FOUNDRY TRADE JOURNAL

EST. 1902

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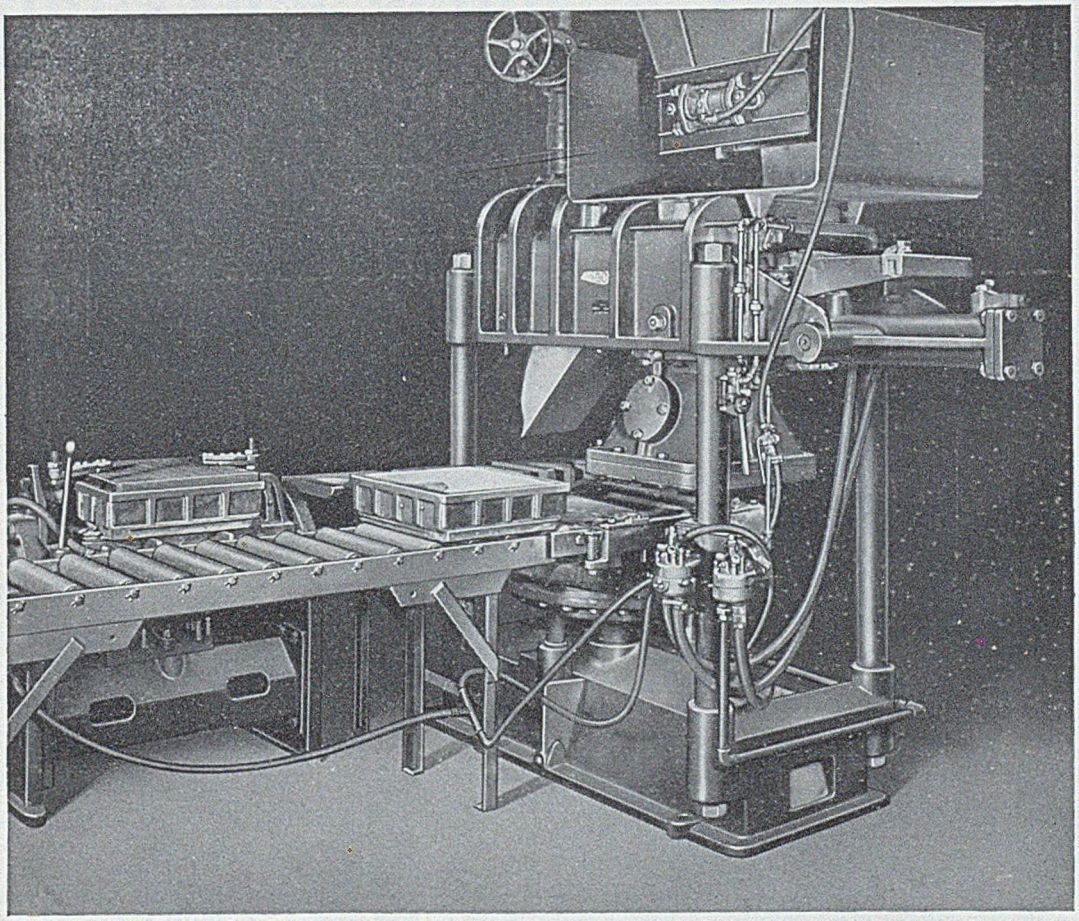


LAY-OUT OF CORE-MAKING EQUIPMENT

LARGE OSBORN COREBLOWER

MAKING LARGE AND HEAVY CORES.

ROLLER CONVEYOR.

ROLLOVER DRAW MACHINE
TO SEPARATE CORE FROM COREBOX

J. W. JACKMAN & COMPANY LTD.

VULCAN WORKS, BLACKFRIARS ROAD, MANCHESTER, 3.

Phone : DEANSGATE 4648. Grams : "BLAST" MANCHESTER.

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.

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.

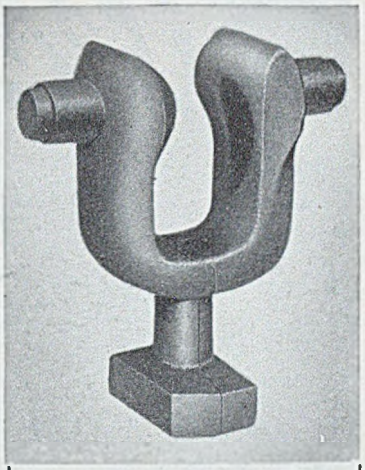
Permol Core Oils are in seven grades, selection being governed by relating dried strength requirements to binder cost. Permol bonded cores have good knock-out after casting.

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

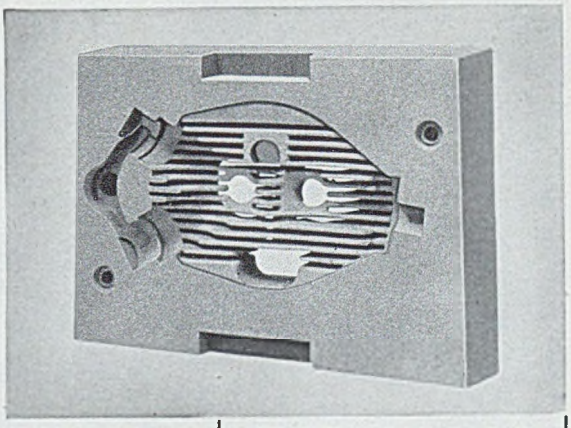
Glyso—Exol Core Powders, a range of cereal powders impregnated with core oil in accurate quantities for different classes of core work.

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

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.



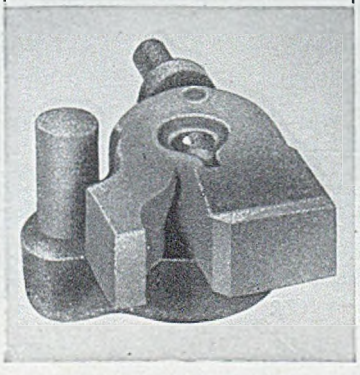
Careful selection from the Glyso range of binders provides exactly the green and baked strengths required.



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.



Full details obtainable from

GLYSO CORE OIL COMPOUNDS

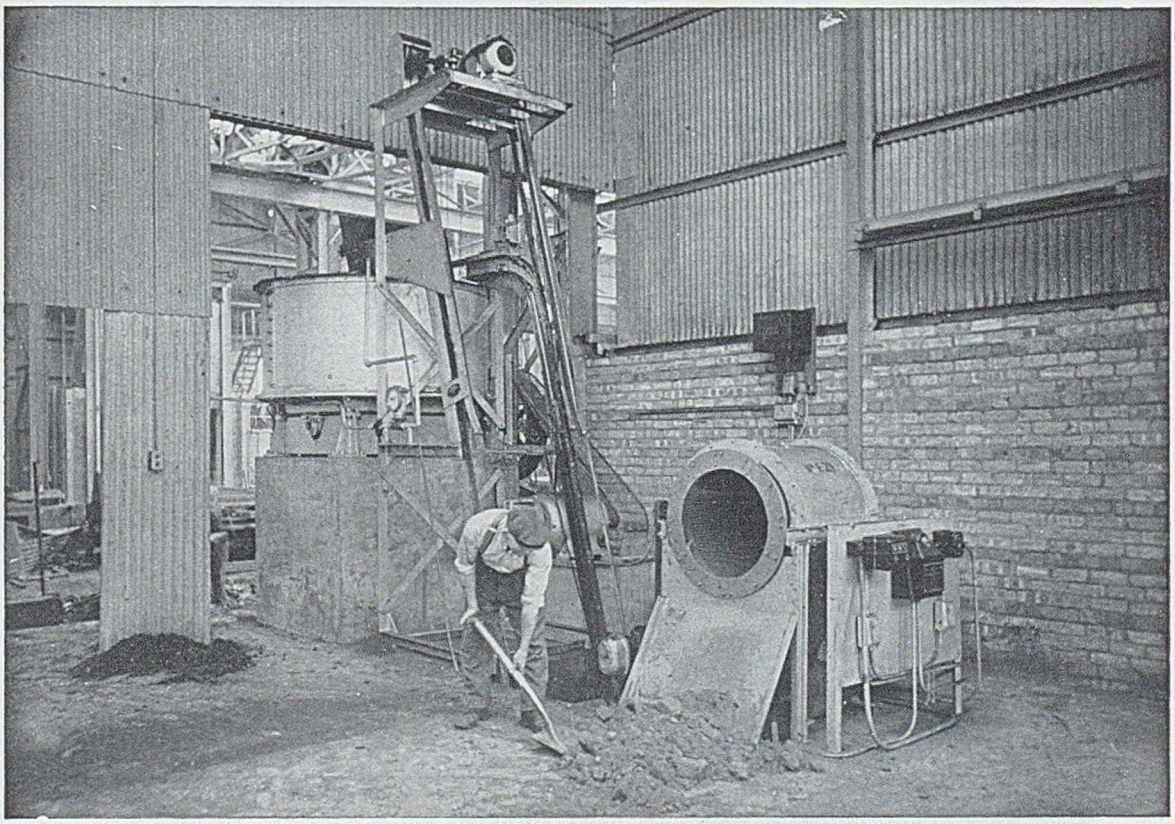
THE FORDATH ENGINEERING CO. LTD.

Hamblet Works, West Bromwich, Staffs.

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

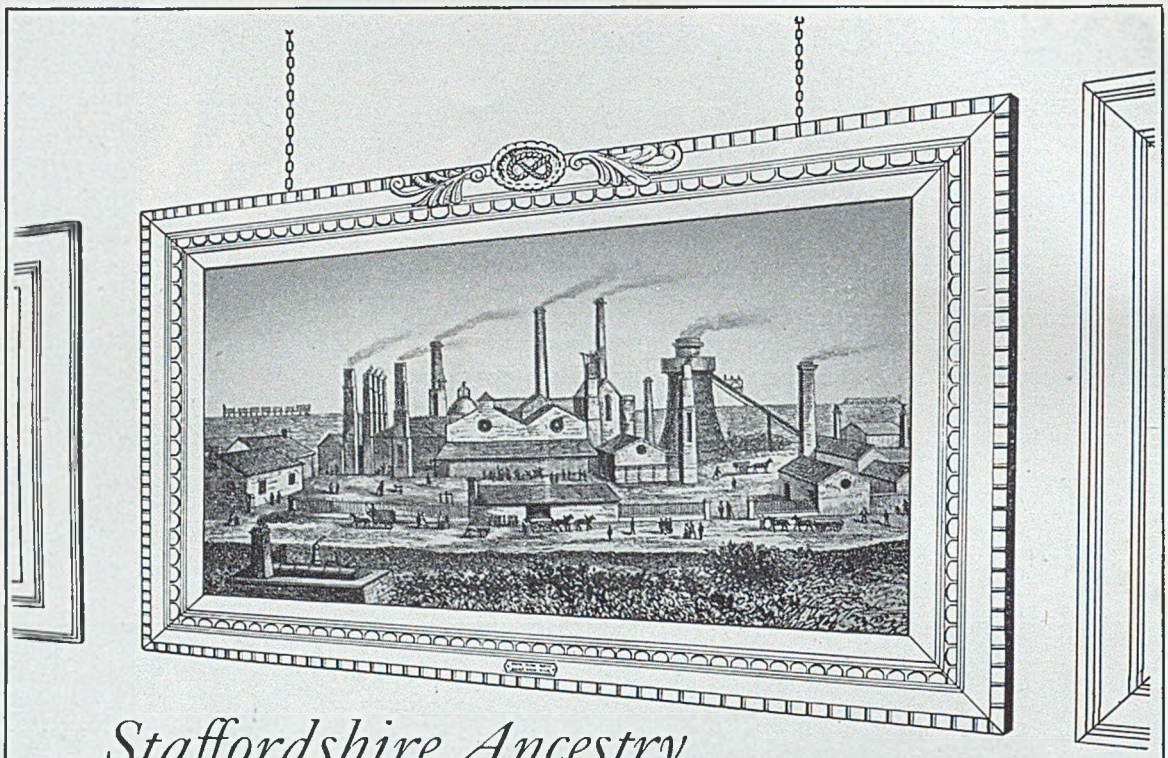
PNEULEC *facing sand plant unit*

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



Staffordshire Ancestry

Since 1700 almost every major improvement in the technique of iron founding has originated in Staffordshire.

