal, resinous, mineral-oil or vegetable-oil binders used for core-sands.

3. The reaction in the 10 per cent. magnesium alloy is partly inhibited by adding beryllium to the metal. Experimental work has shown that the optimum addition is 0.004 per cent. beryllium. This by itself gives adequate inhibition in castings of thin section up to 1-in. dia. or about ½-in. plate thickness, but for thicker sections which take longer to solidify, the addition of boric acid or ammonium bifluoride to the sand is also necessary. In this way, provided contamination with sodium is avoided, sections up to 4-in. dia. or 2-in. plate thickness can be made sufficiently free from mould-reaction for most practical purposes. For still heavier sections, chills should be used to hasten solidification and improve feeding.

4. A certain amount of reaction occurs in alloys containing 1 to 2 per cent. magnesium, such as Y-alloy. This is easier to prevent than the reaction in 10 per cent. magnesium alloy and the addition of an inhibitor to the sand is adequate for medium sections at least.

5. The addition of small amounts of titanium and boron to refine the grain does not interfere with the inhibiting action of beryllium.

6. It has been confirmed that beryllium does not coarsen the grain-size of 90/10 aluminium/magnesium castings.

7. The loss of beryllium on remelting the alloy containing 0.004 per cent. is small.

8. Moulding sands containing boric acid cause mould-reaction in modified aluminium/silicon castings and must therefore be strictly segregated in foundries. Similarly, sands containing sulphur must not be used for aluminium/magnesium alloys containing beryllium.

Acknowledgments

The Author is indebted to the Director and Council of the British Non-Ferrous Metals Research Association for permission to publish this Paper.

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Parliamentary

Exports of Cast-iron Goods

MR. MALCOLM MACPHERSON asked the President of the Board of Trade what steps he had taken during the last six months to increase exports of cast-iron goods; and with what success.

In so far as our exports of cast-iron goods were limited by import restrictions in Commonwealth countries oversea, said MR. MACKESON, we had endeavoured to ensure that such restrictions were relaxed as soon as the balance of payments of the various countries permitted. Our oversea officers in the principal markets for cast-iron goods had been asked to pay particular attention to the possibility of improving the oversea sales of these products, but in the many unrestricted markets the initiative for increasing their oversea sales must rest primarily with the trade.

From the annual rate of exports of the main kinds of cast-iron goods in the first six months of this year it would seem that exports were being fairly well maintained this year as compared with 1952.

Duty-free Import of Machinery

LORD MANCROFT announced in the House of Lords that an independent committee had been set up to review the question of the duty-free importing of machinery. The terms of reference were:—"To consider and report whether it was in the national interest to provide for the duty-free admission into the U.K. of machinery either by classes or individual consignments, and to review the provisions of Section 10 of the Finance Act of 1932 and to recommend what changes should be made.

The chairman was Sir Henry Wilson Smith, and there were three industrialists experienced in the making of machinery, three who were users of machinery, one trade-union representative, and one independent member.

British Industries Fair

The present arrangements for the British Industries Fair are to be reviewed. The President of the Board of Trade has asked the advisory committee of the Fair to carry out the review.

Announcing this in the House of Lords, the Lord in Waiting, LORD MANCROFT, said that the committee's report was expected shortly. In the meantime the Fair would be held annually. There was a division of opinion in industry about present arrangements, said Lord Mancroft. There had been a decrease in the number of exhibitors over the last two years of 20 per cent., from 2,892 in 1951 to 2,280 this year.

Engineering Labour

Although there was a fall of 1 per cent. in the numbers employed in the engineering industries in the 12 months up to May, 1953, there were increases in some important sectors, such as aircraft and shipbuilding, stated the Parliamentary Secretary to the Ministry of Labour, MR. HAROLD WATKINSON. The local offices of the Ministry were doing their best to encourage workers seeking a change of employment to take first preference work in the basic industries, and in defence and export work in other industries, such as engineering.

THE FUTURE LEVEL of employment in the Falkirk-Bonnybridge foundry industry would depend on the volume of orders received and on the ability of individual firms to adjust themselves to changes in the markets for their products.—The Parliamentary Secretary to the Ministry of Labour.

I.B.F. Jubilee Award

Competition for Junior Members

April 9, 1954, is the fiftieth anniversary of the Institute of British Foundrymen, and as part of the programme which the Council is preparing to commemorate this great occasion, it has been decided to organize a short paper competition, open to associate members and associates who will not have attained the age of 30 by the anniversary date. The winner of the competition will receive the Jubilee Award of £25 and the record of his achievement will be permanently preserved by the inclusion of his name in all future annual volumes of the Institute's *Proceedings*, in the same way as the register of the winners of the other major awards of the Institute is maintained.

So that the competition shall attract entries broadly from all sections of junior membership, it has been decided to offer, in addition to the national award, a prize of £10 for the best paper submitted within the membership of each branch, and a separate award of £10 is offered for competition by unattached members. All papers will be eligible for these branch awards, but only the papers adjudged to be the best in each branch competition and the best paper submitted from unattached members will qualify for entry for the Jubilee Award.

Detailed rules governing the competition are given below. The Council wishes to emphasize that competitors are free to deal with any aspect of foundry practice contributing to the economic production of good castings, and that papers will be accepted on moulding practice, melting practice, patternmaking, metallurgical control or any other feature of foundry-work or metallurgy in the foundry, interpreting this definition in the widest possible sense. Adjudication will be on an anonymous basis, in that each entry will bear only a code number allocated by the Secretary of the Institute, who alone will know the name of the entrant. Intending competitors are requested to apply to the secretary of the Institute as soon as possible for an entry form and code number. As the closing date for the receipt of papers is December 31, 1953, overseas members are requested to apply by air mail. Intending competitors are reminded that they should obtain permission from their employers before submitting their entries.

Competition Rules

(1) In order to commemorate the 50th anniversary of the founding of the Institute of British Foundrymen, the Council has decided to offer a series of prizes and a Jubilee Award for the anniversary year, 1954.

(2) Awards will be made on the result of a competition and any associate member or associate of the Institute who has not attained his thirtieth birthday on April 9, 1954, will be eligible.

(3) Each competitor is required to write a paper on any aspect of foundry practice contributing to the economic production of good castings.

(4) Very wide latitude will be allowed in the interpretation of this subject and papers may deal with moulding practice, melting practice, patternmaking, metallurgical control or any other aspect or combination of aspects of foundry metallurgy which can be classified under the main general heading in Rule 3.

(5) Each paper should not exceed 4,000 words; if it is desired to include illustrations and Tables, the number of illustrations and Tables should not exceed 12. Papers may be typed or may be in handwriting.

(6) In the first place, each entry will participate in a competition restricted to the members of the entrant's own branch who are eligible under Rule 2. Members not attached to a branch may submit entries which will be treated as if they belonged to a "general" branch. An award of £10 will be made for the best paper received from a member of this "general" branch.

(7) The winner of each branch competition will receive an

(*Continued at the foot of col.* 2)

award of £10 and each winning paper will be submitted for consideration for the national Jubilee Award and will be adjudicated upon by national assessors. The national Jubilee Award will be the sum of £25.

(8) If fewer than three entries are received in a branch there will be no branch award, but the better of the two papers received or the only paper received if only one, shall be submitted to the national assessors for consideration for the national award.

(9) The competition will be confined to the year 1954.

(10) The name of the winner of the national competition will be printed in the *Proceedings* of the Institute each year in the same way as the names of the winners of the Institute's other major awards.

(11) Intending competitors may obtain entry forms from the secretary of the Institute at Manchester. Each entry form will bear a number which the candidate will write on each sheet of his entry paper. Candidate's papers and entry forms should be sent to the secretary not later than December 31, 1953, and this date will be rigidly enforced. In order that the identity of the candidate shall not be disclosed, the secretary will send the entries for each branch to the adjudicators for that branch and will retain the entry forms. The names will not be disclosed until the adjudicators have made their decisions in all the branch competitions and in the national competition.

(12) Copyright of all prize-winning entries will be vested in the Institute.

House Organs

Craven Gazette. Published by Craven Brothers (Manchester), Limited, Vauxhall Works, Reddish, Stockport.

This issue continues the story of the development of this hundred-year-old company, covering the second period, roughly from 1887 to the present time. The article is illustrated with a number of fine pictures.

Journal of Applied Pneumatics. No. 5. Issued by Marton Air Equipment, Limited, Parkshot, Richmond, Surrey.

This issue contains an illustrated paragraph on the die-casting of a wringer-machine part and a Diesel-engine crankcase. The first application uses air cylinders for opening and closing the mould, and the second the removal of the core by an air hoist to which it is permanently attached. For both, the air equipment is made by the publisher.

Steel News. Vol. 4, No. 2, July. Published from Steel House, Tothill Street, London, S.W.1.

The most interesting article in this issue tells of development of the Conakry iron ore in French West Africa. In 1948 the field was surveyed, and to-day a 12,000-ton ship, the "Ormsary," is one of the ships dealing with a 25,000-ton weekly production. Other exports from Conakry are bananas, pineapples and bauxite. A second article covers the steel production of the Commonwealth.

Albion Works Bulletin. Vol. 7, No. 2 (July). Issued by John Harper & Company, Limited, Albion Works, Willenhall, Staffs.

This issue reports that the attendance figures for June show the best ever recorded, with an average throughout the whole works of 4.55 per cent. Despite that, no fewer than 2,604 days were lost. Attention is drawn to extend its factual investigation of semi-manufactures produced earlier than the moulds. It seems that it costs 5s. to bring a ladleful of metal to a mould. The cost of core breakages, too, can be an important cost item. This issue includes an account of the opening of a new addition to the bathing and wardrobe facilities by Miss Margaret Herbison, M.P.; a visit to Germany by two of the staff and a note about the distribution of Coronation medals to the staff.

Pelleted Foundry Pitch*

Discussion of Blackpool Conference Paper by E. Brett Davies, M.Inst.F., T. F. N. Matthews and G. Smart

MR. REYNOLDS opening the discussion on pelleted pitch said his firm had been experimenting with pitch and also with pitch combined with clay in the form of a proprietary mixture. They found that for cores made in U.F. resin, when pitch was used, gave a better scratch hardness. Founders who had been experimenting with U.F. resin found that the cores tended to rub away very quickly, but pitch/urea cores did not do so.

He had made some experiments with pitch and U.F. resin in connection with skin-drying moulds and he would like to know if the lecturers had any experience of what happened if colloidal clay were added. Was it detrimental or otherwise? A further question was whether the application of pitch was more useful for the resin type of core than for an oil-sand core. Most of the linseed oil sold for the making of cores contained a little pitch and so he wondered why did they need to add more in the case of oil-sand cores.

MR. DAVIES said when colloidal clay was present it was generally found necessary to use more pelleted pitch. The same appeared to be the case when using synthetic resins in that the clay provided a much larger surface area for the absorption of the binder whether it be pitch or resin. When making linseed-oil cores it was not general to use both linseed oil and pitch in the same mix and the speaker had not heard of linseed oil actually containing pitch other than the pitch-like residues which might occur in the cheaper grades of linseed oil used in foundry practice. Was Mr. Reynolds quite sure that pitch had been added to the linseed oil of which he spoke?

MR. MATTHEWS added that a number of his friends who had not been too satisfied with casting skin when using U.F. resin had improved this by using an addition of ¼ to ½ per cent. of pitch in the total mix.

Use in Green-sand Moulds

MR. F. A. HARPER said the Authors to a great extent had confined themselves to the use of pitch as applied to dry-sand and core-sand, and had rather glossed over the use of pitch in green-sand moulding. He was wondering if the answer was to be found on page 6 of the preprint, where they confessed that there was a tendency for the hot return-sand to ball up and cause pellets, which, when they got to the skin of the mould, caused scabs on the castings. He had known that happen in more than one case where pelleted pitch had been used in green-sand moulding, and the foundry had discarded its use completely and now used coal-dust. It seemed to him that quite three-quarters of the foundries in this country had to content with those conditions, and the adoption of pitch was a very doubtful proposition. Another point the Authors made was the controllability of pitch, and they went on to tell of a blue skin or grey or black skin. Surely there was nothing to be claimed for pitch in that it applied equally to the use of coal dust in moulding sand.

MR. SMART said he knew of several foundries in Scotland where the sand was returned to the mill very hot indeed. In fact in one case it was so hot that it was uncomfortable to handle. He could quite honestly say that that firm had not experienced any difficulty in using pitch, which they had done for the past few years. As to the remark about their making a great play with the surface colour of the castings in mentioning blue and black, they should, of course, have mentioned red, white and blue as it was Coronation year, but it happened that the colour did give a practical indication of whether the pitch content of the sand was correct. It was the same with coal dust. The effect of the two additives was similar.

A member referred to the use of pitch as a core binder and mentioned that he had carried out a few experiments with a proprietary compound which was a pitch/dextrose mixture with 5 per cent. of water. He had found he had to use the material at a strength which made the whole mixture very sticky and he did not quite get the hardness associated with an oil-sand mixture. Also, he did not get the surface hardness and so found the cores difficult to handle. On the point about clay in sand he had found that a 1 per cent. addition of clay in core-sand caused a 25 per cent. reduction of compression strength.

Balling

MR. REYNOLDS said he would make one point with regard to hot sand: on a "Sand-Rammer" plant where the knock-out took place early and the sand went back hot through the belt-conveyor system, his firm for some time had been using pitch along with colloidal clay in a proprietary mixture and they had had no trouble at all with balling.

MR. MATTHEWS said normally for core-sand there was sufficient water present, but it depended on the type of sand. He had used sand where at 5 per cent. the mixture had been sticky. The practice then was to use sufficient water, say 4 per cent., and emulate the resin coremaking procedure by spraying the cores with water before stoving. That improved the cores and their skin and also the compression-strength. He agreed as to the percentage addition of clay. He had found, as had other founders, when

* This Paper which was presented to the annual conference of the Institute of British Foundrymen was printed in the JOURNAL, July 30.

reverting to a Cumberland sand, as opposed to a washed silica sand, that the same amount of compound, or roughly the same added content, did give a higher compression figure.

MR. SMART said it was a well-known fact that certain sands did give stickiness but there were many which did not, provided that the moisture was suitably controlled. It was also most important that the mixing of the core sand should be thorough, otherwise there was a danger of patches in the sand which would give rise to a weak core.

MR. BUSHNELL asked could the speaker explain what he meant by thoroughly mixing?

MR. SMART said he had found that in the rotating type of mixer approximately five minutes was adequate and in the roller-type a slightly shorter time. There was no doubt, and he thought most would agree, that the roller-type mixer seemed to develop more quickly a stronger green-bond than the rotating type.

Disadvantages Reported

MR. TIPPER stated that, reading through the Paper members would find that everything appeared to be perfect, which, as had already been pointed out, was far from the case. He would also comment on the difficulty of reducing the extra dry-strength which was present in green-sand and mixed-sand systems. This trouble could be overcome and he did not, therefore, wish to say anything against the use of pelleted pitch in general sand mixtures, or coal-dust. He asserted, however, that pitch addition required more careful working, particularly on the relationship of additions to the type of sand being used and the composition of the sand.

Under the heading of " Core Production," he felt that many of the statements were misleading, or made comparisons which suggested a superiority of the pitch-bonded sand, which were in fact only true in particular cases. The figures quoted for dry-strength in the Tables were, in his opinion, too low for coremaking associated with iron and steel practice. The Paper indicated that the Authors had been trying to get very much higher dry-strength and that fact suggested that in the mixtures quoted it was the cereal which contributed largely to the green-strength and the dry-strength which was being obtained.

Again there had been statements that the mixture was non-sticking and it was said that it was unlike oil/sand mixtures. Surely the Authors were familiar with core bonds which had been in use for 25 years and which if used correctly would give non-sticking properties. He suggested that the use of pelleted pitch had nothing whatever to do with the non-sticking properties; it was the cereal which was producing those properties. It was not suggested that the pelleted pitch played any part as a bonding agent at the stage of the green mixture or in the very early stages of warming up the core.

The Authors had quoted a case where a mixture cost 3s. 6d. a cwt., and which was reduced to 1s., but an oil-cereal mixture, for example, giving comparable green- and dry-strength values, could very well be produced for not more than 1s. a cwt., and probably less. The fact was, the Authors were not really comparing the same material. Various forms of pitch had been used in formulæ of " combined " binders for many years and had certainly been of benefit, particularly in increasing the moisture resistance of the core and in improving resistance to metal penetration. That was why there had been a reference to adding pitch to resin mixtures and to oil-sand mixtures. It had its advantages and had been used for a considerable time in composite materials. Pitch in one form or another was of value to extend the performance of a binder

In reply MR. DAVIES stated that Mr. Tipper had suggested that the use of pitch was by no means new. This certainly was perfectly true and in the Paper attention was drawn to the fact that pitch had been used in America for many years and, indeed, in many other countries. The Paper specifically avoided any suggestion that pitch was a proprietary material but it was a fact that the Productivity Team's Report on their American visit commented upon British pelleted foundry pitch as a superior material to the pulverized pitch used extensively in America. It was for this reason that the Paper had been produced. It was not suggested that pitch was a cure for all foundry sand problems and conditions at each individual foundry required careful consideration when turning over to the use of pitch. In general the Paper, therefore, aimed to give guidance in this direction.

MR. LAWRIE expressed disapproval of this type of Paper.

MR. E. LONGDEN, president of the Institute, in closing the session, thanked the three Authors for the Paper they had prepared and the various members who had taken a part in the discussion.

New Catalogues

Time Recorders. Blick Time Recorders, Limited, 96-100, Aldersgate Street, London, E.C.1, have sent a folder which describes and illustrates a new type of recorder requiring the use of one hand only.

Auto-Shunter. To inaugurate the launching of a new model of the Epping Auto-Shunter, Epping Engineers Limited, of 73, Lindsey Street, Epping, Essex, have prepared a six-page folder. This Diesel-engine-driven, pneumatic-tyred shunter is shown at work and crossing railway tracks.

Shell-moulding Machine. Clino Foundry Supplies, Limited, of 25, Clyde Vale, Dartmouth Road, Forest Hill, London, S.E.23, have now prepared a four-page leaflet which describes, illustrates and prices their new shell-moulding machine, which has already been described editorially in the JOURNAL.

V-Belts. The British Tyre and Rubber Company, Limited, Herga House, Vincent Square, London, S.W.1, have prepared an extremely useful brochure on the care of V-belts. Every phase of deterioration is expounded, together with the steps to be taken for its elimination. This booklet is available to our readers on writing to Herga House.

National Insurance (Industrial Injuries) Scheme

By F. J. Tebbutt

By the National Insurance (Industrial Injuries) Act, 1946 (in force July 5, 1948), it is provided that the Government Actuary is to make quinquennial reports, and furthermore before the expiration of the five-year periods he must make annual interim reports. The most recent interim report (the second) covering the year April 1, 1950, to March 31, 1951, is first reviewed in what follows. The numbers covered by the scheme in 1950 totalled approximately 20½ millions, of which 13¾ millions were men and about 6¾ millions women.

General Outline

This scheme took the place of the old "Workmen's Compensation Scheme." Under the old scheme there was no Government insurance and no payment of contributions, but the liability of the employer to make payments in the case of events occuring covered by the scheme, was always present, and most firms covered themselves through ordinary insurance companies. By the "Industrial Injury Government Scheme," insurance is compulsory, and weekly contributions are payable, the rates of which are common knowledge.

Benefits.—The chief and first benefit payable is "injury benefit" (being for the period covered by the report, 45s. per week for adult employees, plus 16s. adult dependants, with 7s. 6d. for first and only child), and this can continue for six months. Then can follow "disablement benefit," the rate being dependent on an assessment of loss of physical or mental faculty; the amount is a percentage of the disability; thus for 20 per cent. this would be 9s. per week, running up on a sliding scale to 45s. for 100 per cent. disability. Additional benefits are "unemployability supplement," 20s.; "constant attendance allowance," 20s. (for some cases, up to 40s.); and "special hardship allowance" (conditional; 20s. or less). There is also "death benefit" for fatal cases, being payable to widows, children and other dependants. These rates were payable in the period covered by the report but, to save confusion, it might be useful to mention that from July 24, 1952, increased benefits became operative, under which the following are payable: "Injury benefit" is now 55s.; "disablement benefit," 55s. for 100 per cent. down to 11s. for 20 per cent.; "unemployability supplement," 32s.; "constant attendance allowance," 25s., with possibility of 50s.; "adult dependant allowance," 21s. 6d.; and "first or only child," 10s. 6d. per week.

The total number of awards of "injury benefit" in respect of claims in 1950 is estimated at 773,000. From an analysis of the cases, it is shown that the younger men received more injuries than older workers (this applied in earlier years also), the possible reason being that the accident risk is lessened with growing skill and experience, and that the older and more experienced worker has a more cautious attitude towards occupation risks. At the same time, the heavier and more hazardous industrial processes employ a higher percentage of the younger men than do the occupations which make smaller demands on vigour and physique.

Analysis

It is of interest to mention that the figures given in the foregoing for 1950 show very little difference from those for 1949. As regards "disablement benefit," the total number of disablement pensions awarded up to December 31, 1950, was roughly 78,500. Of these some 4,000 were awarded in the second half of 1948, 36,000 in 1949, 38,500 in 1950. The scheme came into force on July 5, 1948, and the reason for the low number at the beginning of the period (figures given for 1948) can be accounted for by this period being the early stages of the scheme, and most persons would be then drawing "injury benefit," which, as shown, precedes the receipt of "disablement benefit."

At the end of 1949, the number of pensions in payment was about 33,300, being 51,500 at the end of 1950. Of the 40,000 pensions awarded in 1948 and 1949, nearly 7,000 had been terminated by December 31, 1949, and of the 71,800 pensions in force at December 31, 1949, or awarded during 1950, over 20,000 were terminated during that year. Of the whole body of 78,500 awards, only about two-thirds were still in payment at December 31, 1950.

Cessations of pensions can be due to death (500 approximately were due to death for 1950), recovery, and other reasons—some, for instance, being assessed for a gratuity, a lump-sum payment, which may be anything, according to the circumstances of the case, up to £150 (N.B. from July 24, 1952, the maximum was raised to £185.

For 1950, the number of deaths for which benefit was payable was 2,125. Awards made in the year numbered 3,131 (widows, 1,931; children, 974; parents and other dependants, 226). This is a benefit where the total annual cost will increase steadily year by year until a relatively stable position is reached; for example, the cost in 1949/50 was £205,000; for 1950/51, £357,000; and for 1951/52 it is likely to be £541,000. The increases are, of course, caused by the growth of the number of pensions in payment.

New Act

On August 26 a new Act, the National Insurance (Industrial Injuries) Act, 1953, will come into operation. This Act makes a number of beneficial changes in the scheme of insurance against industrial injuries, while leaving the main structure of the scheme unaltered. There is no increase in contributions. The main change is a relaxation of the conditions for disablement benefit. At present it can only be paid if the disablement resulting from the accident or industrial disease is substantial, that is, assessed by a medical board at 20 per cent. or more, or likely to be permanent, or in some circumstances both substantial and permanent. From August 26 the benefit may be paid wherever the disablement is assessed at 1 per cent. or more, whether it is permanent or not. People who have already had claims rejected because their disablement was neither permanent nor substantial may now claim benefit from August 26 if there is still some disablement remaining. Anyone wishing to claim from that date should notify his local National Insurance Office as soon as possible. This change does not affect the special rules relating to persons suffering from pneumoconiosis or byssinosis. The following minor changes are also brought about (1) hospital treatment allowance becomes available to people awarded disablement gratuities as well as to disablement pensioners; (2) a technical difficulty is removed which at present prevents disablement benefit from being paid in certain cases from the date when injury benefit stops; (3) industrial death benefit is to be paid at the higher rate of 37s. a week, instead of 20s. a week, to certain widows whose husbands died as the result of an industrial accident or disease, and who are aged between 40 and 50 when they cease to be entitled to an allowance for a child; and (4) there are changes in the system of adjudication.

Book Reviews

L'Acier (Steel), by Jacques Ferry and René Chapel. Published by Presses Universitaires de France, 108, Boulevard Saint-Germain, Paris.

This little book—resembling the Penguin type—is one of a series carrying the collective type of Que sais-je? or What do I Know? It first describes and clearly illustrates the major production units in the iron and steel trades, and then goes on to detail the French national and international set up from the commercial angle, as influenced by the Schuman Plan. A by-product of value to the English reader is the knowledge derived of French technical terms. The main object, however, is to give in simple language an account of the French iron and steel industry and, without doubt, it does this authoritatively.

Higher Industrial Production with Electricity. Published by the British Electrical Development Association, 2, Savoy Hill, London, W.C.2. Price 9s. post free.

This book is extremely wide in scope, and perhaps industry would be better served if each branch could be favoured with one covering its special activity. In truth, everybody is alive to the benefits to be had by mechanical handling, and to this end electrical power is usually harnessed. This book carries 104 pictures in 140 pages, and naturally it covers much more than mechanical handling. There are such applications as melting, heat-treating, welding and lighting. At a cost of only nine shillings it is good value for money.

Properties of Metallic Surfaces. A monograph published by the Institute of Metals, 4, Grosvenor Gardens, London, S.W.1. Price £1 15s.

This monograph contains thirteen papers presented at a symposium organized by the Metal Physics Committee of the Institute of Metals and held in London during November, 1952. The symposium was designed to interest not only metallurgists but also engineers, physicists and chemists, and it is obvious from the discussion, which extends to 69 pages with 34 illustrations, that the organizers' intentions were fully realized.