No. 5. STONEFIELD IRON WORKS, BILSTON.

At Bilston, during the nineteenth century, an ironmaster might operate his own blast furnaces, puddling and ball furnaces, sheet, bar and hoop mills and mine his own coal, ore, limestone and fireclay, all on the same ground. Here Chambers and Sankey opened their Stonefield Iron Works.

An historian had written in 1817 of a works at Bilston — "The power of the steam engine and other mechanical improvements are here employed to great advantage in the wielding of ponderous hammers of two or three tons in weight . . . and bars of iron from one to four inches thick are sheared off with astonishing facility."

For the past 136 years Pig Iron has been manufactured at Bradley & Foster's Darlaston Iron Works.
Today, Bradley & Foster's spectrographic control of raw material and finished product enables them to supply pig iron of consistent uniformity to the most exacting specification.

• *Pictorial reference is reproduced by courtesy of the publishers of Samuel Griffiths' "Guide to the Iron Trade of Great Britain" to whom grateful acknowledgment is made.*

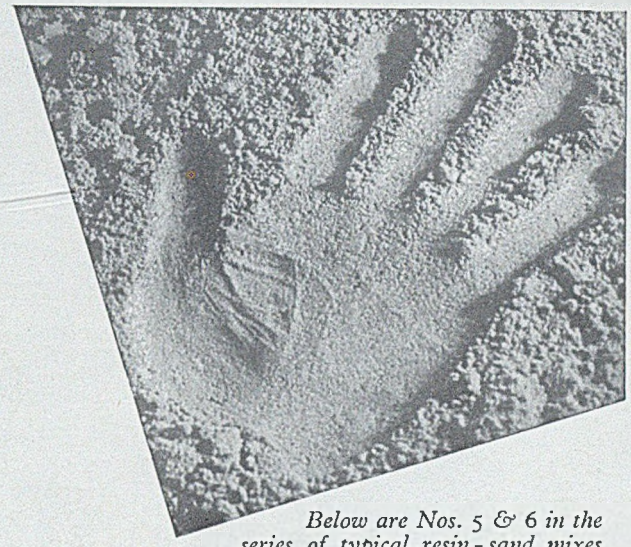
Bradley & Foster LIMITED

FOR QUALITY CONTROLLED
REFINED PIG IRON

DARLASTON · STAFFORDSHIRE

L.G.B.

It looks good!



Below are Nos. 5 & 6 in the series of typical resin-sand mixes being given in these advertisements.

The clear, sharp impressions left in core sand made with THOR are a sure sign of the many outstanding qualities of these core-binding resins.

THOR foundry resins, in fact, meet *all* normal requirements and give in addition numerous advantages. Thus they are enabling the many foundries where they are now in regular use to produce cores better, faster and cheaper than ever before.

These foundries appreciate, too, the service provided by THOR Technical Representatives and the THOR Sand Laboratory. Practical demonstrations (without any interference with normal production), on-the-spot advice and assistance in developing resin-sand mixes to suit special and individual requirements are all part of the service. It is free and available to all.

MIX No. 5

Somerford	100	lb.
Cereal Powder	0.8	,,
Water	1.4	,,
Liquid P/F Resin (THOR SB-109)	1.6	,,
Green Bond	1.05	p.s.i.
Dry Tensile	320	p.s.i.

MIX No. 6

Erith Silica Sand (Dry)	80	lb.
Red Mansfield Clay Sand (Damp)	20	,,
Cereal Powder	2.0	,,
Water	2.5	,,
Liquid P/F Resin (THOR SB-105)	1.0	,,
THOR Parting 203	0.25	,,
Final Moisture Content	3.5%	
Green Bond	2.1	p.s.i.
Dry Tensile	150	p.s.i.

Full details on the complete range of THOR U/F and P/F foundry resins (including Shell Moulding resins) are available on request.

THOR

FOUNDRY RESINS

THOR FOUNDRY RESINS ARE MANUFACTURED BY

LEICESTER, LOVELL & CO. LTD.

NORTH BADDESLEY, SOUTHAMPTON. TELEPHONE: ROWNHAMS 363

Beetle in use No. 24

Since changing to Beetle W20, the knock-out time for these 4 ft. long pillars has been reduced from 5 minutes to about ¾ minute. Hammering to remove the core has been eliminated, consequently reducing from 6 per cent. to nil the number of scrap castings due to breakage during knock-out. Not an easy core to remove, but Beetle's excellent breakdown properties effect substantial economies here, as whenever any knock-out problem exists.

Write for Technical Leaflet C.B.1

B·I·P GROUP

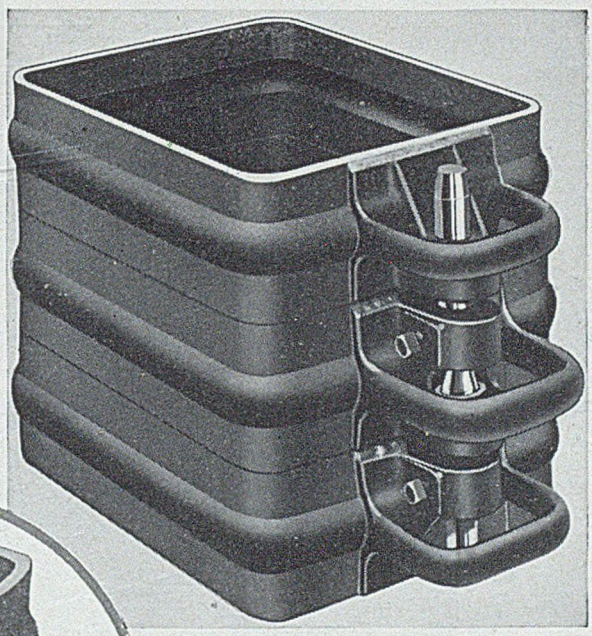
BEETLE RESIN W20 Core-Binder

BRITISH INDUSTRIAL PLASTICS LIMITED, 1 Argyll Street, London, W.1

'BEETLE' is a trade mark registered in Great Britain and in most countries of the world

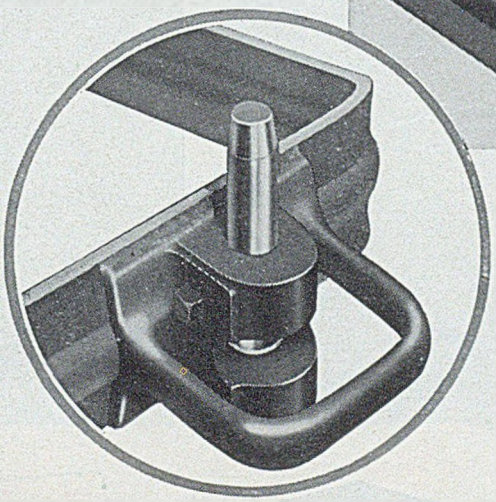
10 good reasons why TALBARD *Moulding Boxes*

are universally popular at home and overseas



Standard 3-part Set.
Type "O" Top and Bottom
Type "M" Middle Part.

TYPE "M" LUG



1 Cast malleable lugs and fittings
2 Accurately ground box faces
3 Precision ground pins adjustable for length
4 Full range of loose pin and multi-part boxes
5 Accurate pin centres and guaranteed interchangeability
6 Renewable steel bushes, round or elongated
7 Straight lifting handles optional
8 Special brassfounders boxes
9 Range of bars, clamps, etc., as required
10 Specially finished and packed for export

These Sections are intended for use with Type "O" Boxes to form 3-part Sets, or may be used in multiples for stacking. Type "M" Lugs are fitted and the Top Section carries a turned and ground pin held in place by a set screw. The Lug Bottom Section is drilled and bushed.

One Type "M" Box can be placed between the Drag and Cope halves of a pair of Type "O" Boxes. Several Type "M" Boxes can be built up to form multi-part sets.

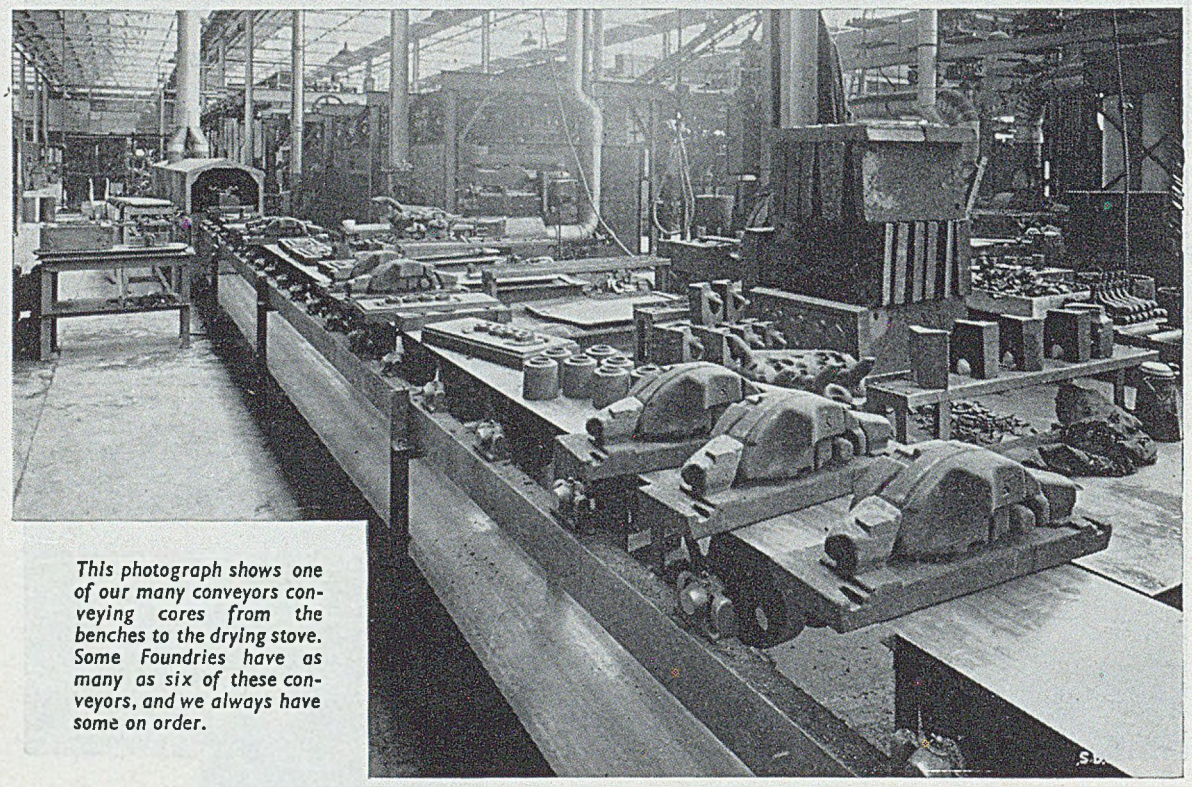
E. TALLIS & SONS LIMITED

TALBARD WORKS, CHARLES HENRY STREET, BIRMINGHAM 12

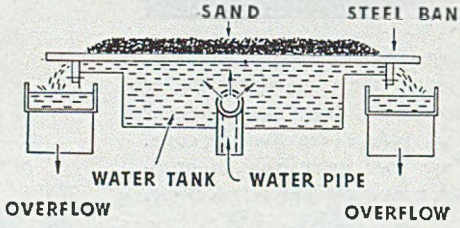
(Phone: MIDland 4387 and VICtoria 2072)

London Office: 47, WHITEHALL, S.W.1 *Phone:* WHITEHALL 7740

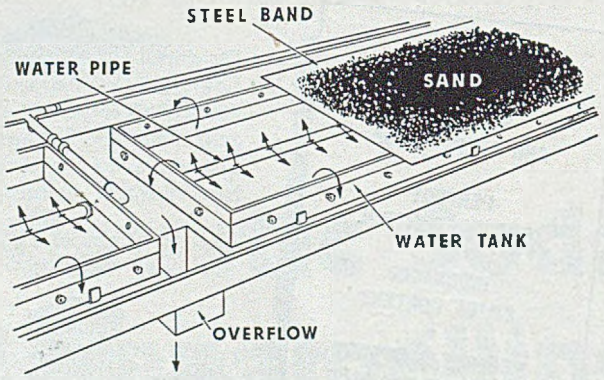
STEEL BAND CONVEYORS
serve the Foundry



This photograph shows one of our many conveyors conveying cores from the benches to the drying stove. Some Foundries have as many as six of these conveyors, and we always have some on order.



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.



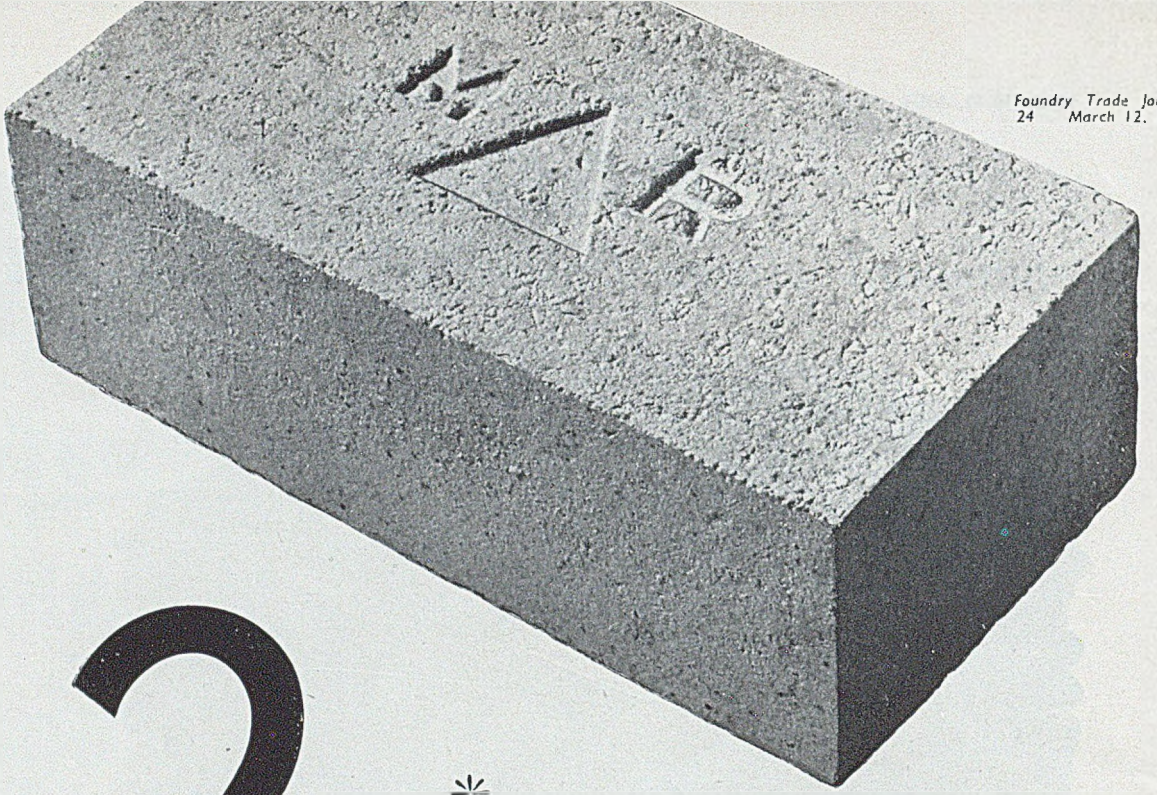
SSBC

3

SANDVIK STEEL BAND CONVEYORS LTD

DAWLISH ROAD, SELLY OAK, BIRMINGHAM, 29

Telephone : SELly Oak 1113-4-5 Telegrams : Simplicity, Birmingham



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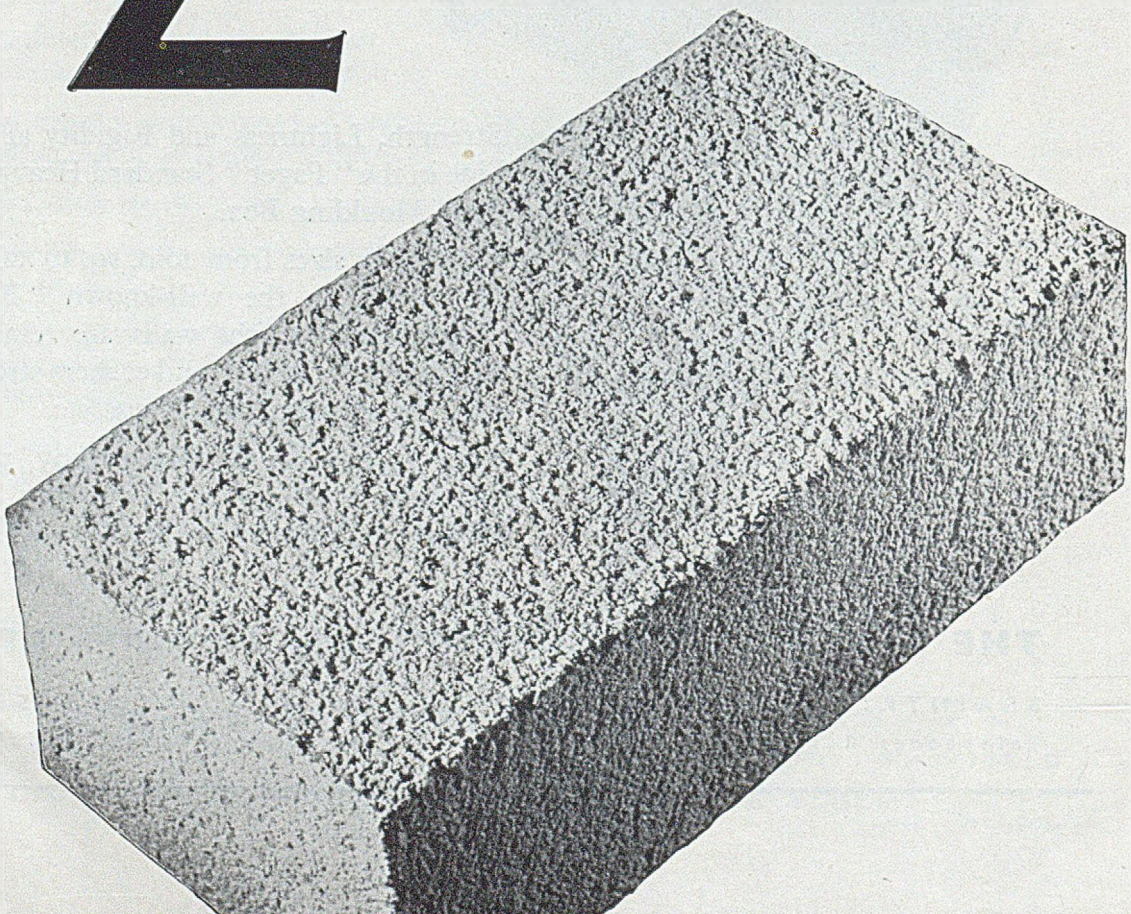
refractories which may well change the

*



Foundry Trade Journal
March 12, 1953 25

* THE MORGAN M.R.1

A brick that carries the ordinary high quality firebrick into entirely new fields of usefulness. It can be used, for example, at temperatures as high as 1600°C—far beyond the capacity of other refractories of similar alumina content: up to this temperature after-contraction is negligible. The strength and resistance to abrasion are unusually high. With these bricks, the conventional standard of comparison—alumina content—is no longer valid. They can be judged only on performance, and in performance they are comparable only with special purpose refractories having a very high alumina content indeed.

How is it done? The answer is in the way they are made: in the selection and purification of the clay; in the unusually hard burning and careful grading of the grog; above all in the very high temperature of the final firing. The manufacturing process is a continuous one—which in itself makes for uniformity—and it is carried out under rigorous quality control. All this costs money—but bricks of this type, although not previously manufactured in this country or in Europe, have been in use for some years in the U.S.A. where they have decisively proved their economy in terms of reduced furnace maintenance.

TYPICAL PROPERTIES OF M.R.1

Approximate Chemical Analysis		
Silica	(SiO_2)	52-53%
Alumina	(Al_2O_3)	43-44%
Iron Oxide	(Fe_2O_3)	less than 1%
Titanium Oxide	(TiO_2)	less than 1%
Magnesia	(MgO)	less than 2%
Lime	(CaO)	
Potash	(K_2O)	
Soda	(Na_2O)	

Physical Characteristics	
Refractoriness ...	Cone 35 (1770°C)
Refractoriness under load (25 lb./sq.in.)	
Commencement of subsidence	1600°C
10% subsidence	1700°C
Bulk density ...	132-137 lb./cu.ft.
After-contraction (2 hrs. 1600°C) ..	less than 1.0%
Thermal expansion ..	4.5 x 10^{-6} per °C.

whole conception of furnace maintenance and efficiency

* THE MORGAN LOW STORAGE REFRACTORY M.I.28

—a brick that can double furnace output. It is a hot-face insulating refractory which can be used at furnace (or interface) temperatures up to 2800°F (1538°C).

At these temperatures it has a lower conductivity than any other type of refractory and therefore provides a greater reduction in the losses from the outside of the furnace. But that is less than half the story. The M.I.28 is only one-third the weight of an ordinary refractory and consequently would require only a third of the heat to raise it to the same average temperature. But, with the same furnace temperature, the average temperature of an M.I.28 is much lower (owing to its lower conductivity), and this still further reduces the amount of heat it takes up. With the same heat input, therefore, furnaces built from M.I.28 bricks heat up rapidly. On batch furnaces the bricks can double the furnace output—to say nothing of the saving in fuel.

There have been hot-face refractories before. What is new about the M.I.28, then? In theory nothing. . . . but in manufacture Morgans have put the whole of the theory into practice. The bricks are made on entirely new plant with scrupulous attention to detail and rigorous quality control from the purification of the clay to the final grinding to size. As in the case of the M.R.1., bricks of this quality have been available for some years in the U.S.A., and the improvements they can make in furnace efficiency have been firmly established.

TYPICAL PROPERTIES OF M.I.28

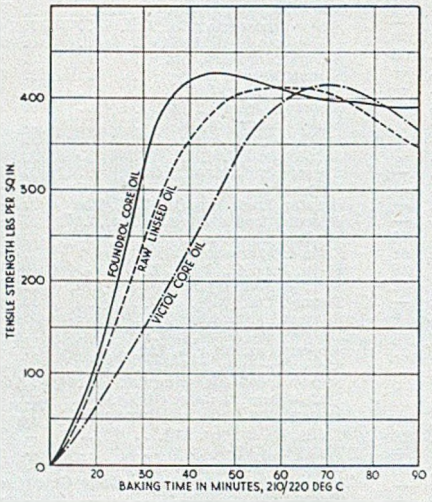
Maximum Service Temperature		1538°C (2800°F)
Thermal Conductivity:		
Mean Temperature	538°C(1000°F)	2.4 B.Th.U./hr.(sq.ft.)(in.)(°F)
	816°C(1500°F)	2.9 B.Th.U./hr.(sq.ft.)(in.)(°F)
Bulk Density		47.5 lb./cubic ft.
Refractoriness		1710°C (3110°F)
Modulus of Rupture		greater than 120 lb./sq.in.
Heat Capacity Factor		0.105
(the ratio of the heat stored in a M.I.28 furnace wall relative to that stored in a firebrick wall of the same area, and of a thickness giving similar hot and cold face temperatures)		

MORGAN refractories ARE WORTH FAR MORE THAN THEY COST

THE MORGAN CRUCIBLE COMPANY LTD.
Battersea Church Road, London, S.W.11. Tel: Battersea 8822

INDEX TO ADVERTISERS

VICTOL & FOUNDROL Core Oils



RATE OF BAKING OF VARIOUS CORE-OIL 2% WT. IN CONGLETON SILICA SAN S BAKING TIME @ 210°-220° C. D

Do you require High-Grade Core-Oils with properties excelling Linseed Oil or Low Priced Core-Oils which still produce excellent cores?