Engineers will find much to interest them in three of the papers, viz., "The Influence of Machining and Grinding Methods on the Mechanical and Physical Condition of Metal Surfaces," "The Effect of Lubrication and Nature of Superficial Layer After Prolonged Periods of Running," and "The Influence of Surface Films on the Friction and Deformation of Surfaces." Of a very different type but most interesting is Dr. U. R. Evans' paper, "Chemical Behaviour as Influenced by Surface Condition." The contributions to the discussion were of a very high order and are well worth reading. As is usual with publications produced under the auspices of the Institute of Metals, the present monograph is very well arranged and printed, and adequately indexed.

J. F. K.

The Instrument Manual. Second edition. Published by the United Trade Press Limited, 9, Gough Square, Fleet Street, London, E.C.4. Price £4 4s. 0d., post free.

In the metallurgical industries, instrumentation is assuming ever-increasing importance and the object of this manual is not only to give the reader the underlying principles and construction of the various pieces of equipment but also, by references and more than a hundred pages of advertisements tells where they can be purchased. In the six-hundred-odd pages of text, there are 60 pages devoted to temperature measurement and recording. Other subjects of interest to the foundry industry include spectroscopy; X-rays; pressure and volume measurement; microscopy; moisture-content measurement ("Speedy"); and instruments for automatic control. The illustrations in such an expensive book as this might well have been made more uniform, as the lettering varies from the barely readable (Figs. W 14, etc.) to "baby's first book" size (Fig. CQ 51, etc.). The section headings, which are rightly classified on a theoretical basis, are not as useful to the average reader as the index, which has been done in a thoroughly workmanlike manner. For the larger concerns in the foundry industry, especially those having a research laboratory, this book will certainly be helpful in finding sources of supply for measuring and metering equipment.

Technology of Engineering Materials, by B. Richard Hilton. Published by Butterworths Scientific Publications, Bell Yard, Temple Bar, London, W.C.2. Price 37s. 6d. post free.

In this book the author has endeavoured to present metallurgical information likely to be of interest to students and engineers, and has attempted to compress too much information into the space available. The scope of the metallurgical field is now such that a much larger text is needed than that which is under review. A treatment of this type will inevitably involve omissions of an important character, and much of the incomplete data presented may, therefore, be misleading.

The author has succeeded in assembling much useful information, and the diagrams generally are good (though one is incorrect), and the balance between foundry processes and those in the wrought field is nicely made. A notable omission is any treatment of the physical metallurgical field, and this cannot reasonably be excluded from any modern metallurgical textbook.

Most of the alloys now used in engineering are made to various standard specifications, and it is regrettable that these specifications have not been quoted, in most cases. Any account of aluminium casting alloys is incomplete if the relatively important material corresponding to DTD.424 is not mentioned.

The glossary which is included at the end of the book fails in its object, since many of the definitions given are incomplete and, in a few cases, are incorrect. For example:

(a) Acid process . . . apparently refers to the furnace lining, and the character of the slag in the process is apparently not worth consideration.

(b) Ferrite . . . small percentages of silica and phosphorus may be present in it.

(c) Gjers kiln . . . is alleged to be an early form of soaking-pit introduced in 1890.

(d) Hematite . . . is said to be one of the commonest iron ores used for smelting purposes. This is certainly not true in Britain, and furthermore "yields of up to 60 per cent. of metallic ore are obtained," according to the glossary.

The impression is given that Ductile Iron is made only by Lloyds of Burton, and a statement is made that this magnesium alloy material is lighter than ordinary grey cast iron. In the steel-processing section, the flame-deseaming process is mentioned, apparently in the same breath as the planing methods of conditioning alloy-steel ingot surfaces, without mentioning that the many air-hardening types of steel are quite unsuitable for the flame-deseaming treatment. The reviewer cannot recommend this work as a reliable textbook.

J.B.M.

Research as it Affects the Customer*

By J. F. B. Jackson, B.Sc., A.R.I.C., F.I.M.

[SLIGHTLY ABRIDGED]

In interpreting the title of this Paper, it has first of all been taken for granted that industrial research, rationally conceived and effectively pursued, will inevitably affect the customer and do so to his advantage. The point is neither questioned nor debated. Secondly, while it is recognized that an important feature of the steelfounding industry's present-day research effort is the contribution being made by the laboratories and staff of individual steelfounders, this Paper is concerned primarily with co-operative research within the industry, and therefore with the British Steel Castings Research Association in particular. It is in fact the main purpose of this Paper to convey to the users of steel castings that the steelfounding industry of this country has during the past three years or so generated from within its midst an organization for co-operative research that has a realistic appreciation of its responsibilities, and an approach to its problems that is not only vigorous but essentially "down to earth."

Consistent with an outlook such as that elaborated in the foreword, the British Steel Castings Research Association itself is staffed not only with men who have what is appropriate in the way of technological or scientific training and background, but also with men who have, as an essential requirement, direct experience in industry itself of steel castings manufacture, men who have learned at first hand of the complexities of the steelfounding process.

It has in fact been the industry's object to have built up for it a research organization capable of producing results that bear direct relationship to industrial practice, and that are therefore acceptable to those engaged in making steel castings. To aid in the planning of its work, and to assist particularly in maintaining this within the right channels in keeping with the requirements of the industry, the B.S.C.R.A. staff has the benefit of continual expert guidance and criticism from a number of technical committees and scientific panels, which are constituted from authorities and specialists drawn not only from within the industry itself, but also from the universities, from Government departments, and indeed from user organizations.

Division of Work

For the execution of its work, the Research Association makes use of various facilities, according to the nature of the problems under investigation. It will be appreciated that all research and development work passes, in effect, through a number of phases in the course of its prosecution, such phases clearly ranging from the preliminary search for published relevant data to the other extreme of full-scale production trial and application. Thus, certain phases of certain problems lend themselves particularly well to investigation under the conditions peculiar to the universities, and the B.S.C.R.A. —and its predecessor, the Research and Development Division of the B.S.F.A., before it—has taken and continues to take advantage of the assistance which the universities can give, particularly in relation to long-term research work aimed at establishing fundamental data. The B.S.C.R.A. has in fact twelve researches of this character being conducted in the universities at this present time.

Further along the scale, *i.e.*, further from theory and nearer to practice, the B.S.C.R.A. staff carry on their work in their laboratories and workshops attached to their headquarters in Sheffield, in the works and on the plant of member firms (who at all times have responded readily in affording such access) and, last but not least, in such research station facilities as the B.S.C.R.A. has at its disposal. The importance of research stations, that enable part or full-scale experimental work to be conducted under closely-controlled conditions, will be referred to again, but let it be recorded at this juncture that their importance is looked upon as being paramount in relation to the successful execution and ultimate application in industry of steel castings research and its results.

So much for the steelfounding industry's approach to co-operative research and to its planning and execution. Yet remain to be considered the measures being taken to enable the industry—and indeed its customers—to get the most out of these research efforts, *i.e.*, the ways and means that are being adopted for facilitating the translation into practice of the work of the B.S.C.R.A. Without such translation into practice research clearly means very little, and, in terms of the title of this paper, without such translation research cannot affect the customer.

Before concluding on this all-important issue of translating science into practice, certain items on the current B.S.C.R.A. research and development programme demonstrated in the section of the exhibition devoted to the B.S.C.R.A. and its activities, call for comment. The projects selected relate to a relatively broad field of steel castings science and technology, and thereby are intended to convey the breadth of the field in which research work is being undertaken. This ranges from fundamental studies of the behaviour of steel in refractory moulds and of the causes of certain types of defect in steel castings, to such practical developments as those intended to simplify and accelerate procedures for the sampling of steel during steelmaking,

* Presented to the Customer/Founder Convention and Exhibition of the British Steel Founders' Association. The Author is director, British Steel Castings Research Association.

Research as it Affects the Customer

the fettling and dressing of steel castings, for the non-destructive examination of the finished product itself, and so on. All projects, whether of long- or short-term variety, have as their object the attainment of higher quality in its broadest sense, of lower manufacturing cost, or, as is so frequently the case in industrial research, of both. Each project demonstrated was fully documented in the exhibition itself.

Attention is drawn particularly to three major research projects, each of which has a very important bearing upon quality and upon the elimination of certain of the defects that can occur in steel castings. These three projects are related to the mechanism of freezing of steel in sand moulds, to the interaction between molten steel and silica moulding sands, and to the resistance offered by various moulding materials to the solid contraction of steel castings when still in their moulds in the foundry. These researches, in practical terms, have a direct bearing upon the prevention of shrinkage cavities, upon the avoidance of burnt-on sand that adheres to the surface of steel castings, and upon the prevention of hot-tears.

Research on Mechanism of Freezing

Both Rowe and Rait have dealt with the inherent problems arising from the changes in volume that occur in steel as it freezes, and of the steps that are taken in foundry practice to offset such effects and to avoid residual shrinkage cavities in the casting itself. The fact remains, however, that at this date, understanding of the process of solidification is far from complete and the measures that are taken in the foundry, such as the application of feeder heads, are largely arbitrary and based upon accumulated experience, and even upon personal predilection rather than upon data that has been established quantitatively and scientifically.

The B.S.C.R.A. researches in this field, which are subject to the detailed guidance of its " mechanism of freezing " panel, are essentially of a long-term character, and whereas they seek to establish fundamental data in the first instance their ultimate aim is of a distinctly practical nature. The researches to which we refer do in fact lead directly to the use of optimum form and dimensions of feeder heads, having due regard not only to the avoidance of shrinkage cavities but also to metal economy and to the physical properties of the casting itself. It is true to say that a great deal more is known to-day than three years ago when this research started, and many factors of unsuspected significance have been revealed. It has, for instance, been appreciated for many years that movement of molten metal due to convection currents can take place in the mould cavity after a casting has been poured, and that such movement is one of the several factors influencing the process of solidification.

B.S.C.R.A. research at Durham University, using radioactive isotopes, has demonstrated that, arising from convection, movement of metal between the feeder head and the casting proper takes place to an extent that had not hitherto been recognized. This movement can be shown to take place in a directly similar manner when studying castings made from stearin wax in place of steel, and when using a coloured dye in place of radioactive iron. Further research in this field will no doubt reveal whether or not this movement by convection should be promoted or retarded, depending upon the effect to be achieved. This, of course, represents no more than a small corner of the whole picture, and it has been used merely to demonstrate that such background work is proceeding and that, at the same time, its bearing upon ultimate practice in the foundry is being maintained throughout.

Burnt-on Sand

It is no doubt fitting, particularly in the light of the problems that burnt-on sand can present, that of the several long-term investigations that were sponsored in the universities by the B.S.F.A. Research and Development Division during its first few months of operation, the first two of these related to an elucidation of the causes of sand penetration by molten steel. This work was commenced in Cambridge in 1950, and still continues. It has been found possible to produce in the laboratory precisely the same phenomenon as that which occurs in industrial practice. This in itself is not necessarily claimed as any outstanding achievement, but it does mean that one can proceed to examine the " burning-on " process under conditions that are quantitatively varied and controlled. It is likely that within the foreseeable future there will be established the relative importance of the various factors which determine whether or not metal penetration of the mould face occurs and burnt-on sand results. This is neither, of course, the answer to the problem in industry, nor does its realization automatically mean that burnt-on sand in steel foundries will disappear overnight.

Having, however, established the necessary conditions in respect of metal and mould that will prevent burning-on, the way opens to reproduce, or to attempt to reproduce, such conditions in liquid steel moulds in the course of casting manufacture. To achieve this in respect of the molten metal may be relatively easy, but to do so in respect of the mould into which the metal has to be poured is another matter. It is visualized that in order to achieve this latter objective, it will be necessary to evolve what amounts to an entirely new and comprehensive technique for the control of moulding-sand properties, and for the assessment of mould and core quality, a testing technique in fact that bears little relation to anything that has been applied in practice to date. It is believed that laboratory sand-testing, as it is generally known in steel foundries to-day, is relatively useless and that the future will see this superseded by a combination of laboratory and shop-floor high-temperature tests, based upon the direct use of liquid steel. An essential feature of such mould and core control technique will, it is visualized, be the direct correlation between high-temperature tests conducted on the moulding sand,

with examination and testing by non-destructive methods, needless to say, of the same sand when incorporated in actual production moulds. In fact, subject to the approval of the Council, research specifically intended to evolve a technique for moulding-sand control, and for mould and core testing along such lines, will very shortly be put in hand. The need for such practical measures, while appearing very obvious in the light of present-day knowledge has, without question, been brought more rapidly to the forefront as a result of the several fundamental research projects conducted both in Sheffield and Cambridge.

Interim Measures

It may of course with good reason be said that research of this kind takes a long time. It may also be asked "what can the steelfounder do in the meantime to prevent the customer getting castings with adherent sand in dangerous proportions and in undesirable locations, such as have been demonstrated. Assuming for the time being that burnt-on sand on certain types of castings is inevitable, the obvious answer is surely that the steelfounder faced with this problem should see to it that he detects the adhering sand before it leaves his foundry, by such means for example as acid pickling, and, secondly, that he should then proceed to remove it, employing again if necessary, and if practicable, such techniques as "powder washing," which, as a result of co-operative development—it can hardly be called research—it has been found possible to introduce during the last two or three years into steelfoundry practice. The powder-washing technique (which was also demonstrated in the exhibition) enables adherent sand to be removed rapidly and completely by means of an oxy-acetylene flame into which iron powder is injected.