VICTOL & FOUNDROL CORE-OILS WILL MEET YOUR NEEDS

4 reasons for using VICTOL & FOUNDROL CORE-OILS

they will

1. IMPROVE YOUR PRODUCTION AND SAVE MONEY
2. GIVE HIGHEST DRY STRENGTH AT COMPARATIVE PROPORTIONS
3. GIVE MAXIMUM GREEN BOND
4. GIVE NORMAL OR SHORTER BAKING PERIODS

★

FREE SAMPLES · PROMPT DELIVERY
FINEST QUALITY · LOWEST PRICES

★

Let us also quote you for
RESIN BINDERS - CORE COMPOUNDS - CEREAL BINDERS - DRY AND OIL IMPREGNATED

HARBOROUGH CONSTRUCTION CO. LTD

MARKET HARBOROUGH
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3.

FOUNDRY TRADE JOURNAL
Established 1902
WITH WHICH IS INCORPORATED THE IRON AND STEEL TRADES JOURNAL

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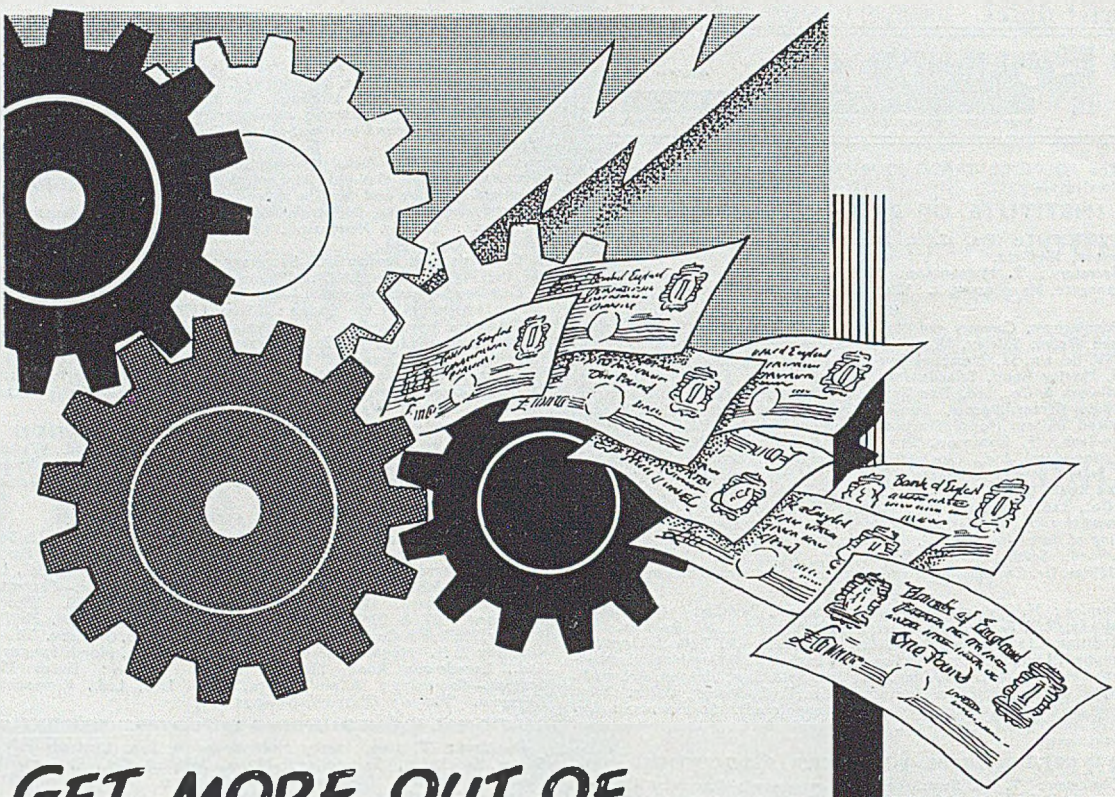

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PRINCIPAL CONTENTS

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American Aid to British Productivity

Last week, a Government White Paper announced an agreement as to the allocation of a sum of £3,000,000 which the United States Government is placing, through the M.S.A. Economic Aid Scheme, for use by this country to sponsor schemes for increasing productivity. Help is to be given under four headings and we deem the fourth to be the most important. This heading details a scheme for making available short-term loans to industry from a £1,000,000 fund for equipment and reorganization of plant, especially by means set out in the various Anglo-American Council reports. The administration of the fund is to be undertaken by a committee or committees drawn from the Federation of British Industries, the National Union of Manufacturers and the Trade Union Congress, but these people are to be members of the committee as individuals not as delegates or representatives. The object of any loan made is to be for the increase of production and productivity used "so as to promote an expanding economy capable of providing a progressive increase in standards of living."

Another activity to be supported is the provision of advisory experts, especially for the smaller concerns; these are to be drawn from either the research or business organizations and will be under contract for the British Productivity Council or with the Department of Scientific & Industrial Research. This is not such a good proposition as the one commented upon initially. This second aid is for research into factors connected with national economy, that is such matters as incentives; the effects of restrictive practices; and the relative efficiency of competitive and monopolistic enterprise. These seem good subjects, but the later listed items such as "the social psychology of relations between employer, management and employed" will simply mean the postulation of ideas. To quote Mr. Frank Rowe "ideas are ten-a-penny but it takes the hard-working and brilliant man to get them over." At the moment, there are too many organizations producing too many ideas on human relationships and two few brilliant people capable of absorbing them, let alone applying them. This clause could well be allowed to "lie on the table."

The third purpose listed is publicity for productivity and we are promised more films, training courses, conferences and exhibitions. None of these appeals to us, for, as the members of the foundry industry are literate, they can procure most of these things from existing sources, but perhaps other industries are less favourably placed. We hope our American friends will not think us churlish for criticizing their bounteous generosity, for it may be that in some industries all the four purposes listed are germane, but the position of the foundry industry is that all it needs, imperatively, is modern plant and lowered taxation.

Notes from the Branches

Scottish—Falkirk Section

The fourth meeting of the session of Falkirk section of the Scottish branch of the Institute of British Foundrymen, under the chairmanship of Mr. W. Bulloch, heard a paper read by Mr. R. Carswell on "Synthetic Resins in the Foundry." At the outset, the lecturer explained the method by which resins are prepared, and mentioned that synthetic resins are used in many industries, including timber and textiles. In the foundry the resin was used to bond sand in the making of cores and shell moulds.

He explained that this latter process, of German origin, was a method of making sand moulds in the form of a shell for metal castings of very fine finish and to accurate dimensions. Shell moulds could be stored for long periods and had no affinity for water. The equipment required for making shell moulds was comparatively cheap, and consisted essentially of a patternplate of fairly uniform thickness, a sand mixer of conventional design, a dump-box sufficiently large to allow the sand mixture to fall about 12 in. on to the hot patternplate, and a gas-fired oven with a maximum temperature of about 350 deg. C.

Moulding Operations

Stages in the making of the mould were:—The resin-bonded sand mixture was prepared and the patternplate heated to approximately 280 deg. C., and placed over the dump-box which was inverted quickly, thus allowing the mixture to remain in contact with the patternplate, until the desired shell thickness was formed, a matter of 5 to 6 secs. The resin fused by the heat of the pattern and bonded the sand grains together, but the shell was not cured until the patternplate with the coating attached had been baked in the oven at 350 deg. C. for 3 to 4 mins.

The shell was then stripped from the pattern and the plate was then ready for a second cycle. Two half-moulds made in the manner described were clamped together and poured. Gases escaped easily through the mould, thus eliminating back pressure, and castings with a solid, dense structure were produced. Completely automatic machines for this purpose were in use in America and were now becoming available in this country. Claims made for the process stated that considerable economies could be effected by shell-moulding, but the Author's experience did not fully substantiate these.

Mr. Carswell then detailed many tests carried out on core-binding, with both phenol-formaldehyde and urea-formaldehyde resins, but mainly in the latter, because of their lower cost. Mixtures with varying percentages of pitch were also tried, which were said to be less critical to moisture and temperature, and to give a good surface finish on the cores produced.

Mr. Carswell then digressed slightly and mentioned a new core-oil which was being produced at only half the cost of linseed oil. Reverting again to resins, the Author then gave details of the production of heavy cores, and concluded by illustrating a station-frame casting and showing by means of slides the various stages in its production.

London Branch Men-only Dinner. So many applications were received to participate in the annual "stag-party" of the London branch of the Institute of British Foundrymen on March 20 that the lists had to be closed early this week, as all the available places had been taken up. Apologies are tendered to members whose applications have had to be refused.

Iron and Steel Bill

This week, the Iron and Steel Bill was again considered in Parliament, this time at the Report Stage. Answering cricitism by Opposition members for introducing into the Bill a sub-section which removes iron foundries from the supervision of the Board, Mr. Sandys, the Minister of Supply, said the clause was concerned with the Board's veto power and would not affect foundry development.

Mr. F. Lee, who moved an Opposition amendment to delete the new sub-section from the Bill, alleged that Mr. Sandys had bowed to the pressure from the foundry owners. The Minister, Mr. Lee complained, had said that the Board was not intended to concern itself with minor schemes, which affected the well-being of the workers.

The Opposition amendment was defeated by 247 votes to 231, a Government majority of 16.

Use of Steel Levy

Opposition allegations that the Iron and Steel Federation used its special levy for political purposes were refuted by the Minister. Labour members had moved an amendment to the Steel Bill to give the Steel Board power to obtain information from trade associations, and the Minister surprised the Opposition by saying that "under pressure" from the Federation he was prepared to see if the Government could find a satisfactory amendment on similar lines.

He then revealed that the Federation had sent in details of how the special levy had been spent. This levy, he said, had become known as the 1s. a ton levy, and out of £19,000—equivalent to about one farthing a ton—spent on external relations in 1952, an entirely negligible sum could be regarded as in any way spent on political purposes.

He gave this analysis of the way in which the money was spent: visits to works by representatives of the technical Press, etc., £3,500; publication of the Federation's reports. £2,000; subscriptions to other bodies, £7,300; and general publicity—mainly for training and research—£6,200. The remainder of the 1s. levy was accounted for as follows: salaries, rents, administrative expenses, 3½d.; statistical publications, 1½d.; scrap drive publicity, 1d.; training schemes, ¾d.; reserve for capital expenditure, 2½d. and taxation, 2½d.

It was admitted that "several hundreds" had been spent on a pamphlet entitled "Policy for Steel," which was a reply to attacks made on the Federation. The Opposition withdrew its amendment in view of Mr. Sandys' promise, and the Minister was asked to ensure in his amendment that an annual statement would be given by the Federation as to how the special levy was used.

Dinner

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This company entertained their agents and others to dinner at the Dorchester Hotel on March 4. Mr. Vincent Jobson presided and was supported at the high table by Sir John Green, Mr. Eric Bellingham, Mr. W. T. Wren, Mr. R. G. Elliot, Mr. H. V. Shelton, Mr. J. Stanleigh Turner, Mr. H. C. Wilson Bennetts, Mr. Carl Otto (U.S.A.), Mr. J. W. Mactavish, Mr. E. F. G. Slough, Mr. J. Galbraith Sneddon, Mr. G. M. Stephenson, Mr. A. Sykes, Mr. R. G. Leach, Mr. R. J. Moffat, Mr. A. H. Masser, Mr. R. A. Sherman, Mr. A. Young, Mr. C. Insch and Mr. K. C. Bowyer.

Metallurgical Developments in Iron Foundries*

By A. J. D. Black

A review of the ironfounding industry recapitulating much basic metallurgy less well understood by practical foundrymen, and concentrating on recent progress towards the establishment of irons of clearly-identified structures and properties, produced by the exercise of various methods of metallurgical control. A series of excellent micrographs of the typical structures is included.

In his inaugural address to members of the branch, the president used as his theme "The Metallurgist in the Iron Foundry." By way of introduction, the speaker first briefly reviewed the industry's history, including reference to prehistoric times; the Catalan forge; early smithy work; the evolution of the blast-furnace and British iron castings, of antiquarian interest, illustrating his remarks where appropriate. He then passed on to the early contribution to the metallurgy of iron by Turner, and the development of equilibrium diagrams, first of binary iron/carbon alloys and later iron/carbon/silicon ternary alloys.

At this stage, the president described and illustrated the more modern structures of iron and their production in commercial irons; from this section the following remarks have been abstracted:—

Fig. 1, included as a matter of historical interest, shows the type of metal which was produced by the primitive Catalan forge. This is of wrought iron and the structure consists of ferrite (pure iron) with threads of slag running through it in the direction of forging. The six illustrations (Figs. 2 to 7) show photomicrographs of a series of metals with the silicon increasing from a low value amount in a white iron to a high content in a sample with a coarse-graphite structure.

Fig. 2 shows the structure of a low-silicon iron which consists of pearlite (the dark constituent) in a matrix of cementite (or iron carbide). This material has a Brinell hardness of about 400 and is unmachinable (except under special conditions) and very brittle. It is used for some applications where its resistance to abrasion is valuable. Fig. 3 shows the structure of a "mottled" iron. This has a somewhat higher silicon than white iron, but not enough for complete graphitization, and so consists of "islands" of white iron in a matrix of grey iron. Continuing the series, with increasing silicon content, Fig. 4 shows a sample with only a slight mottle. Fig. 5 represents a grey iron with flake or primary graphite, as well as undercooled or secondary graphite. This also shows the dendrites of the original solidification pattern with an irregular graphite distribution, which material is unsatisfactory for many engineering purposes. The secondary graphite, formed after solidification, is the finer graphite lying between the dendrites.

Fig. 6 shows an iron with a matrix of pearlite and the photograph was taken at a sufficiently high magnification to resolve this constituent, which is seen to be formed of alternate plates of iron and of iron-carbide—a type of structure usual in high-strength irons. Progressing further, Fig. 7 shows the coarse graphite found in irons high in carbon and silicon and causing a very weak structure. Other constituents to be seen are ferrite and a very little pearlite. The whole series of sections illustrates the profound change in the form of the carbon which is brought about by the variation of the silicon content, and how the control of this element is used to vary the properties of the castings.

Other Factors

A similar change in the form of the carbon present can also be shown to result from changes in section. Thus with metal of a given composition, the rapid cooling of a thin section tends to keep the carbon in the combined form, while the slow cooling of a heavy casting results in the more complete breakdown of carbides and the separation of larger graphite flakes. It is therefore essential in determining the level of silicon necessary in a casting, to consider the thickness of section of the casting, together with the type of structure desired, and also to make allowance for the amount of carbon

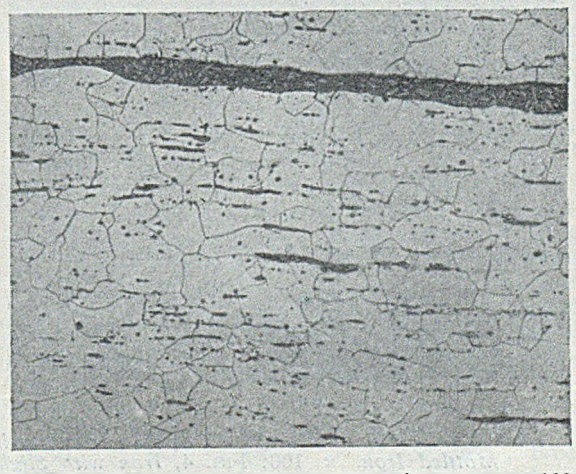


FIG. 1.—*Photomicrograph of Wrought Iron* × 100 *mags, etched 2 per cent. Nital. Typical of Metal produced from the Catalan Forge.*

* Extract from the Author's address on his induction to the presidency of the Scottish branch of the Institute of British Foundrymen.

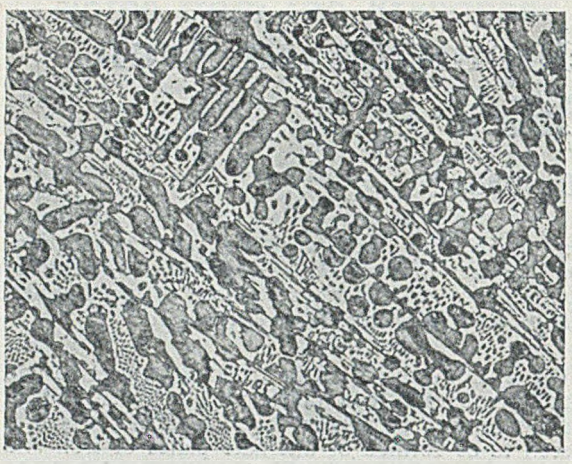


FIG. 2.

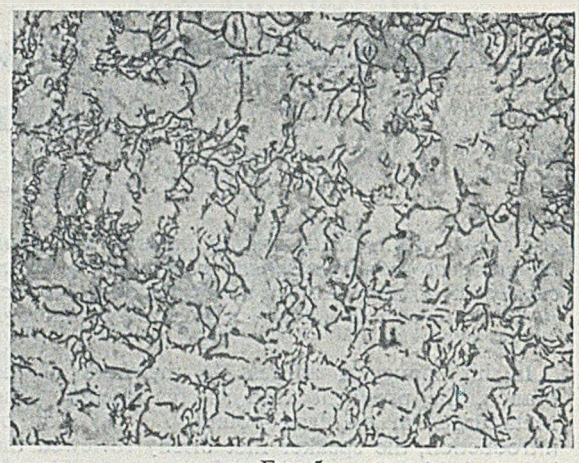


FIG. 5.

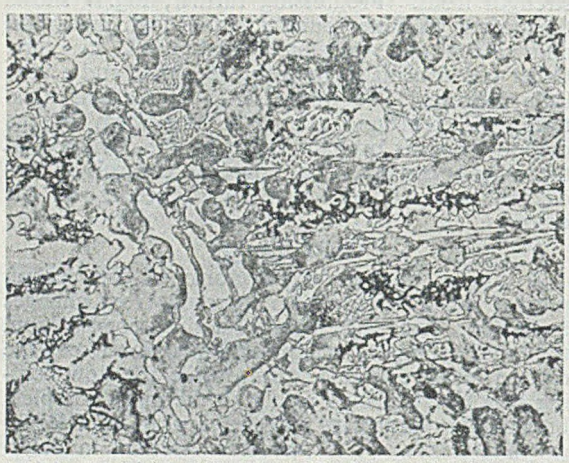


FIG. 3.

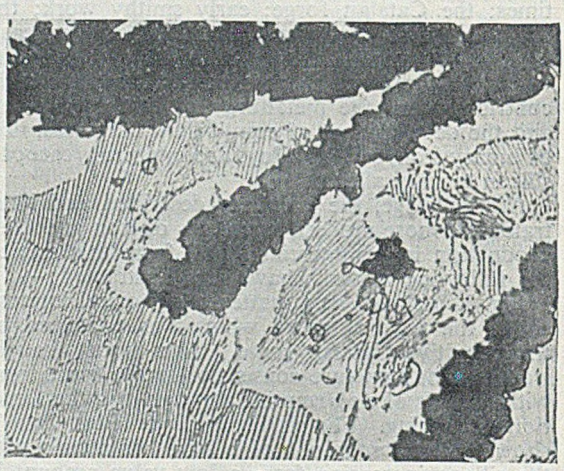


FIG. 6.

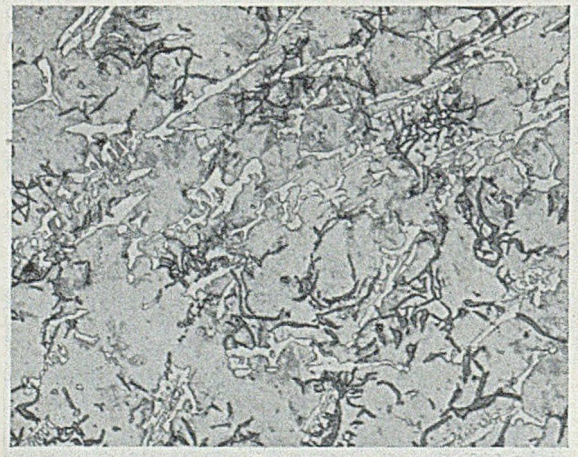


FIG. 4.

FIG. 7.

FIGS. 2 TO 7.—*Photomicrographs of Cast Irons having Increasing Silicon;* FIG. 2, *White Iron,* × 100; FIG. 3, *Mottled Iron,* × 100; FIG. 4, *Iron with Slight Mottle,* × 60; FIG. 5, *Grey Iron showing Flake or Primary Graphite and Undercooled or Secondary Graphite,* × 100; FIG. 6, *Grey Iron at High Magnification* (× 800) *to resolve the Pearlite Matrix; and* FIG. 7. *Coarse-flake-graphite Iron,* × 60. *All etched in 4 per cent. Picral.*

FIG. 8.—*Non-inoculated Grey Iron, superheated before Casting.*

FIG. 9.—*Iron of Similar Type to that shown in Fig. 8, but taken After Inoculation.*

[*Both Photomicrographs at* × 100 *mags, etched in* 4 *per cent. Picral.*]

present. When one considers that the Brinell hardness number of the constituent ferrite is from 75 upwards, and that of pearlite ranges from about 200 to 240, while iron carbide (or cementite) has a hardness of about 550, the effect on the properties of the resultant castings of variations in the form of the carbon become obvious.

Simply by the control of the silicon, early foundry metallurgists achieved a certain degree of control of the properties of castings, but it was found from time to time that cases of anomalous results occurred. The cause of this state of affairs was explained in 1920 when a paper by Elliott showed that the properties of iron could be modified by the temperature of melting. Metal superheated to a high temperature was shown to require a higher silicon content to cause the separation of the graphite than if the same metal were melted at a lower temperature. This delayed separation of the graphite gives rise to the secondary type of graphite, such as in Fig. 5. Arising from Elliott's work, it was later realized by a number of investigators that the "inoculation" of superheated iron just before casting, with any one of a number of inoculants such as ferro-silicon, calcium-silicide, graphite or many others, would cause the separation of the graphite in a finer form than was then thought normal. This resulted in the production of castings with enhanced mechanical properties and it is on the application of these methods that present-day high-duty cast iron depends for its qualities.

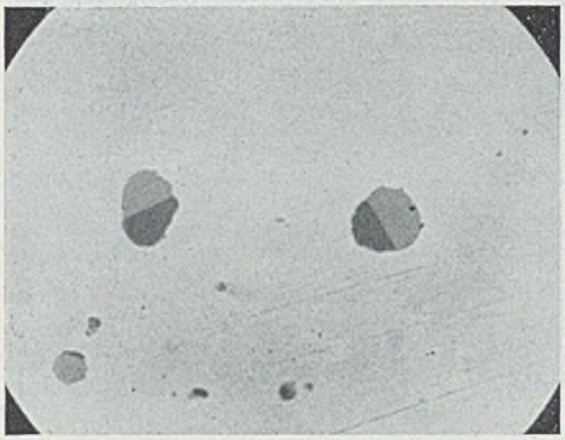
Fig. 8 is of a non-inoculated grey iron, with under-cooled graphite, somewhat similar to that shown in Fig. 5. This iron has been superheated to a high temperature before casting. Fig. 9 is of a similar cast iron after inoculation. The tremendous structure change is quite obvious and consideration of the refinement in the grain of the metal and of the small, evenly-spaced graphite flakes gives a clue to the enhanced physical properties which are found on testing the metal.

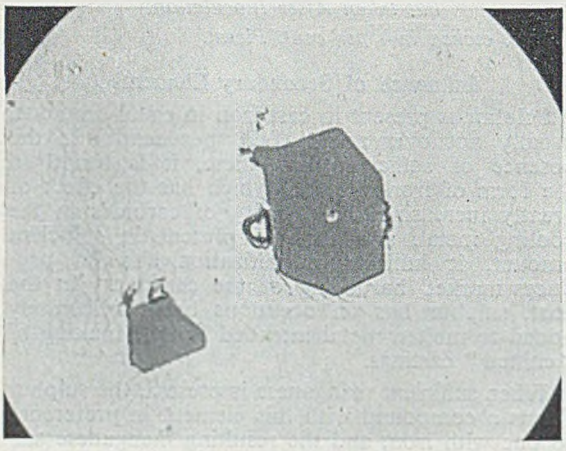
Influence of Secondary Elements

Sulphur is present in cast iron in small amounts, usually not over about 0.120 per cent. In the absence of sufficient manganese, it is found in the form of iron-sulphide, which has the effect of greatly increasing the stability of carbides in the cooling metal, and thus, if present in sufficient amount, it inhibits graphitization and so produces marked hardening of the castings. In the past, sulphur has on occasions been deliberately added to molten metal intended for the making of "chilled" castings.