Research on Hot-tearing

The incidence of hot-tearing, *i.e.*, the local rupturing of steel castings while still at high temperature and still in their moulds, is a matter of considerable consequence to producers and indeed, it must be admitted, on occasions to the user also. Hot-tears qualify for at least as much attention from the research angle as internal shrinkage cavities and the adherence of sand to the surface of steel castings.

Some details of the B.S.C.R.A. research on hot-tearing have been provided in the exhibition, and test apparatus has been developed and is being applied to assess quantitatively the resistance of the various classes of mould refractory and of bonding agent used in steelfoundry practice to the contraction of molten steel when such materials are incorporated in a mould. In this research a test casting is moulded in such a way that its contraction after solidification is hindered by a block of the mould materials under test, the force exerted on the test casting by the moulding materials being indicated by a calibrated beam, and the casting itself of course being examined for the incidence of hot-tears after it has been removed from the mould.

Data arising from this research show that very marked differences have already been shown in the characteristics of a large variety of well-known steelfoundry moulding materials, clays and other binders. The importance of this work obviously lies in the direct assistance it will give the steelfounder in enabling him to select, for castings that are prone for design reasons to hot-tearing, those moulding materials which will minimize such defects.

It may be noted that these B.S.C.R.A. tests related to the hot-tearing problem make direct use of molten steel to assess the property of a mould material, and this point has special significance in the light of what was said earlier, *i.e.*, that revolutionary changes in the routine testing of steelfoundry moulding sands and in the control of foundry moulds are foreseen. In this principle appears to lie the key to many moulding-sand and refractory problems with which the steelfounder, and possibly founders in other metals, are at present faced. The application of the principle to steelfoundry moulding sands in a manner practicable in the laboratory and on the foundry floor will no doubt require time and ingenuity.

Science into Practice

In this relatively short statement, steel castings research has been referred to as being undertaken by individual companies, and particularly by the co-operative arrangements initiated some four years ago and now sponsored by a major portion of the steelfounding industry. It has been endeavoured to show that this co-operative research is being conducted energetically and that it is being aimed at problems which have a very real significance, not only to the steelfounder himself, but also to his customer. While extensive research of a fundamental character is being sponsored by the steelfounding industry, in the universities and elsewhere, at the same time work is in hand upon a large number of short-term problems, which collectively have as their object early and measureable improvements in quality, in productivity and in manufacturing costs.

However, purposely left until the last is the most important and crucial issue of all. This refers to the putting into practice of the developments and advantages that achieved through research efforts. This problem, known to be common to research and to industry throughout the world, has been the subject of a great deal of comment in this country, in so far as it affects British research and British industry, and it is undoubtedly a problem which exercises the minds of everyone concerned with this country's economic welfare.

As far as the steelfounding industry is concerned, it is believed that a present-day research association is not only charged with the discovery of new information, but that it has an overwhelming responsibility for helping in any way it can towards the use in industry of scientific knowledge and of developments in technology that are already available. In setting out to reach this goal, or to use the more popular cliché—to help in "bridging the

Research as it Affects the Customer

gap" between theory and practice—it has been found necessary to depart in some respects from what may be regarded as research-association tradition.

"Bridging the Gap"

It may be unorthodox, but true, that there is in practice very little value in the written report, issued at what is normally regarded as the conclusion of a research project. A written report provides, of course, an essential record, but in industry it is very little use, however popular its language, in the operation of "bridging the gap." In common with other research associations, the B.S.C.R.A. issues research reports, and through the medium of the Press, members of the B.S.C.R.A. are advised of the progress of work, and indeed of any developments of importance which may be learned. Members are kept posted on scientific and technical articles relating to steel castings technology, in whatever countries these may appear; but, necessary as these publications may be and helpful as they undoubtedly are in their particular way, neither one nor all of them are exhaustive. On the contrary, it is believed that only by direct demonstration of a new process, a new technique or of improved methods of inspection or manufacture can any tangible and lasting result be achieved within a reasonably short period of time. There can be nothing more certain than the fact that the potential users of research in industry should not be expected to believe or to be convinced, unless they can see for themselves that the results of research are all that they are claimed to be, and that they do unquestionably fit into industrial practice. It is also realized only too well that it is frequently not enough that the management of a member firm should know the value of a new technique or a new development, or is it usually sufficient that a firm's senior technicians and shop superintendents know of such developments. It is found in practice that it is highly desirable that such information be transmitted directly to those working on the foundry floor itself. Where all concerned can see the value of a technique or a process, there is a real possibility that the process will be appreciated and applied.

Three Methods

Three main forms of demonstration are open; first, where practicable and where manpower is available, the plant or apparatus, or whatever it is, can be taken to each member foundry and demonstrated in action; second, it can be demonstrated by motion films; and, third, a demonstration can be given in the B.S.C.R.A.'s own research stations, the importance of which has already been stressed in another connection.

The value of direct demonstration is believed to be much enhanced if supported by discussion among those in industry concerned with the application of a process or a technique. This important element of discussion, which is rated second only to demonstration, has been introduced through the medium of technical discussion groups, meetings of which are held in various localities, and to which B.S.C.R.A. member firms can send as many representatives as they wish, depending upon the subject. Through these discussion groups, it is not only possible to pave the way for the application of developments, but it is also possible to find out the difficulties and practical obstacles that may be in the way of application. This is, of course, not the whole story, but it is an important part of it and it is believed that along such lines the British Steel Castings Research Association can give an increasing and effective return to the industry that formed it and of which it is part. Its measure of success in doing this will, it is suggested, ultimately be determined by the extent to which its research work and its development undertakings affect and benefit the industry's customers.

Canadian Iron and Steel Output

Canadian pig-iron production in April, 1953, was 241,583 short tons, of which 4,465 tons was foundry iron and 23,077 tons malleable iron. This compares with 214,330 tons in April, 1952. Steel ingot production was 351,907 tons (252,684 tons basic open hearth), as against 304,956 tons in the same month last year. Steel castings output amounted to 10,384 tons, against 11,685 tons in April, 1952.

Production for the first four months of this year was at a higher rate than in the same period of last year, 949,943 tons of pig-iron being produced, compared with 863,400 tons, and 1,401,976 tons of steel ingots and castings against 1,278,936 tons.

Copper Semi's Investigation

The President of the Board of Trade has requested the Monopolies and Restrictive Practices Commission to extend its factual investigation of semi-manufactures of copper and copper-based alloys to the bearing of the facts upon the public interest.

In a written Parliamentary answer recently, Mr. Peter Thorneycroft, making this announcement, said that the commission having investigated and reported on the facts of the industry, he had now asked it to proceed with its investigation and report whether the conditions revealed operated, or could be expected to operate, against the public interest.

Changes of Name

The undermentioned companies are among those which have recently changed their names. The new titles are shown in parentheses.

J. A. DOMENET, LIMITED, steel makers and converters, etc., of Stoke-on-Trent (Akron Standard (Engineers), Limited).

STRUCTURAL & MECHANICAL DEVELOPMENT ENGINEERS, LIMITED, Slough (Bucks) (S.M.D. Engineers, Limited).

SIR W. G. ARMSTRONG WHITWORTH & COMPANY, (IRONFOUNDERS), LIMITED, Jarrow (Co. Durham) (Armstrong Whitworth (Metal Industries), Limited).

SULPHURIC ACID and ground sulphur were freed from price control by the Minister of Materials on August 4.

A CONTRACT for the supply of 10-ton Diesel locomotive cranes for Burma, valued at £42,000, has been secured by Thomas Smith & Sons (Rodley), Limited, Leeds.

Fuel and Power

The British Productivity Council is giving detailed consideration to the formation of the new industrial fuel efficiency company on the lines of the report of the Pilkington Committee, said the MINISTER OF FUEL AND POWER recently. Further details would not be available until the memorandum and articles of association of the company had been completed.

There had been 34 applications received in connection with the experimental industrial efficiency loan scheme during the first year of the operation which ended on May 29, involving £249,707. Applications withdrawn numbered 14, and 13 had been rejected; they represented a sum of £189,847. Three applications valued at £13,900 were under consideration and four loans had been granted to a value of £45,960.

The expanded loan scheme came into operation on June 25 this year, said Mr. Lloyd. All loans granted after May 29, 1952, would be treated under the arrangements applicable to the expanded scheme.

Winter Cuts Again

Arrangements for spreading the load on power stations this winter are to be the same as last year. This was announced by Sir Walter Monckton, Minister of Labour, in the House of Commons recently. He said in a Parliamentary reply that no national load-spreading target would be set but that regional boards for industry should have discretion to make arrangements in the light of conditions likely to arise in their areas.

All possible encouragement would continue to be given to the use of private generating plant and domestic and small commercial consumers would again be asked to exercise maximum economy during the hours of peak load.

New Equipment

Electron Microscope. One of the more outstanding items of interest at the recent eighth annual exhibition of electronic devices held at Manchester by the Institute of Electronics (N.W. branch) was the RCA electron microscope, table model, permanent-magnet type. Characterized by the utmost simplicity of operation, the instrument has a resolution of 100 A., yet it is small enough to be mounted upon a desk or laboratory table. Magnetic lenses in the microscope are energized by permanent magnets, thus eliminating lens coils and their associated power supplies. Direct magnifications of 1,500, 3,000 and 6,000 times are possible, depending upon the pole-pieces being used, and images may be photographed upon two-inch square plates. Such images may be enlarged up to ten times, thus providing a maximum magnification of 60,000 times. Amongst other applications, this compact and simple microscope should be a most useful tool in the control and examination of metallurgical processes.

High-speed Portable Grinder. A new 6-in. portable electric heavy duty grinder—type GQ6—has now been added to the range of Wolf Electric Tools, Limited, of Ealing, London, W.5. It is powered by a special type of motor, which possesses high speed/torque characteristics and the peripheral speed of the grinding wheel is 8,800 ft. per min. For this reason a fast cutting resinoid bonded wheel is fitted and the wheel guard is a heavy steel pressing. Ordinary vitrified wheels should on no account be used with this model. This new machine is of interest for all engaged in fettling and general foundry grinding.

French Al/Cu Alloy

As a high-strength alloy, the French authorities have standardized a heat-treated aluminium/copper alloy, under the number A-U5GT, Its percentage composition is of the order of:—Fe <0.35; Si <0.30; Cu 4.20 to 5.0; Zn <0.10; Mg 0.15 to 0.35; Mn <0.10; Ni <0.05; Ti <0.30; and total other impurities <0.20.

No individual impurity element should exceed 0.10 per cent. The minimum mechanical properties of the alloy are *as sand cast*: Breaking strength 19 tons per sq. in.; elastic limit 11.4 tons per sq. in.; elongation 5 per cent. and Brinell hardness 85; *as die-cast*: 21 tons; 12.7 tons; 7 per cent. and 85 respectively.

The heat treatment is as follows:—Solution treatment between 525 and 530 deg. C. for from four to six hours, followed by quenching in cold water; finally, there is an ageing at room temperature for five days. The resistance of this alloy to corrosion is poor and, as its foundry properties are not good, the design of the castings and their moulding must receive close attention. It is to be recommended where high mechanical strength of the castings is desired.

Production Engineers' Awards

The Institution of Production Engineers announces that the following medal awards for 1951-52 will be made at the annual dinner in the Guildhall, London, on October 9:—

Best paper presented by a member: Mr. A. Cameron, A.M.I.PROD.E., works director of Victor Products (Wallsend), Limited, Wallsend-upon-Tyne, for his paper, "Increased Productivity by Workshop Practice."

Best paper presented by a non-member: Dr. J. D. Jevons, B.SC., F.R.I.C., F.I.M., chief metallurgist, Joseph Lucas, Limited, Birmingham, for his paper, "How the Production Engineer Can be Helped by the Metallurgist." This is the second time Dr. Jevons has won this award, the previous occasion being in 1945-46.

Hutchinson Memorial Award, 1952 (*for the best paper presented by a graduate*): Mr. J. E. Poulter, ceramic development engineer, industrial ceramics division, Doulton & Company, Limited, London, for his paper, "Industrial Application of Porous Ceramics."

Aluminium Development Association

The annual report of the Association just issued covers its eighth year of activity. It records how, during 1952, no fewer than 2,750 enquiries have been answered; nearly 132,000 publications have been issued, and 38 lectures and 400 film shows were given by the staff. Work is being undertaken to develop the use of light-alloy castings in building, and experiments are being made on the brazing of castings to form composite entities and the welding of castings to wrought alloys.

Growth of World Trade

The growth in trade volume in the world between 1946 and 1951 was unprecedented, although the development took place at a time when many governments were maintaining severe restrictions on imports. The total volume of world trade last year was only slightly below the record level established in 1951, according to the provisional figures. The latest report of G.A.T.T. (General Agreement on Tariffs and Trade), entitled "International Trade 1952," points to the fact that this expansion depended largely on the stimulus of U.S. economic aid, which amounted to $35,000 million between 1945 and 1952, equivalent to about one tenth of the total value of international trade during that period.