When sufficient manganese is present, the sulphur forms a compound with this element in preference to one with iron, and the resulting manganese sulphide is found as small dove-grey patches scattered throughout the metal. In this form, while not beneficial, its effect on the strength of the metal is almost negligible. The condition necessary to ensure that the sulphur forms the less-harmful manganese-sulphide is that the manganese content of the metal should have a minimum value of 1.7 times the sulphur content, plus 0.3 per cent. In most cases, the normal manganese content of the iron is found to meet this requirement, but in a few cases it may be necessary to add additional manganese alloy to the charge.

Fig. 10 shows an unusual form of duplex inclusion in an iron structure, the dark portions being manganese-sulphide, and the light portions, iron sulphide. Fig. 11 shows the normal or angular type of manganese-sulphide inclusion. This large type of inclusion is found in cases where the metal is melted and cast at a fairly low temperature, say about 1,350 deg. C., and then only found in non-inoculated iron. Fig. 12 shows a less-common form of manganese-sulphide inclusion which is known as the "anchor" or "elongated" type. This type also occurs only in the non-inoculated iron but this time is more usually to be found in metal melted and cast at fairly high temperatures,





FIGS. 10 TO 13.—*Occurrence of Sulphur in Cast Iron;* FIG. 10 (TOP LEFT) *Duplex Iron/Manganese-sulphide Inclusions;* FIG. 11 (BOTTOM LEFT) *Normal Angular-type MnS Inclusion;* FIG. 12 (TOP RIGHT) *Anchor-type MnS Inclusion; and* FIG. 13 (BOTTOM RIGHT) *Distribution of MnS in Inoculated Iron. Photomicrographs Figs.* 10 *to* 12, *all* × 1,000, *unetched. Fig.* 13, × 500, *etched in* 4 *per cent. Picral.*

say between 1,440 and 1,530 deg. C. Fig. 13 shows the effect of inoculation (with any inoculant except graphite) on the manganese-sulphide in the metal. It will be noticed that the inclusion has been dispersed in very fine particles, and it will be obvious that in this form the effect of the sulphide on the properties of the metal is very much reduced.

Generally speaking, the effect on the metal of sulphur (in the presence of sufficient manganese), and particularly in inoculated irons, is not nearly of so much importance as some authorities state, and at the present time when the availability of foundry coke with low-sulphur content is limited, the tendency is for the suphur content in the castings to be higher than in the past. It is to be noted that work done by Smith and Riggan has shown that sulphur contents up to 0.766 per cent. have but little effect on the tensile strengths of grey irons, while up to 0.20 per cent. has no adverse effect on the machinability of the metal.

Manganese is found to some extent in all pig-irons and therefore all castings. Its effect on the metal is exerted in a number of different ways. Perhaps the most important application, already touched upon, is that harmful effect of sulphur is prevented. In addition, manganese has a slight stabilizing effect on carbides, and if added in sufficient quantity can make the iron "austenitic" at room temperatures. However, in the amounts commonly found, its only observable effect is in neutralizing sulphur.

Phosphorus

Phosphorus is found in all irons in amounts varying from traces up to or above 1.60 per cent. It is the most harmful of the elements which are normally found in engineering castings as it embrittles the iron and at the same time increases the difficulty of getting the castings free from internal porosity. It is commonly stated that the phosphorus in engineering castings may be up to a limit of 0.60 per cent., but a much safer limit is 0.20 to 0.30 per cent. Metal of this composition is

much more expensive, but the improvement in quality makes it well worth while when castings of high mechanical properties are being made.

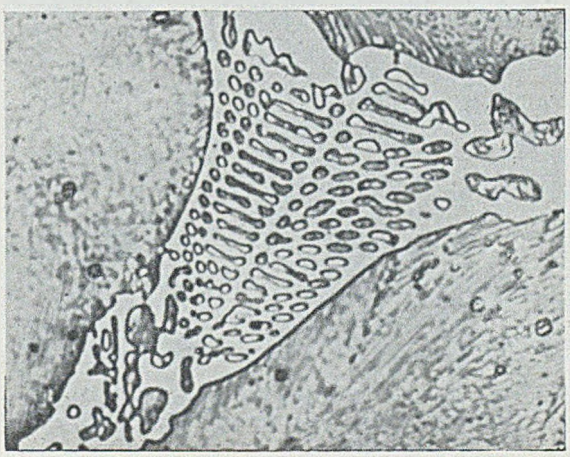
In the manufacture of castings for stove-grate work, however, metal with high phosphorus is usually employed in order to get sufficient fluidity to run the large surface thin-section castings required. In this case, the phosphorus may rise to the maximum of about 1.60 per cent. Fig. 14 is a graph showing the effect of increasing phosphorus content on the length of the spiral-shaped test-casting used in estimating the fluidity of cast iron. Increase in spiral length is shown to be directly proportional to the reduction in the melting point of the metal, which the increase in phosphorus content brings about. Fig. 15 shows the structure of an iron containing phosphide eutectic (a compound of iron-phosphide and iron) which contains about 10 per cent. of phosphorus. The appearance of the eutectic is characteristic. Fig. 16 shows the distribution of the phosphide eutectic in a cast iron fairly high in phosphorus.

Alloying Conditions

Elements so far considered form those usually to be found in most ordinary cast irons, but in recent years the use of additional elements in cast iron to produce metal with enhanced physical properties has greatly increased. These metals include nickel, chromium, molybdenum. A number of others are used to a less extent.

Nickel acts to some extent as a graphitizing agent, but at the same time it refines the pearlite structure, and hardens the matrix. When it is added in larger amounts, an increase in the combined carbon is observed up to the eutectoid amount of 0.80 per cent. Substantial additions of nickel, either alone or with copper or manganese, are used for the production of austenitic irons. Nickel is one of the most valuable alloy elements available to the ironfoundry metallurgist, and much of the success in the production of high-strength irons has been dependent on its use. The use of nickel by itself brings about an increase in the strength of an iron, and by the use of other alloying elements along with the nickel, this improvement can be still further augmented. One other very important effect which results from the use of nickel in iron castings is that the difference in the hardness of the varying thicknesses of the casting is greatly reduced.

Chromium is a powerful carbide-stabilizing agent, and also enters into solution in the ferrite, and in this way increases the hardness of all the structural phases of cast iron, increasing wear-resistance, heat resistance, hardness and strength. It is usually used in amounts under 2 per cent., but for special purposes it may be used up to over 30 per cent. It is generally used in conjunction with nickel or nickel and molybdenum, and when



FIGS. 14 TO 16.—*Occurrence and Influence of Phosphorus in Grey Cast Iron*:—

FIG. 14 (BELOW).—*Effect of Increasing Phosphorus on the Length of Spiral Fluidity Test Castings at Two Casting Temperatures.*

FIG. 15 (UPPER RIGHT).—*Photomicrograph of Iron Phosphide Eutectic,* × 1,000.

FIG. 16 (LOWER RIGHT).—*Distribution of Eutectic in a Phosphoric Grey Iron,* × 100.
(*Figs. 15 and 16 both show specimens etched in 4 per cent. Picral.*)

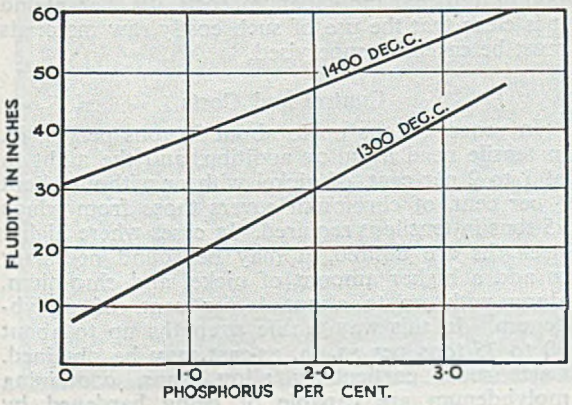


FIG. 17.—*Acicular Structure revealed in a Photomicrograph of an Iron containing Nickel, Chromium, and Molybdenum;* ×600, *etched in* 4 *per cent. Picral.*

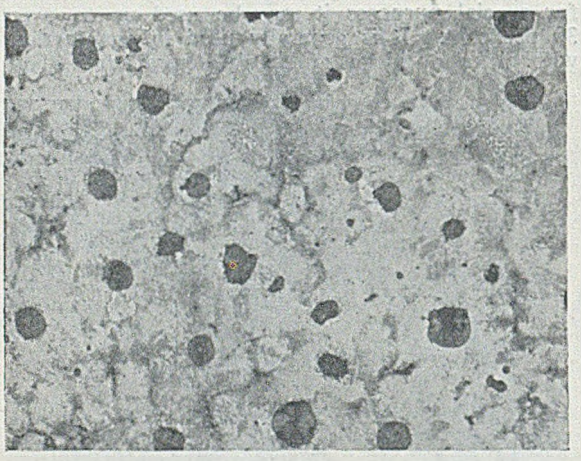


FIG. 18.—*Typical Structure of a Spheroidal-graphite Cast Iron having a Pearlitic Matrix;* ×100, *etched in* 4 *per cent. Picral.*

its carbide-stabilizing effect is neutralized by the graphitizing effect of the nickel, marked improvement in the mechanical properties of the metal is brought about.

Molybdenum has very little effect in carbide stabilizing, and its very marked effect in improvement of the physical properties of an iron appear to be due to its decreasing the rate of breakdown of the austenite formed on solidification—thus pro-producing a fine or acicular pearlite, depending on the amount of molybdenum and other alloying elements present. Fig. 17 is a section of a fully-acicular iron produced with the use of nickel, chromium, and molybdenum additions. This iron is machinable and has a tensile strength of up to 40 tons per sq. in. The actual amount of alloy necessary depends on the section thickness of the casting, and only practical experience in the production of metal of this nature is a real guide to

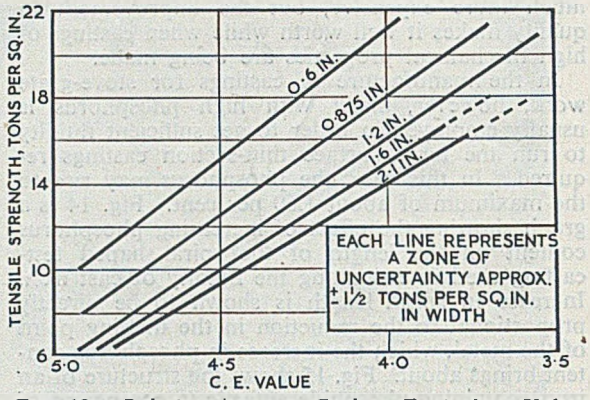


FIG. 19.—*Relation between Carbon Equivalent Value and Tensile Strengths of Grey Iron Test-bars of Various Sections.*

the amounts required. The use of too much alloy causes the acicular pearlite to remain martensitic and therefore unmachinable. Several other elements have been used in cast-iron metallurgy, but these, such as vanadium and titanium, are not used to anything like the same extent as those already mentioned.

Nodular-graphite Irons

During recent years, it has been found that if cerium or magnesium be added in small quantities to molten grey cast iron, a change occurs in the form in which the carbon is deposited. Instead of appearing normally as flake graphite, it is found in the form of rounded nodules, as shown in Fig. 18. It is clear that in this form the carbon does not have the weakening effect on the metal that the flake-graphite has, and iron so treated has tensile strengths up to or over 30 tons per sq. in. with a fair degree of elongation.

Alloying elements are valuable in the hands of the foundryman, but their use has to be carefully controlled, and not least important, the cost of their use has to be considered, as the indiscriminate use of additions to obtain results which can be obtained by the careful control of unalloyed irons, can be the cause of waste. When one remembers that the cost to-day of nickel is about 4s. 6d. per pound and that molybdenum costs 10s. per pound it is clear that the use of such costly raw materials must be carefully supervised.

Control and Costs

In general, irons up to about 20 tons per sq. in. in tensile need no alloy addition, and the addition of 1 to 2 per cent. of nickel with or without about ¼ per cent. of chromium covers those from which 25 tons in tensile is required. In cases where higher strengths are desired, it may be found necessary to add a higher amount of nickel and chromium, along with up to about 1 per cent. of molybdenum. In this way tensile strengths up to about 30 to 35 tons per sq. in. as-cast may be obtained. Cast irons, particularly alloy irons, containing molybdenum are capable of being hardened by

heat-treatment and this property can in certain cases prove very valuable as castings may be machined as-cast and then hardened to resist wear in service. It should also be borne in mind that irons containing molybdenum can be readily machinable even when they show a Brinell hardness of up to 50 deg. higher than the usual limit for unalloyed irons.