U.S. Aid for U.K. Industry

In a White Paper issued on August 5 the Government sets out its plans for spending over £3,000,000 of "Counterpart Funds" derived from United States Economic Aid. The main groups of expenditure will be:—Advisory service, £457,500; research, £589,500; education and training, £519,000; publicity, £188,400; "revolving loan" fund, for short-term loans to industry and agriculture, £1,000,000; contribution to European productivity agency, £257,000. This gives a total of £3,011,400, leaving £201,600 unallocated reserve.

Advisory Service

Of the total allocated to advisory service, £25,000 has been allocated to the Department of Scientific and Industrial Research for the development of advisory services in industrial engineering, and in the use of measurement techniques developed in the National Physical Laboratory, and £125,000 for assistance to research associations (in conjunction with trade associations where suitable) for either the development or the initiation of advisory services. Grants worth £72,000 are made to a number of trade and employers' associations to enable them to employ consultants on such subjects as cost accounting, factory layouts, and organization and the deployment of labour. The British Institute of Management receives £35,000 for research and the preparation and provision of information on certain management subjects of importance to productivity, and for the general extension of the institute's information and research departments to handle the demand which will arise, and to disseminate information which will be made available, as a result of the Conditional Aid programme.

The British Productivity Council and the National Union of Manufacturers receive grants of £44,000 and £5,000, respectively.

In the research field, £210,000 is granted for economic research, £190,000 for social research, and £75,000 for research in production economics. The last programme will include such items as the innovation and development of new ideas; the flow of scientific and technical information to industry and its relation to innovation and industrial efficiency; the economics of re-equipment; and the measurement of productivity and the causes of variation of industrial efficiency.

The research programme will be carried out under the ægis of the Department of Scientific and Industrial Research and by research associations and other bodies.

The sum for education and training will include £290,000 for universities for the endowment of three Chairs or Readerships in engineering and related subjects. It is hoped that two will be at Imperial College of Science and Technology, London; of these one will be in heavy electrical engineering and one in production engineering (to foster post-graduate studies in the fields between engineering, economics and industrial psychology).

A grant of £130,000 for technical education will cover the creation of teaching posts in industrial engineering and establishments of further education and the provision of scholarships in methods engineering, work study, and personnel management. In Northern Ireland, £20,000 will be allocated for the provision of assistance towards the development of engineering training facilities at Queen's University of Belfast and the Belfast College of Technology.

The Department of Scientific and Industrial Research receives £6,000 for assistance for technical and management training in the cast-iron industry.

A "revolving loan" fund of £1,000,000, includes £700,000 for industry. An advisory committee for short-term loans to industry has been set up and consists of:—Sir John Woods (chairman); Mr. David Colville, Colonel E. R. Mayer, Sir Andrew Naesmith, Mr. S. J. Pears, Lord Piercy, Mr. W. W. S. Robertson, and Dr. Harold Whitehead.

An announcement will be made shortly inviting applications and indicating the types of loan which are likely to be approved and the conditions which will be attached to them.

I.V.E. Committees

At a meeting of the Technical Committee of the Institute of Vitreous Enamellers the following sub-committees were appointed and work is proceeding.

"Atlas of Defects" Sub-committee:—Mr. A. Biddulph, chairman and convenor, Mr. J. H. Gray, Mr. S. E. A. Ryder and Mr. A. K. Williams.

Cast Iron for Vitreous Enamelling Sub-committee:—Dr. J. E. Hurst, chairman and convenor, Mr. A. Biddulph, Mr. J. Bernstein, Mr. J. W. Gardom, Mr. H. Laithwaite, Mr. W. Todd, Mr. K. E. Walker, Dr. H. W. Webb and Mr. J. K. Whitaker.

Enamel Standards Sub-committee:—Mr. W. S. Grainger, chairman and convenor, Mr. A. Biddulph, Mr. J. A. Clarke, Mr. S. Hallsworth Mr. H. Laithwaite, Mr. C. P. Stone and Mr. W. Thomas.

Organic Suspension Agents Sub-committee:—Mr. J. H. Gray, chairman and convenor, Mr. J. A. Clarke, Mr. J. J. Guy, Mr. E. Lawrence, Mr. J. Nicholson, Mr. W. A. Ross and Mr. A. C. Smith.

Scumming of Enamels Sub-committee:—Dr. H. W. Webb, chairman, Mr. W. E. Benton, Mr. J. A. Clarke, Mr. A. Murdoch, convenor, and Mr. S. E. A. Ryder.

It is hoped that reports by the Scumming of Enamels and the Enamel Standards sub-committees will be available in the near future. It was also agreed at the meeting to appoint a new sub-committee under the chairmanship of Mr. A. Biddulph, to investigate "The Use of Inhibitors in Acid Pickling for Enamelling."

British Standards Institution

By Monday, August 17, the British Standards Institution will be in full operation at its new premises, No. 2, Park Street, London, W.1 ('phone: MAYfair 9000). The removal is to extend over the whole of the current week. Although during this period some disturbance of day-to-day activities will inevitably be caused, the B.S.I. has arranged that services to its members and committee members are fully maintained. As already announced, the new building will contribute to more efficient working by concentrating the Institution's scattered departments under one roof. It will also provide increased and more convenient accommodation for the 13,000 specialists who attend the 3,500 committee meetings held during the course of each year.

THE TURNOVER of Hick Hargreaves & Company, Limited, Bolton, was increased by over 20 per cent. during the year ended March 31, 1953, said Mr. W. D'Arcy Madden, chairman and managing director, at the company's annual meeting recently. Contracts on the firm's books exceeded £5,000,000, and included condensing plant and feed heating contracts for the British Electricity Authority for commissioning up to the end of 1958. It was hoped to have a new erecting shop in production before the end of 1954.

Personal

MR. G. S. STRACHAN has been appointed production manager of Lightalloys, Limited, Willesden. Formerly he was works manager, Marshall Castings, Limited, Birmingham.

MR. J. GRIMSTON, M.P., a director of Enfield Rolling Mills Limited, has been appointed managing director of the company in place of Mr. C. E. Frederick Plutte, who died recently.

MR. R. J. ASHBY, lecturer in structures at the Imperial College of Science, of London University, has been appointed to the University Readership in Civil Engineering, tenable at the college.

MR. E. M. SUMMERS, who has been general superintendent of Holwell Works, Melton Mowbray, since October, 1949, has been appointed blast furnace general manager at the Stanton Ironworks Company, Limited, near Nottingham, with effect from October 1.

MR. CECIL F. HURST, a director of Samuel Osborn & Company, Limited, high-speed steelmakers, etc., of Sheffield, has been appointed chairman of the Engineers' Tool Manufacturing Company, Limited, Tel-Aviv, the firm's new subsidiary in Israel, which will shortly go into production.

AIR COMMODORE J. A. CECIL WRIGHT, chairman of Warne, Wright & Rowland, Limited, nut, bolt, and screw manufacturers, etc., of Birmingham, left by air on Wednesday to join the company's finance and sales director, MR. J. B. RULE, in Canada, in an exploration of dollar markets in the Dominion and the United States.

MR. GEORGE V. NEWLANDS has been appointed works engineer of Thomas Summerson & Sons, Limited, railway equipment manufacturers, of Darlington, on the retirement of MR. WALTER SCOTT. Mr. Newlands served his apprenticeship with Cammell Laird & Company, Limited, shipbuilders and engineers, of Birkenhead.

MR. TOM BROWN, managing director of Sheepbridge Engineering, Limited, Chesterfield, has returned from Canada. When there he opened a new subsidiary, Sheepbridge Engineering (Canada), Limited, Guelph, Ontario. MR. D. D. CROSTHWAITE, who was formerly at the company's Sutton-in-Ashfield works, is manager of the new works.

ENGR. REAR ADMIRAL C. W. LAMBERT, the retiring general manager of the Scunthorpe works of the Appleby-Frodingham Steel Company (branch of the United Steel Companies, Limited) has been presented with a dining table and eight chairs from the staff of the company. He is 61, and has held the post, and a directorship of the company, since 1948.

MR. J. H. PITCHFORD and PROF. S. ZUCKERMAN have been appointed members of the Scientific Advisory Council to the Minister of Fuel and Power. Mr. Pitchford is managing director of Ricardo & Company, Engineers (1927), Limited, consulting engineers, of London, S.W.1, and is an authority on Diesel-engine design. Prof. Zuckerman had previously served on the council from its inception in 1948, until June, 1952.

LORD RIVERDALE has resigned as chairman and director of High Speed Steel Alloys Limited owing to indisposition. He has been chairman of the company since its formation in 1914, having been a prime mover in its creation when it was necessary to ensure a supply of tungsten to this country and terminate dependence on continental supplies. The Board has appointed MR. LEWIS CHAPMAN as chairman in succession to Lord Riverdale.

Power-Gas Corporation Expansion

A statement has been issued to shareholders of the Power-Gas Corporation, Limited, Stockton-on-Tees, in which it is disclosed that the company expects to spend more than £900,000 on works developments and the acquisition of the remaining one-third of the issued ordinary shares of Rosedowns Holdings, Limited, Hull.

The second phase of the works development programme started in 1949, which embraced the construction at Stockton of a new heavy machine-shop, and an extension of the existing constructional shop, will involve an estimated expenditure of £600,000. In addition to this it will be necessary in the course of the next 18 months to spend approximately £200,000 on the modernization of plant at the Parkfield works.

The purchase of the remaining ordinary shares of Rosedowns Holdings will place Power-Gas in complete ownership of the Hull firm's ordinary share capital.

The directors consider that a proportion of the total outlay of £900,000 can be met out of the company's existing resources, and future retained profits, but that the major part should be raised from the issue of new capital on lines to be considered at an extra-ordinary general meeting of the shareholders in London on August 24.

Resolutions for T.U.C Congress

Two motions on the preliminary agenda for the Trades Union Congress, to be held at Douglas, Isle of Man, from September 7 to 11, arise out of the acceptance of positions on the Iron and Steel Board by Sir Lincoln Evans and other members of the general council. One, from the United Society of Boilermakers, says that if any members should accept similar appointments in future, their resignation from the general council should be demanded. The other says that no further full-time or part-time appointments on any denationalized board should be approved without the sanction of the congress itself.

The foundry workers' and miners' unions advocate the extension of nationalization, and the foundry workers want to include the principle of workers' control. The boilermakers also have a resolution criticizing TUC members of the council for agreeing to the setting-up of local productivity committees on the ground that they infringe on the sovereign rights of affiliated organizations.

Bilateral Trade Negotiations

The report* of the committee appointed by the President of the Board of Trade, Mr. Peter Thorneycroft, to review current procedures for consultation with industry in connection with bilateral trade negotiations has been published by H.M. Stationery Office. The committee, while recognizing that the field of trade subject to bilateral agreements is a limited one, have made a number of suggestions for improving consultation between Government and industry in those cases where it is necessary to negotiate such agreements. In particular they have recommended the appointment of a standing committee, including representatives of the Federation of British Industries, National Union of Manufacturers and Associated British Chambers of Commerce, to ensure that arrangements for consultation are carried out smoothly and in good time to make them fully effective.

* Price 6d., by post 7½d., from H.M. Stationery Office, Kingsway, London, W.C.2, and branches.

European Steel Production

April/May Figures Indicate Levelling off

A possible pause in the general post-war upward trend of steel production in Europe, excluding the U.S.S.R., is suggested by the crude steel production figures for April and May published by the United Nations Economic Commission for Europe. Developments in different countries, however, are not uniform. While the United Kingdom is breaking past records, elsewhere output is relatively stable, except in Western Germany, where output dropped steeply in April and May after reaching a post-war record in the first quarter of the year. Relevant figures are given in Table I.

The trend towards the more rational utilization of scrap through feeding it into steel furnaces, rather than blast furnaces, which could be observed throughout 1952, was maintained in the first quarter of 1953 in Europe as a whole. Table II shows the position. The trade figures in raw materials for the first quarter of 1953, when compared with the corresponding quarter of 1952, reveal that, as regards scrap, U.K. and Italian imports, at 184,000 metric tons and 177,000 metric tons respectively, rose by well over half, while the West German exports became insignificant. U.K. exports of coke rose by 61 per cent. to 461,000 metric tons, and West German imports of iron ore, at 2,596,000 metric tons, were almost half as high again as in the first quarter of 1952.

TABLE II.—*Specific Scrap Consumption in Steel Furnaces, 1952 and 1953.*

Country.	Scrap consumed in steel furnaces as a percentage of steel output.				
	1952.				1953.
	1st qtr.	2nd qtr.	3rd qtr.	4th qtr.	1st qtr.
Western Germany	42	42	43	42	43
France	36	35	33	34	34
Belgium	18	18	18	19	20
Italy and Trieste	81	81	77	81	82
Luxembourg	8	9	8	9	9
Saar	25	23	22	22	22
United Kingdom	56	55	55	59	55
Sweden	58	62	60	62	63
Austria	48	48	51	53	47
Small producers*	64	63	64	67	66
TOTAL (weighted)	43	43	43	44	44

* Denmark, Greece, Norway, Turkey, and Yugoslavia.