In particular, the most critical sections of the cooling cycle for cast irons are:—First, the zone of initial solidification, from 1,250 to 1,130 deg. C., at which point in the case of a grey iron, austenite or primary graphite separate from the liquid, depending on whether the iron is hyper-eutectic or hypo-eutectic in composition, *i.e.*, whether the carbon in the iron is above or below 4.3 per cent.; secondly, the zone from 720 to 650 deg. C. where the austenite transformation occurs and the austenite deposited on solidification changes to pearlite.

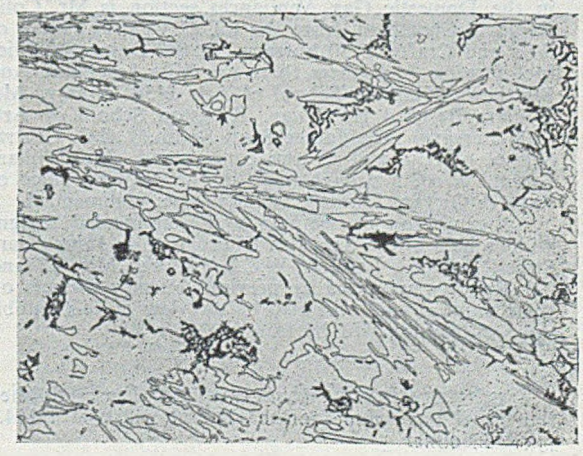
Summarized Effects

Effects of variation in composition are as follow:—

Carbon.—This element gives fluidity to the metal, being about three times as powerful in this respect as phosphorus. There is, however, a limit to the permissible carbon level, as if it is allowed to increase above about 3.2 per cent., a marked reduction in the tensile strength of the iron results. Some authorities link up the physical properties of the metal with the "Carbon equivalent," or C.E. value. The eutectic composition of iron and carbon (as is seen from a study of the iron/carbon diagram referred to earlier, is at 4.3 per cent. carbon. As has also been referred to, the introduction of silicon reduces the carbon necessary for producing the eutectic composition, and phosphorus, too, has a similar effect. Thus, the effect of both these elements is equal to about one third that of carbon, and the carbon equivalent of an iron is, therefore, the actual carbon content per cent. plus one third of the sum of the silicon and the phosphorus contents. Much work has been done relating the carbon equivalent with other properties of cast iron, and Fig. 19 shows the connection between the tensile strength and carbon equivalent for test-bars of various thicknesses. The values shown agree with the results usually obtained in practice.

Applications

Forearmed with knowledge of the properties of the metal, the foundry metallurgist proceeds to arrange the composition required in his metal for the castings being made. He must examine the casting and from this examination, together with experience gained from earlier work, decide what composition will give metal of the desired physical properties in castings of the required section. He is constantly being faced with castings where the designer gives abrupt changes of section, or otherwise has made the task of metal selection more difficult than necessary, and very often has to arrive at a mean value for properties in some parts



FIGS. 20 TO 22.—*Typical Photomicrographs of Highly-alloyed Cast Irons;* FIG. 20 (*below*), *Ni-Hard,* ×150, *etched in* 4 *per cent. Picral;* FIG. 21 (*top right*), *Ni-Resist,* ×100, *etched in* 2 *per cent. Nital; and* FIG. 22 (*lower right*), *Nicro-Silal,* ×150, *etched in boiling* 10 *per cent. HCl.*

of a casting in order to ensure that other parts will be machinable.

Having fixed the composition of the charge, the metallurgist must take steps to ensure that the practice is satisfactory and in foundries where engineering castings of different compositions are made in the same day's work it must be ensured that the metal is used as specified. This is perhaps the most difficult part of the job and a part which must be properly carried out or the castings will be unsuitable for the purpose for which they are intended. Between tapping the metal from the furnace and its casting, any necessary inoculation up to a maximum of about 2 per cent. of alloy addition may be made. If the composition calls for a higher alloy content than this, the addition, or part of it, must be made to the furnace charge, as otherwise the effect of a large addition of cold alloy to the ladle cools the metal to too low a temperature for pouring good castings.

Highly-alloyed Irons

Brief mention can be made of some of the more common of the special alloy irons. Fig. 20 shows a section of Ni-Hard, a white iron containing Ni 3.0, Cr 0.75, and Si 0.7 per cent., having a structure similar to the ordinary white iron shown in Fig. 2, with the difference that instead of being composed of cementite and pearlite, it is composed of cementite and martensite. The alloy addition has caused the austenite formed at the moment of solidification to change to the intermediate product of martensite instead of the pearlite of the iron of normal composition. As martensite is much harder than pearlite, the resultant metal is much harder than ordinary white iron, reaching a Brinell hardness of 650. It is used in many applications where great resistance to abrasion is called for, such as wearing parts of shot-blast apparatus and the like.

Fig. 21 is of Ni-Resist, an austenitic cast iron containing upwards of Ni 14, Cr 2, Cu 7, and Si 1.5 per cent. This metal has a high resistance to many forms of chemical corrosion and is used in many applications where this property is valuable, such as for chemical works machinery, oil pumps, and the like. The iron is non-magnetic and has a structure composed of austenite and graphite. Fig. 22 is a section of Nicro-Silal, a high-silicon, nickel-chromium iron containing Si 4.5, Ni 18 and Cr 2 per cent. This metal has very great resistance to scaling or growth due to the application of high temperatures, and is used for such castings as furnace parts, fire doors, and the like.

In conclusion, the president acknowledged indebtedness to Mr. W. J. Williams, of the British Cast Iron Research Association, for assistance in preparing the illustrations, and also to Mr. R. R. Taylor, of Robert Taylor & Company, Limited, Larbert, for helpful suggestions.

Industrial Art Bursaries Competition

The bursaries awarded in the Royal Society of Arts Industrial Art Bursaries Competition for 1952 amount to a total in value of £2,225, which compares with £1,750 in 1951, and brings the total sum awarded in these competitions since 1946 to £9,340. In addition to their bursaries, 11 winners will also be eligible for Associate Membership of the Society. There was a record number of entries in the competition; in all, 233 candidates competed from 64 schools and industrial establishments, as compared with 156 candidates from 45 schools and establishments in 1951.

Amongst the list of winning and commended students in the Domestic Gas Appliances section is Mr. Colin Reginald Cheetham, from the L.C.C. Central School of Arts and Crafts; £150 bursary. In the Domestic Solid-fuel-burning Appliances there are Miss Josephine Ann Matthews, Kingston School of Art; £150 bursary. Mr. William Bernard Holdaway, Kingston School of Art; £100 bursary. Mr. James Scott Smith, L.C.C. Central School of Arts and Crafts; commended. Mr. William Easton Wren, a draughtsman in the drawing office of Lane & Girvan, Limited, Bonnybridge; commended.

An exhibition of winning and commended designs will be held at the Society's House, 6 to 8, John Adam Street, Adelphi, London, W.C.2, between May 11 and 22. Reports submitted by previous bursary winners on their tours abroad will also be on view at this exhibition. Admission will be free.

THE INTERNATIONAL MONETARY FUND has established the initial par value for the Deutsch mark at DM4.2 per US dollar.

P.O.A. Minibition 1953

Now in its fourth year, the Minibition will again be an important feature of the National Conference of the Purchasing Officers' Association to be held in Brighton from September 24 to 26. The Minibition is designed so that the maximum information regarding exhibitors' products can be displayed attractively and economically. The stands, all of one size, will be situated adjacent to the main Conference hall.

The membership of the Association, now exceeding 3,000, covers the whole field of industrial and public undertakings, and at previous Minibitions the well-known companies which have exhibited have been drawn from a wide range of industries. A new feature this year will be a competition to decide the three best displays, based on the educational nature of the exhibits and the attractiveness of their layout. All Conference members will be given voting forms to enable them to take part in selecting the winning exhibitors.

Transport and Steel Bills in the Lords

The Transport Bill is expected to pass through all its remaining stages in the House of Lords before Easter. This week the peers have been discussing the Bill in committee for four successive days, beginning on Monday. The provisional date fixed for the third reading debate is March 23.

When the Iron and Steel Bill is received by the Lords from the House of Commons this also will be passed under an agreed time-table. It is expected that the Bill will be debated on second reading on March 23 and that it will be passed and returned to the Commons by the first week in May.

New Non-ferrous Melting Furnace

Sklenar Furnaces of Colchester Estate, Colchester Avenue, Cardiff, who were first in the field with their "Reverbale" reverberatory melting/maintaining furnace, have issued details of their recently-introduced type 050 plant. This is a small reverberatory tilting unit of only 50 lb. (brass) capacity. The furnace, which is shown in Fig. 1, consists of a fabricated steel shell supported on a steel base which requires no foundations. An adjustable tilting handle permits the furnace to be emptied with one hand, whilst the operator's other hand steadies a shank ladle carried in a swivel ladle yoke. The latter takes the weight during pouring and thus enables the operator to keep well away from the furnace, yet at the same time retain perfect control of the pour.

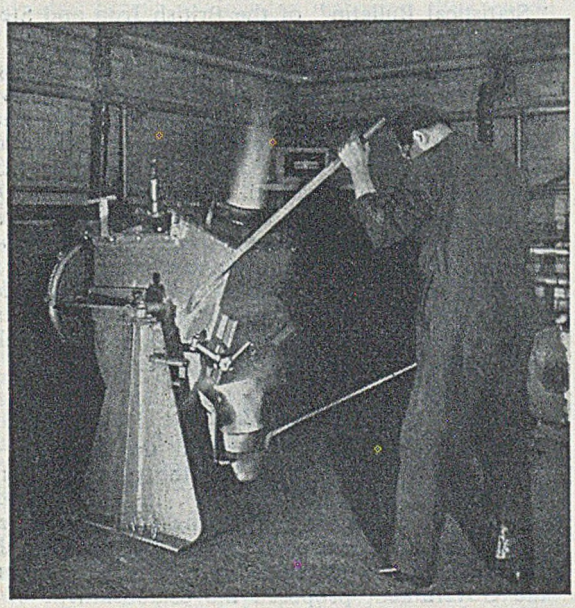


FIG. 1.—*New Reverberatory Furnace in Use.*

Furnace Operation

The blower fan which is fixed to the furnace body is used as a counterweight. Air for the burner is preheated by a built-in recuperator and this enables medium fuel-oils to be burned, without having to preheat them. The steel, loamed-lined ladle is preheated during the time the metal is melting, a suitable support being arranged to steady the ladle in an inverted position above the flue, so that the waste gases can be usefully adapted for this purpose.

The charging of the furnace is carried out by dropping the metal into the flue, the hearth being designed to withstand ingot loading in this manner. An alloying and fluxing door is provided, which, when opened, gives direct access to the bath of metal. The interior of the furnace has been designed to keep melting losses to a minimum and from the results shown in the melting data (Table I) it would appear that this has been achieved. Whilst the furnace has a nominal capacity of 50 lb. brass, it should be noted that charges of up to 100 lb. capacity can if necessary be achieved.