TABLE I.—*Production of Crude Steel in Europe, 1952 and 1953 (in Thousands of Metric Tons—annual rate).*

	1952.				1953.		
	1st quarter.	2nd quarter.	3rd quarter.	4th quarter.	1st quarter.	April.	May.
REPORTING COUNTRIES.							
E.C.S.C.—							
Western Germany	15,236	14,900	16,428	16,652	17,144	15,324	13,980
France	10,084	10,012	10,328	11,548	10,924	10,656	10,356
Belgium	5,452	5,080	4,540	5,320	4,896	4,848	4,536
Italy and Trieste	3,484	3,588	3,464	3,604	3,204	2,940	3,216
Luxembourg	3,164	2,884	2,900	3,052	2,768	2,784	2,712
Saar	2,764	2,732	2,860	2,936	2,916	2,676	2,664
Netherlands	584	572	804	772	856	756	—
Sub-total	41,368	40,668	41,324	43,884	42,708	30,984	—
Others—							
United Kingdom	16,244	16,360	15,468	17,316	18,500	18,421	18,525
Sweden	1,608	1,708	1,456	1,924	1,808	1,788	—
Austria	1,108	1,044	1,052	1,028	1,176	—	—
Spain	848	888	920	976	892	—	—
Small producers*	1,200	1,208	1,168	1,316	1,280	—	—
Sub-total	21,008	21,208	20,064	22,560	23,656	—	—
Total	62,436	61,876	61,388	66,444	66,364	—	—
OTHER COUNTRIES.							
Czechoslovakia		3,577†			—	—	—
Poland		3,183			—	—	—
Eastern Germany		1,803			—	—	—
Hungary		1,396†			—	—	—
Rumania		608			—	—	—
Total		10,747			—	—	—
TOTAL (EUROPE)		74,120			—	—	—
United States	98,692	64,716	69,628	105,004	105,220	103,908	108,840
U.S.S.R.		34,500			—	—	—

* Countries which each produce less than 500,000 tons annually, namely: Denmark, Finland, Greece, Norway, Switzerland, Turkey, and Yugoslavia. † Estimate.

Leaders of the Industry.—In this feature item appearing last week, the date of Mr. P. H. Wilson's appointment to the position of deputy managing director of Stanton Ironworks, Limited, was given as December, 1953, which should, of course, have been December, 1943.

The Expenditure of £60,000 has been approved by the Derbyshire Education Committee, for major specialist equipment for the new College of Technology, Chesterfield. This will include scientific and electrical gear, also wood- and metal-working machinery.

News in Brief

THE CONSOLIDATED NET PROFIT of Wagon Repairs, Limited, Birmingham, was £162,454, after tax, in the year ended March 31, compared with £118,592 in the previous year.

A NEW LABORATORY and factory extensions for Electroflo Meters Company, Limited, Maryport, have been completed under industrial development schemes in West Cumberland.

THE BRITISH INTERNAL COMBUSTION ENGINE RESEARCH ASSOCIATION announce that Mr. H. Norman G. Allen has been re-elected chairman of Council for the current year.

C. W. TAYLOR & SON, ironfounders, of Templeton, South Shields, will extend the foundry following the purchase of a site comprising 7,300 sq. yds. adjoining the main premises.

ACROW (ENGINEERS), LIMITED, of South Wharf, London, W.2, have recently been appointed sole agents in Great Britain and Ireland for the Junkers free-piston type of compressor.

THE NEW COLLEGE OF FURTHER EDUCATION, at High Road, Chilwell, Beeston, will open on September 14, and among the courses will be included electrical, mechanical, and machine-shop engineering.

THE FIRST of four large-voltage power transformers, which with three others make up a Canadian contract of $700,000 obtained by Ferranti, Limited, Hollinwood (Lancs), was shipped from Liverpool last week.

A CONTROLLING INTEREST has been acquired in Line Equipment, Limited, switchgear manufacturers, of Bridgend (Glam), by Bowthorpe Holdings, Limited, Crawley (Sussex). The management of the company remains unchanged.

THE VIENNA TRADE FAIR is being held from September 6 to 13, and intending visitors are recommended to write to the British-Austrian Chamber of Commerce, 29, Dorset Square, London, N.W.1, as reduced travelling costs are offered.

TO COPE with an increasing demand, a larger factory is being built at Droitwich for Deritend Precision Castings, Limited, a subsidiary of the Deritend Stamping Company, Limited, Birmingham. Production is expected to start towards the end of the year.

THE DUST CONTROL SYSTEM developed by the British Cast Iron Research Association for pedestal grinding machines will be shown on the stand of the Department of Scientific and Industrial Research at the forthcoming Engineering and Marine Exhibition.

WILLIAM JESSOP & SONS, LIMITED, and J. J. Saville & Company, Limited, have opened a new area office to direct selling activities of the Lancashire and Yorkshire territories. This is under the control of Mr. H. Carr and is situated at York House, 12, York Street, Manchester, 2. 'Phone Manchester Central 9184.

THE OLDBURY TOWN COUNCIL has passed plans for the extension of the iron foundry at Tat Bank Road by the Rood End Foundry Company, Limited. Planning permission has also been granted subject to the submission of a new site of the premises to one only of the two cupolas (to be installed) being used at any time.

WOLVERHAMPTON EMPLOYEES of the Barnett Organization are to celebrate the sixth anniversary of the company on August 21 by flying to Dublin for the day. The party will be headed by Mr. G. V. Paul Barnett, chairman and managing director, and will travel in a chartered aircraft from Elmdon Airport, Birmingham.

FINAL BUILDING PERMITS have been granted for a new 70-ton furnace at the Clydesdale steelworks of Stewarts and Lloyds, Limited. Completion is expected within 18 months, when the increased production of some 2,000 tons will be used in the manufacture of tubes at the works, where a new seamless-tube mill is already under construction.

STEAM ROAD LOCOMOTIVES owned and preserved by the Road Steam Locomotive Preservation Society, the president of which is Mr. Jack Mellor, of Wolverhampton, were exhibited in a show at Hartlebury (Worcs) on August 8. The Society owns ten engines, valued at up to £3,000 each, which have been saved from being scrapped. All are in working condition.

THE BARDIC CROWN which was awarded at the National Eisteddfod of Wales recently, to Miss Dilys Cadwaldr, was made by the Birmingham firm of Arthur and Frank Meredith of Albion Street. They have been making Bardic Crowns since 1949. This year's award was made to the design of Mr. R. L. Gapper, of Aberystwyth University and weighed 2½ lb.

WORK IS IN PROGRESS at the Sheffield works of the English Steel Corporation on three 25-ton transmission shafts for the Forcacava underground power plant—part of a hydro-electric scheme in south-east Brazil. The shafts are 21 ft. long and 34-in. dia., with collars 42-in. dia. A 7,000-ton press is being used to forge them from an ingot with a 64-in. section weighing 60 tons.

THE 1899 DAIMLER touring motor car in which Mr. Ernest Hare of Rotherham, and his son, are hoping to travel from John o' Groats to Land's End in a trip lasting about 12 days and averaging 10 to 12 m.p.h., is not the oldest Daimler still in running order. The first machine was made by the firm in 1897 and the company still keeps as a museum piece a car made in that year. It is still able to run under its own power.

UNDER THE REGISTERED TRADE MARK "Nimoply 75," Henry Wiggin & Company, Limited, now announce the introduction of composite metal sheets, having Nimonic 75 on both sides of a copper base. This metal sandwich is produced by rolling copper between sheets of Nimonic 75, resulting in a clad sheet having many potential uses, not only in gas-turbine construction but also in other fields of high-temperature engineering.

EAST ASIATIC COMPANY, LIMITED, 11, Rue Lefebvre, Saigon, Indo-China, wishes to contact U.K. manufacturers of domestic hardware, pressure lamps and stoves, fork-lift trucks, and various tools. Interested manufacturers should communicate with the company by air mail at the above address, or may consult the company's London office at 21, Mincing Lane and Great Tower Street, E.C.3, and are requested at the same time to notify the Board of Trade, Export Services Branch, Lacon House, Theobalds Road, London, W.C.1 (reference, CRE/24393/53), of any action taken.

JEWEL SALES COMPANY, 464, McGill Street, Montreal 3, Quebec, Canada, wishes to contact UK manufacturers in the plumbing and allied trades, especially ironfoundries making cast-iron bath tubs, basins, sinks, and malleable iron fittings, manufacturers of cast-iron soil pipe, brass tubing, and brass pipe, and foundries manufacturing brass plumbing fittings. Interested manufacturers should communicate with the company at the above address, and are requested at the same time to notify the Board of Trade, Export Services Branch, Lacon House, Theobalds Road, London, W.C.1 (reference, CRE/21460/53), of any action taken.

Raw Material Markets

Iron and Steel

Foundries taking the traditional August holiday week for their annual vacation resumed work on Monday. Some business accumulated during the break, and it was badly needed. This applies particularly to the textile and light foundries and some of the jobbing foundries, which for some time now have been unable to book sufficient orders to keep themselves occupied at anywhere near capacity levels. As most of their business is derived from home consumers, whose holiday period had in many instances coincided with their own, there is no immediate improvement in order books, and although hopeful of a revival of export trade because of the improved financial outlook of some countries abroad, this has yet to materialize in actual business. Fortunately, the engineering and speciality foundries, many of which cater for the busy motor-vehicle trades, the machine-tool makers, collieries, steelworks, and power-plant manufacturers, are much more favourably placed and continue to achieve good outputs. Their future prospects are encouraging and production, if not increased, is likely to stay at present levels for some time ahead, although improved export trade would ensure larger outputs.

As the supply of pig-iron is mainly directed to the steelworks, producers were not unduly embarrassed by the suspension of supplies to the foundries during the holiday period, or on account of their declining demand for supplies due to the recession in trade, except in the case of the furnaces supplying the high-phosphorus irons used by the light and jobbing foundries. For some time demands have fallen much below outputs, and reports are received of the accumulation of stocks at some of these furnaces, the necessity of which will be accentuated by the present suspensions in deliveries. From a financial point of view the foundries are not inclined to add to their stocks at present prices, with little prospect of early absorption due to the present depressed trading conditions.

The makers of the low- and medium-phosphorus irons and hematite have little difficulty in disposing of available supplies to the engineering and speciality foundries, and although a stoppage was enforced while foundries were closed, orders were on hand to absorb accumulated stocks when work was resumed.

The prospect of an improvement in export trade for merchant bars has been revived by the recent reduction in the British f.o.b. price and at the figure of £35 per ton, coupled with the improved financial outlook of some countries abroad, it is hoped that more business will be forthcoming from oversea buyers in the near future. Home trade for small sections, bars and strip is fairly well maintained, but with arrears of orders—the legacy of the shortage of steel—now wiped off, work on hand is insufficient to maintain production at capacity levels, and a much larger volume of business could be accommodated.

Due to holidays, the demand for finished steel has fallen off considerably, but the steelworks continue to turn out their usual tonnage, thus reducing their heavy backlogs still further.

Non-ferrous Metals

During the first few minutes after the signal had been given for a start in copper trading it was apparent that most ideas for the new level of value had been too optimistic, although it is true that the size of the backwardation was less than had been generally anticipated. At the end of the opening session on August 5 the official quotation for electro was £217 10s.. while the forward price was £202 10s. In the afternoon there was a drop of about £5, but in the two following days an improvement was seen and the close on Friday afternoon last was £225 for prompt, and £203 10s. forward.

In the States, where the cutting of the price by a leading Customs smelter had been largely responsible for the lower level at the opening in London, the close of the week saw the situation unchanged at 28½ cents to 30 cents, so that the London parity was a long way below New York. This would appear to be an impossible situation and some adjustment is inevitable.

Recent reports from the U.S. suggest that copper business is brisk there, and that August sales have been quite good. Interest has been aroused, too, by the Chilean Government offer of its unsold surplus of about 65,000 short tons to the U.S. for stock-piling. The basis of the deal is to be the "world price," but as already indicated, there is some discrepancy between London and New York.

Once again there is a threat of labour trouble on the copper belt in Northern Rhodesia, where at three mines African workers may come out on strike. This undoubtedly went some way towards imparting a firm tone to copper last week, and strike action might lift the price still more.

The other metals last week showed a good front, zinc closing with little change at £73 10s. for August and £73 12s. 6d. for November. Price movements in lead were somewhat erratic, for July was up 10s. at £95, while November showed a drop of 30s. at £89. The backwardation widened to £6.

Tin turned round and staged a modest recovery of £10 10s. in both cash and forward, and this may act as an encouragement to users to abandon their recent policy and do some buying. So far it is almost impossible to say much about the course of scrap prices, but on the face of it brass seems to have lost very little ground as a result of the fall in copper. On the other hand, copper scrap has moved down somewhat.

Official tin quotations were as follow:—

Cash—August 6, £576 to £577 10s.; August 7, £582 10s. to £585; August 10, £585 to £587 10s.; August 11, £582 10s. to £585; August 12, £586 to £587 10s.

Three Months—August 6, £572 10s. to £577 10s.; August 7, £580 to £582 10s.; August 10, £582 10s. to £585; August 11, £580 to £582 10s.; August 12, £583 to £585.

The following official zinc prices were recorded:—

August—August 6, £72 10s. to £72 15s.; August 7, £73 5s. to £73 10s.; August 10, £73 5s. to £73 10s.; August 11, £73 17s. 6d. to £74; August 12, £74 5s. to £74 7s. 6d.

November—August 6, £72 15s. to £73; August 7, £73 5s. to £73 10s.; August 10, £73 10s. to £73 15s.; August 11, £73 17s. 6d. to £74; August 12, £74 2s. 6d. to £74 5s.

Official prices of refined pig-lead:—

August—August 6, £92 10s. to £92 15s.; August 7, £94 to £94 10s.; August 10, £95 10s. to £96; August 11, £96 5s. to £96 10s.; August 12, £96 to £96 10s.

November—August 6, £87 10s. to £87 15s.; August 7, £88 to £88 5s.; August 10, £89 5s. to £89 10s.; August 11, £89 10s. to £89 15s.; August 12, £89 17s. 6d. to £90.

Standard copper prices:—

Cash—August 6, £214 to £216; August 7, £217 to £220; August 10, £220 to £222 10s.; August 11, £230 to £232 10s.; August 12, £232 10s. to £235.

Three Months—August 6, £197 10s. to £199; August 7, £203 to £205; August 10, £207 10s. to £208; August 11, £209 to £210; August 12, £214 to £214 10s.

Current Prices of Iron, Steel, and Non-ferrous Metals

(*Delivered unless otherwise stated*)

August 12, 1953

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2:—Middlesbrough, £13 18s.; Birmingham, £13 11s. 3d.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent. P, £16 14s. 6d., delivered Birmingham. Staffordshire blast-furnace low-phosphorus foundry iron (0.10 to 0.50 per cent. P, up to 3 per cent. Si), d/d within 60 miles of Stafford, £17 0s. 3d.

Scotch Iron.—No. 3 foundry, £16 11s., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £18 3s.; South Zone, £18 5s. 6d.

Refined Malleable.—P, 0.10 per cent. max.—North Zone, £19 3s.; South Zone, £19 5s. 6d.

Hematite.—Si up to 2½ per cent., S. & P. over 0.03 to 0.05 per cent.:—N.-E. Coast and N.-W. Coast of England, £16 12s.; Scotland (Scotch iron), £16 18s. 6d.; Sheffield, £17 13s.; Birmingham, £17 19s. 6d.; Wales (Welsh iron), £16 18s. 6d.

Basic Pig-iron.—£14 6s. 6d. all districts.

FERRO-ALLOYS

(*Per ton unless otherwise stated, delivered*).

Ferro-silicon (6-ton lots).—40/55 per cent., £53 10s., basis 45 per cent. Si, scale 21s. 6d. per unit; 70/84 per cent., £82 10s., basis 75 per cent. Si, scale 23s. per unit.

Ferro-vanadium.—50/60 per cent., 23s. 8d. to 25s. per lb. of V.

Ferro-molybdenum.—65/75 per cent., carbon-free, 10s. to 11s. 6d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., carbon-free, £204 to £210 per ton; 38/40 per cent., £235 to £265 per ton.

Ferro-tungsten.—80/85 per cent., 21s. 4d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 24s. 3d. per lb. of W.

Ferro-chrome (6-ton lots).—4/6 per cent. C, £85 4s., basis 60 per cent. Cr, scale 28s. 3d. per unit: 6/8 per cent. C, £80 17s., basis 60 per cent. Cr, scale 26s. 9d. per unit; max. 2 per cent.C, 2s.2d. per lb. Cr; max. 1 per cent. C, 2s. 2¼d. per lb. Cr; max. 0.15 per cent. C, 2s. 3¼d. per lb. Cr; max. 0.10 per cent. C, 2s. 3¾d. per lb. Cr; max. 0.06 per cent. C, 2s. 4d. per lb. Cr.

Cobalt.—98/99 per cent., 20s. per lb.

Metallic Chromium.—98/99 per cent., 6s. 5d. to 7s. 6d. per lb.

Metallic Manganese.—93/95 per cent., carbon-free, £262 to £275 per ton; 96/98 per cent., £280 to £295 per ton.

Ferro-columbium.—60/75 per cent., Nb + Ta, 40s. to 70s. per lb., Nb + Ta.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft, u.t., £25 12s. 6d.; tested, 0.08 to 0.25 per cent. C (100-ton lots), £26 2s. 6d.; hard (0.42 to 0.60 per cent. C), £28; silico-manganese, £33 16s. free-cutting, £28 16s. 6d. SIEMENS MARTIN ACID: Up to 0.25 per cent. C, £32 12s.; case-hardening, £33; silico-manganese, £34 17s. 6d.

Billets, Blooms, and Slabs for Forging and Stamping.—Basic, soft, up to 0.25 per cent. C, £29 16s.; basic, hard, over 0.41 up to 0.60 per cent. C, £30 16s.; acid, up to 0.25 per cent. C, £33.

Sheet and Tinplate Bars.—£25 11s. 6d.

FINISHED STEEL

Heavy Plates and Sections.—Ship plates (N.-E. Coast), £30 6s. 6d.; boiler plates (N.-E. Coast), £31 14s.; floor plates (N.-E. Coast), £31 15s. 6d.; heavy joists, sections, and bars (angle basis), N.-E. Coast, £28 9s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., untested, £32 4s. 6d.; flats, 5 in. wide and under, £32 4s. 6d.; hoop and strip, £32 19s. 6d.; black sheets, 17/20 g., £41 6s.; galvanized corrugated sheets, 24 g., £49 19s. 6d.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £51 14s. 3d.; nickel-chrome, £73 3s. 6d.; nickel-chrome-molybdenum, £80 18s. 3d.

Tinplates.—57s. 9d. per basis box.

NON-FERROUS METALS

Copper.—Cash, £232 10s. to £235; three months, £214 to £214 10s.; settlement, £235.

Tin.—Cash, £586 to £587 10s.; three months, £583 to £585; settlement, £587.

Zinc.—August, £74 5s. to £74 7s. 6d.; November, £74 2s. 6d. to £74 5s.

Refined Pig-lead.—August, £96 to £96 10s.; November, £89 17s. 6d. to £90.

Zinc Sheets, etc.—Sheets, 15 g. and thicker, all English destinations, £102 15s.; rolled zinc (boiler plates), all English destinations, £100 10s.; zinc oxide (Red Seal), d/d buyers' premises, £90.

Other Metals.—Aluminium, ingots, £150; magnesium, ingots, 2s. 10½d. per lb.; antimony, English, 99 per cent., £225; quicksilver, ex warehouse, £70 to £70 10s. (nom.); nickel, £483.

Brass.—Solid-drawn tubes, 20⅜d. per lb.; rods, drawn, 30⅜d.; sheets to 10 w.g., 236s. 6d. per cwt.; wire, 28⅜d.; rolled metal, 223s. 3d. per cwt.

Copper Tubes, etc.—Solid-drawn tubes, 25½d. per lb.; wire, 243s. 6d. per cwt. basis; 20 s.w.g., 274s. 9d. per cwt.

Gunmetal.—Ingots to BS. 1400—LG2—1 (85/5/5/5), £157 to £170; BS. 1400—LG3—1 (86/7/5/2), £170 to £190; BS. 1400—G1—1 (88/10/2), £254 to £285; Admiralty GM (88/10/2), virgin quality, £252 to £300 per ton, delivered.

Phosphor-bronze Ingots.—P.Bl, £265 to £295; L.P.Bl, £215 to £240 per ton.

Phosphor Bronze.—Strip, 330s. 9d. per cwt.; sheets to 10 w.g., 352s. 6d. per cwt.; wire, 42d. per lb.; rods, 36½d.; tubes, 34¾d.; chill cast bars: solids 3s., cored 3s. 1d. (C. CLIFFORD & SON, LIMITED.

Nickel Silver, etc.—Rolled metal, 3in. to 9in. wide × .056, 2s. 11½d per lb.; round wire, 10g., in coils (10 per cent.), 3s. 4½d.; special quality turning rod, 10 per cent., ½in. dia., in straight lengths, 3s. 3½d. All prices are net.

Obituary

MR. THOMAS L. WELLS, who has died at the age of 76, had been a director of Jonas Wells, Limited, brassfounders, of Keighley, for more than 40 years.

MR. TOM PRATT, principal surveyor for Lloyd's Register of Shipping at Liverpool since 1948, died recently at the age of 63.

MR. FRANK HOLDEN WHITELEY, managing director of G. E. Whiteley, metal brokers, of Cleckheaton (Yorks), died recently, at the age of 55.

MR. GEOFFREY EDELSTON TOULMIN, secretary since 1931 of Baker Perkins, Limited, Diesel engineers, etc., of Peterborough, died suddenly on July 27 at the age of 64. He had been a director of the company since 1933.

MR. ALBERT ALLEN, who died recently at the age of 87, was a metallurgical engineer who spent his earlier years in gold and silver mining in many parts of the world. For 15 years he worked at the Imperial Institute, where for some time he was in charge of the Mineral Resources Bureau. He was the author of many monographs on the mineral resources of the British Empire.

MR. NORMAN EBENEZER HEWITT died at his home, Rossall House, Thames Street, Sunbury-on-Thames, on Friday last week, aged 63. The inventor of a number of items of film equipment which are now in use throughout the world, Mr. Hewitt was the managing director of the Hewitt group of companies, comprising Universal Gear Works, Limited, Multiple H. & D. Industries Limited, Leysfield Engineering Company, Limited, and Hounslow Foundry, Limited. He was a member of the National Union of Manufacturers and of Sunbury Chamber of Commerce.

Increases of Capital

ROBERT HYDE & SON, LIMITED, iron and steel founders, axle-box manufacturers, etc., of Stoke-on-Trent, increased by £20,000, in £1 ordinary shares, beyond the registered capital of £40,000.

E. P. JENKS, LIMITED, water and gas fitting manufacturers, brassfounders, etc., of Wolverhampton, increased by £50,000, in £1 ordinary shares, beyond the registered capital of £250,000.

BAXTER & SONS, LIMITED, ironfounders, etc., of London, N.7, increased by £25,000, in £1 5 per cent. cumulative participating preference shares, beyond the registered capital of £2,000.

MANSILL, BOOTH & COMPANY, LIMITED, manufacturers of drop stampings, forgings and castings, etc., of Smethwick, increased by £250,000, in 5s. shares, beyond the registered capital of £150,000.

MACDOWALL EQUIPMENT COMPANY, LIMITED, engineers, machine-tool manufacturers, etc., of Romford (Essex), increased by £40,000, in £1 ordinary shares, beyond the registered capital of £10,000.

THOMPSON & SOUTHWICK, LIMITED, iron and non-ferrous founders, pulley makers, etc., of Tamworth (Staffs), increased by £20,000, in 5s. ordinary shares, beyond the registered capital of £30,000.

Board Changes

STERLING METALS, LIMITED, COVENTRY—Mr. F. Carpenter, sales manager for nearly twenty years, has been appointed to the Board as sales director. Mr. Carpenter has been with the company for twenty-five years.

BIRMID INDUSTRIES, LIMITED—The retirement is announced of Mr. Frank G. Woollard from the Boards of the Birmingham Aluminium Casting (1903) Company, Limited, and the Midland Motor Cylinder Company, Limited, with whom he has been associated as a director for 17 yrs. It is understood that Mr. Woollard will continue with his consulting and educational activities.

CLASSIFIED ADVERTISEMENTS

PREPAID RATES : Twenty words for 5s. (minimum charge) and 2d. per word thereafter. Box Numbers 2s. extra (including postage of replies).

Advertisements (accompanied by a remittance) and replies to Box Numbers should be addressed to the Advertisement Manager, Foundry Trade Journal, 49, Wellington Street, London, W.C.2. If received by first post Tuesday advertisements can normally be accommodated in the following Thursday's issue.

SITUATIONS WANTED

IRON MOULDER seeks position as Foundry Foreman, ferrous or non-ferrous; time served apprenticeship; age 39.—Box 3689, FOUNDRY TRADE JOURNAL.

TRAVELLER calling on Foundries and Engineers in the Midlands wishes to contact Foundry Requisites and Firebrick Manufacturers needing representation on commission basis.—Reply Box 3634, FOUNDRY TRADE JOURNAL.

FOUNDRY MANAGER, 30 years' experience jobbing and repetition; used to full control sales, buying and production, desires change. Willing to take up shares.—Box 3691, FOUNDRY TRADE JOURNAL.

PATTERNMAKER, age 39, first class experience; present position, Chief Patternmaker with textile firm in India. Returning U.K. first week in October, 1953, requires responsible position, pref. Representative position. — Box 3679, FOUNDRY TRADE JOURNAL.

A GRADUATE IN METALLURGY, whose main interest is in foundry techniques and management, seeks a progressive position offering scope for hard work and initiative. Sound industrial experience. Age 28 years.—Box 3687, FOUNDRY TRADE JOURNAL.

FOUNDRY RESINS, CORE SHOP AND SHELL MOULDING. Representative, several years' practical experience technical and commercial, all branches foundry resins, United Kingdom and Continent, desires appointment in Sales/Technical Sales organisation of resin manufacturers. Excellent connections.—Box 3688, FOUNDRY TRADE JOURNAL.

FOUNDRY EXECUTIVE, non-ferrous foundries, M.I.B.F., extensive experience of large and small castings by hand and mass production in all alloys; accustomed to complete control of all departments, and of higher responsibility. Capable administrator.—Box 3692, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT

The engagement of persons answering these advertisements must be made through a Local Office of the Ministry of Labour or a Scheduled Employment Agency if the applicant is a man aged 18-64 *inclusive or a woman aged* 18-59 *inclusive unless he or she, or the employment, is excepted from the provisions of the Notification of Vacancies Order* 1952.

FOUNDRY MANAGER required for Australia. Experienced in Mechanical and Floor Jobbing work, with Metallurgical training. Knowledge Stove and Bath Castings. Salary £A1,500/£A1,700 p.a. plus bonus. First-class passages applicant and family.—Box 3685, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT—*contd.*

FOUNDRY FOREMAN, age 30/35, experienced in ferrous and non-ferrous machine moulding, hand moulding and sandrammer practice, required for Middlesbrough Foundry. — Box 3695, FOUNDRY TRADE JOURNAL.

CHEMISTS required for Steel Foundry control analysis on shift work. Leeds area. Detail training given to suitable applicants if necessary. State age and experience.—Box 3670, FOUNDRY TRADE JOURNAL.

GENERAL MANAGER required for Modern Mechanised Malleable Iron Foundry. Applicants must have excellent production and administrative ability, combined with good educational and technical background.—Apply in confidence to Box 3671, FOUNDRY TRADE JOURNAL.

ESTIMATOR required by Yorkshire Steel Foundry. Applicants must be able to read drawings, must have a knowledge of Foundry processes, and must have experience of Sales or Estimating Office procedure.—State age, career to date, and present salary, to SALES MANAGER, Catton & Co., Ltd., Leeds, 10.

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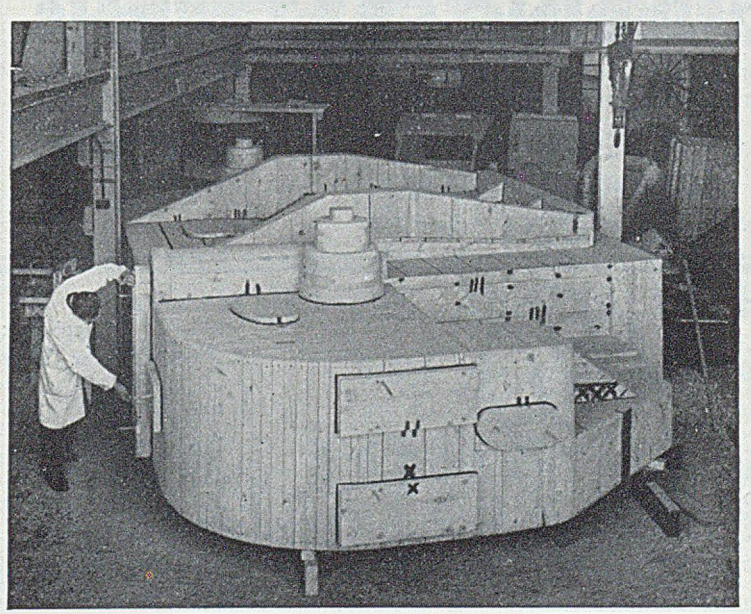

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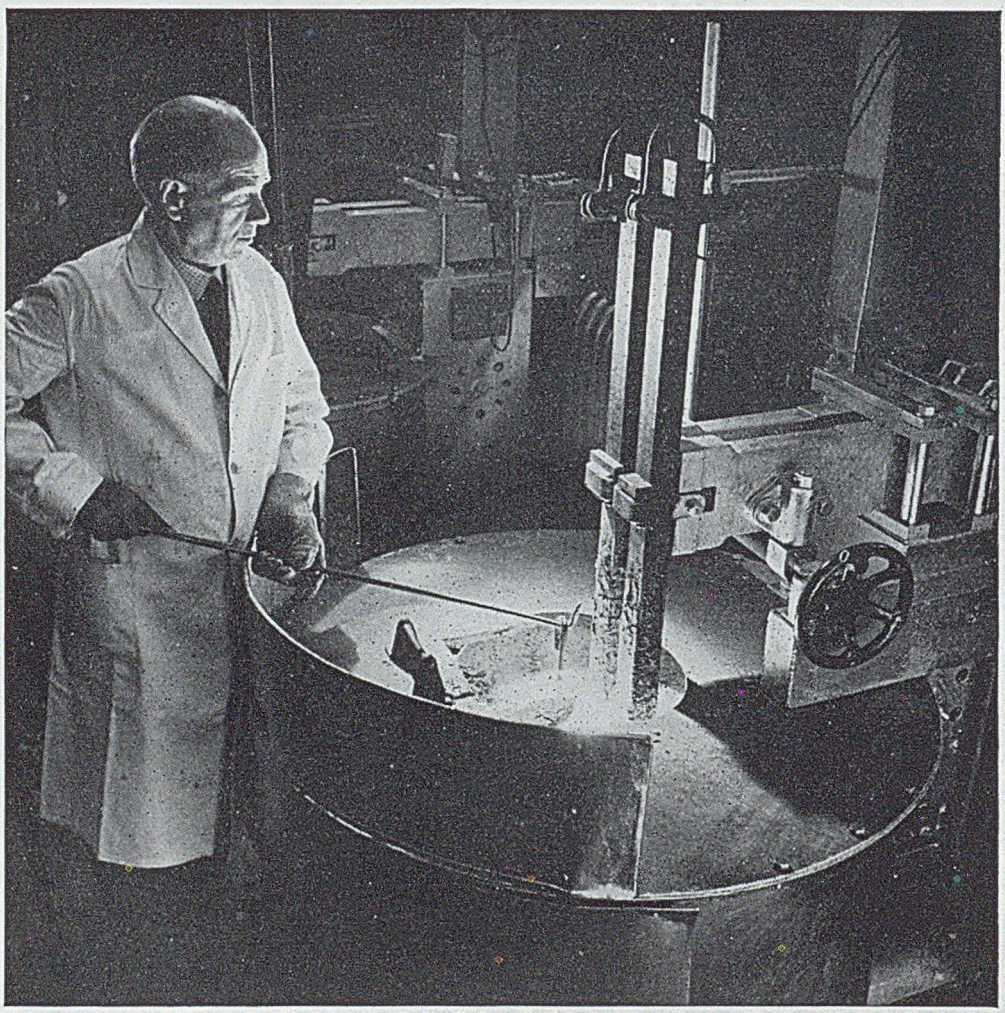

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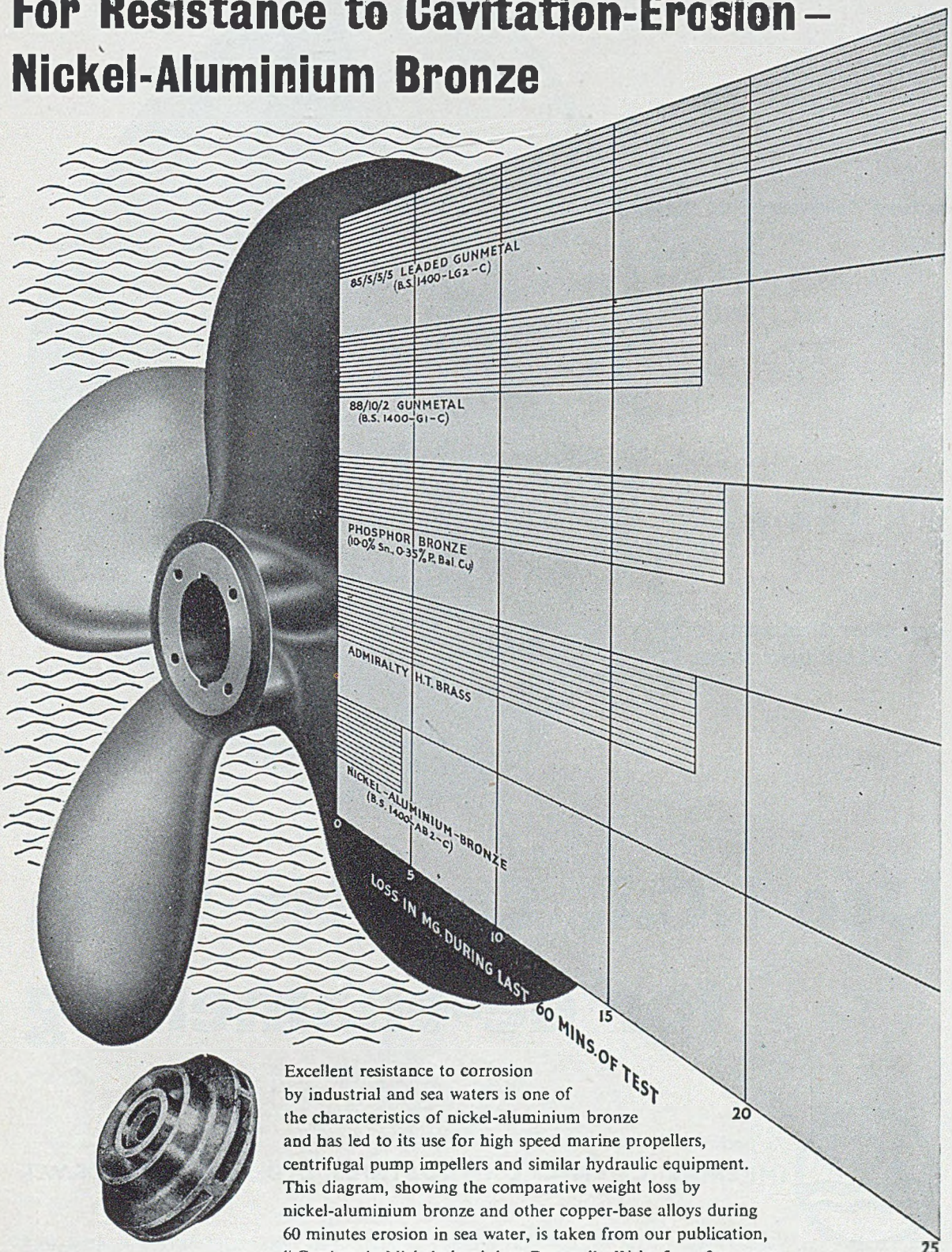

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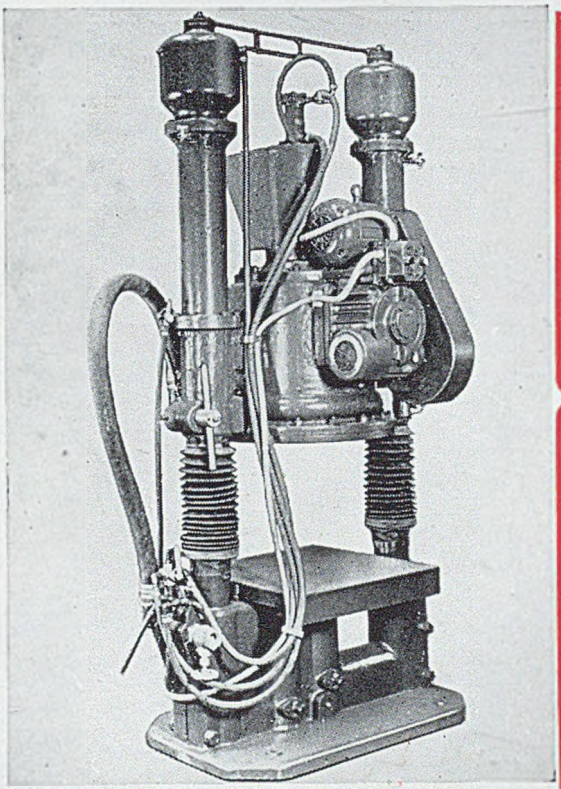

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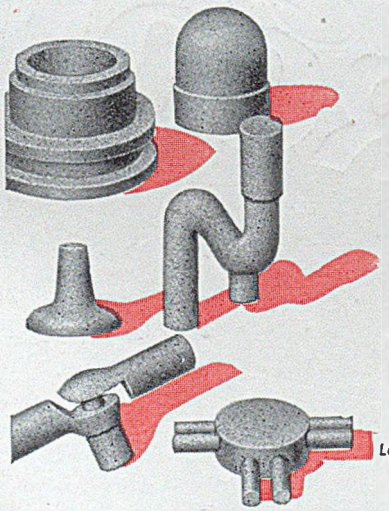

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