TABLE I.—*Melting Data for the Type-050 Sklenar Melting Furnace.*

Metal.	Melting programme.			Per cent. loss.	Fuel-oil used. (galls.).
	Wt. (lb.).	Temp. (deg. C.)	Time (min.).		
Aluminium alloy D.T.D.424 ..	19	730	8	0.42	1¼
	21	730	8		
	20	730	9		
	21½	730	8		
	21½	730	9		
	19½	730	8		
60/40 Yellow brass ..	53	1,130	20	1.25	2½
	55½	1,130	20		
	55	1,130	20		
	54	1,130	20		
	53½	1,130	18		
	54½	1,130	18		
Phosphor-bronze ..	28	1,130	35	0.57	2
	51	1,130	21		
	49	1,130	17		
	50	1,130	18		
Gunmetal 85.5.5.5 ..	54	1,130	25	0.2	2
	55	1,130	22		
	53	1,130	22		
	51½	1,130	20		
	54	1,130	17		
Manganese-bronze ..	54	1,100	34	1.0	2½
	54	1,100	28		
	52	1,100	26		
	48	1,100	20		
	47	1,100	19		
Copper	53	1,200	25	0.8	3¾
	49	1,200	23		
	49	1,200	30		
	53	1,200	33		
	53	1,200	32		

The makers have endeavoured to make a small furnace which can be used by the foundryman as just another piece of equipment. As he changes from one job to another, he can quickly rake out the furnace, leave the burner set with a severely oxidizing atmosphere and then, by the time he is ready to drop his metal into the furnace, he knows that any trace of the previous melt will have been completely neutralized, so that he can charge new metal without fear of contamination. The furnace hearth has been designed to give a clean pour and so that raking can be achieved. The whole area of the hearth is clearly visible from the spout opening. For raking the furnace, it is held in position by a suitable swivel clip, thus giving the operator perfect freedom to rake and inspect the hearth.

A.B.B.F. London-area Meeting

An informal meeting of the London-area members of the Association of Bronze and Brass Founders was held at the Clarendon Restaurant, Hammersmith, last Thursday, Mr. W. R. Buxton presiding. Both Mr. W. R. Marsland, the president, and Mr. G. A. Woodruff were present. The main business of the meeting was to hear an informal talk by Mr. E. C. Mantle, B.Sc., of the British Non-Ferrous Metals Research Association, on aluminium matchplates. Afterwards, an appreciation of the metal market was given by Mr. Taring. Other subjects dealt with included the appeal for funds by the National Foundry College; the Productivity Conference Report and a quantity of routine business.

Heat Losses in Open-hearth Furnaces

The extent to which an open-hearth furnace system, particularly the regenerators, can be cooled during the tapping of a heat is not generally appreciated, according to T. J. McLoughlin, of the United States Steel Company, in a paper on "Attainment of Maximum Open-hearth Production," submitted to the American Iron and Steel Institute recently. On a well-operated furnace, the temperature of the top checkers is 2,400 deg. F. (1,300 deg. C.) when tapping commences. During that process and bottom making, these temperatures fall below 1,800 deg. F. (about 1,000 deg. C.), due to the infiltration of cold air while furnace doors are open. This is not conducive to fast melting, because in the early stages of the heat the flame temperature will be at its lowest point, just when the maximum air temperature is most desirable to speed up melting. A difference of 400 deg. F. (say 200 deg. C.) in regenerated air temperature is said to lower flame temperature by 200 deg. F. (about 100 deg. C.).

"Casting Design in Relation to Production"

The Authors of this Paper published in the February 12 issue of the JOURNAL have written to amplify one detail. In the caption for Fig. 5, "Design of Cast-steel Couplings as frequently used Abroad for Railway Rolling Stock and now to be adopted for British Railways," the actual photograph shows the design of the couplings as used abroad, but this is not the identical coupling to be used on British Railways, although, as the script states, it is similar and will intercouple with the knuckle-type coupler to be used by British Railways, and has a similar contour outline. In presenting the actual Paper, the Authors showed slides of this coupling and fully explained it.

British Industries Fair, 1954

Mr. Mackeson, Secretary for Overseas Trade, recently stated in Parliament that there was no foundation for rumours that this year's British Industries Fair was to be the last. Immediately the Coronation Fair was over, he said, work would begin on the 1954 fair, which would be held in London and Birmingham from May 3 to 14. The exhibitions advisory committee were studying, at the request of the President of the Board of Trade, the best way to organize the British Industries Fair in the longer term. But they had already told him that they were unanimously of the opinion that the Fair should continue.

FIELDEN (ELECTRONICS), LIMITED, of Wythenshawe, Manchester, have designed and placed on the market an electronic controlled thermometer, having a temperature range between −200 and 500 deg. C. Normally, it records simultaneously in coloured inks temperature values at four points.

AT THE ANNUAL DINNER of the Midland centre of the Institute of British Carriage and Automobile Manufacturers in Birmingham on March 5, Mr. F. J. Buckingham, chairman, spoke of the productive capacity of West Germany and said that last year Germany produced 428,455 vehicles, 303,393 of them being cars, of which one-third were exported.

Spanish Iron and Steel Industry

Shortage of Equipment and Metallurgical Coke

The Spanish iron and steel industry since the war has been endeavouring to re-equip the various works but has been severely handicapped by shortage of foreign currency, and the prospect is likely to take a further four years. Meanwhile, the present steelmaking capacity has a potential output of 1¼ million tons.

Apart from plans of private industry, the State proposes to add 700,000 tons of new steelmaking capacity in the form of an integrated plant at Avilés in Asturias and has placed orders valued at some £6 million in the United Kingdom. The general situation was discussed in a recent "Statistical Bulletin" of the British Iron and Steel Federation.

With completion of these plans, ingot output should theoretically reach the 2¼ million-ton level by 1956-57. The industry, however, is fully aware that home coking coal deposits are not adequate, either in quantity or quality, to maintain iron and steel outputs even at the 1929 peak of 0.8 million and 1.03 million tons respectively, rendered possible only by additional supplies of coke from abroad. The mines, therefore, are being pressed to intensify their production of certain other grades of coal, which, by their more or less complementary characteristics, might produce a blend of coke acceptable for metallurgical purposes.

Avilés Plant

The I.N.I. (Instituto Nacional de Industria—a State body set up in 1941 for the protection and development of home industry), in collaboration with a London firm of consulting engineers, investigated the technical and economic aspects of the industry's problems and, based on their report, the Government proposed the establishment of a new integrated plant financed by I.N.I. and private capital, with foreign participation up to the legal limit of 25 per cent. The existing iron and steel industry declined to participate, and the new company was constituted by I.N.I. alone, leaving the way clear, however, for possible future participation by Spanish or foreign capital. The Empresa Nacional Siderúrgica S.A. (ENSIDESA) thus came into being on July 29, 1950, with the object of erecting at Avilés, on the Asturian coast, a new integrated plant. The equipment to be installed in the first stage includes two coke-oven batteries each of 35 ovens, making 1,000 tons per day; a 1,000 tons per day blast furnace; three 300-ton tilting open-hearths and a 600-ton active mixer; a 42-in. blooming/slabbing mill and 32-in. 3-stand structural mill. The output will comprise 300,000 tons per annum of billets, sections and rails. The second stage will involve two further batteries of coke ovens, the blast furnace and steelmaking plant being also duplicated. Either a billet and merchant mill or a semi-continuous light plate and strip mill will be installed.

Export Guarantees Act

By F. J. Tebbutt

The first Act concerning export guarantees was in 1920; others have followed at intervals, and many of these provisions were embodied with other new provisions in the "Export Guarantees Act of 1949," former Acts being repealed. This 1949 Act is now the principal Act, but there has since been the 1951 Act, and later still the 1952 Act with the same title, recently passed. All these Acts concern what can be termed insurance matters, power being given the Governments *via* the Export Credits Guarantee Department (with the over-riding authority the Board of Trade) to give guarantees against possible loss in export trading on payment of premiums. They are therefore of considerable benefit to founders enlarging their export business.

The Government, of necessity, must give protection to the E. C. G. department against the possibility of payments being required, and so capital is made available to cover any possible losses although up to now no losses have fallen on the Exchequer; on the contrary, profits have followed (see later), but more and more business has been done and so more cover capital has become necessary.

There are two different types of insurance, one (*a*) being in relation to ordinary commercial risks and the other (*b*) covering what may not be considered ordinary commercial propositions. For (*a*) the department only gives guarantees after consultation with an advisory council (that is, a body composed of bankers, business men and representatives of labour). For (*b*) the department can operate without putting the matter before the advisory council and roughly it can give guarantees if the proposition is considered as being in the national interest. Space forbids giving many details of these, but such cases would come under this head as where there are fixed-price contracts for capital goods which require a lengthy period for manufacture with possibilities of increases in costs of labour and prices of materials occurring between receipt of order and delivery of the goods, as also would contracts in relation to machinery and plant, etc.—contracts which might mean large sums tied up for lengthy periods. The 1952 Act, now allows cover capital for (*a*) of £750 millions, and in addition for (*b*) of £150 millions, the amounts previously being £500 millions and £100 millions respectively.

Interesting Figures

Some recent figures reveal that, under (*a*), the total value of business transacted in 1950-51 was £511,200,000, the value for the nine months to December 31, 1951, amounting to £470,600,000 and the average annual value of policies for the three years before the war was £43 millions. At the end of 1948, the maximum liability outstanding was £224,500,000. In October, 1951, business had increased so that the liability outstanding was £415 millions, but at December 31, 1951, the liability had fallen to £387 millions.

Under the second category (*b*) the business in 1949-50 was £1,600,000; in the following year £45,200,000 and for the nine months to December 31, 1951, it amounted to £55,800,000. As regards the department's liability on December 31, 1951, it was £63 millions, being in October, 1951, £70 millions. Since April, 1930, the department has made a contribution to the Exchequer of £7,387,568, being what is known as the "national reserve" in the Treasury.

Policies, Rates of Premiums, etc.

Details have been given in previous articles concerning policies, rates of premiums and so forth, but it might be mentioned briefly here that the most commonly-used contract is the E.C.G.D. Contracts "V" Policy which covers practically everything likely to occur in export trading generally, particularly bad debts, etc. Ordinarily, the cover is 85 per cent. of the contract price for bad debts, for other risks 90 per cent. Premiums of course vary according to risks and country of export, being as low as 5s. or as high as 40s. per £100 of turnover. On average, however, and with a reasonable amount of business, the premium would work out in most cases at £1 per £100 of turnover or even less (*e.g.* 15s.).

Apart from guarantees, the department gives information concerning firms in other countries. Information covers 120,00 firms and about 2,000 new buyers' files are opened each month. As regards the dollar drive (*i.e.* U.S.A. and Canada) the department has insured over 500 exporters and has 218 current guarantees. For U.S.A. and Canada, there are special guarantees for special risks, such as risks in building-up stocks in dollar markets, market research, risks in connection with sales and advertising campaigns and joint venture policies. From time to time, the Board of Trade issues notices regarding special credit guarantee arrangements available to cover certain limited fields. An example of these was given recently,* when it was realized that the export of spare parts for U.K.-made machinery installed in Brazil called for special facilities to be given to exporters.

* See JOURNAL, March 5, 1953, p. 280.

Publications Received

As the Spirit Moves.—Case Studies in Materials Handling. Published by the British Productivity Council, 21, Tothill Street, London, S.W.1. Price 2s. 6d.

Readers who are familiar with *Target*, will recognize this is much the same but produced in magazine form, and therefore worth preservation. The Council have been fortunate in having had the co-operation of the Materials Handling Sub-committee of the Institution of Production Engineers. The combined effort has resulted in a well-balanced collection of practical notions for many sections of industry. Foundry practice is represented by improvements which have taken place in the manufacture of investment castings.

The Policy for Steel.—Issued by the British Iron and Steel Federation, Steel House, Tothill Street, London, S.W.1.

This pamphlet takes the form of an *aide mémoire* for the members of the Federation, for it summarizes the main issues—excepting that of castings control—raised by the Iron and Steel Bill. It has not confined its attention only to the debates which have taken place in the House, but has included some of the wilder statements by pamphleteers and the Press. In general, the "comments" are well supported by facts and the members of the foundry industry desiring to be well-informed on the major issues could not do better than consult this important publication, which is available free of charge on writing to the publications department at Steel House.

Book Reviews

Investment Castings for Engineers, by R. L. Wood, and D. Von Ludwig. Published by the Reinhold Publishing Corporation, 330, West Forty-Second Street, New York 36, U.S.A., and available in this country from Chapman & Hall, 37, Essex Street, London, W.C.2. Price £4.

The early 1940's saw the introduction of the lost-wax or investment process into this country from America. To say that its claims were exaggerated in those embryo days is an understatement. The past few years have seen a more sobering attitude adopted and this latest work from America will go far in helping to put the process in its true setting. The policy of the book and general statements contained therein show a common-sense and logical approach to the whole subject and it is gratifying that many of the conclusions arrived at in America coincide with the experiences in this country.

The book has been written primarily for engineers, but foundry technicians, whether engaged in the investment industry or not, will find much to interest them. For the executive engineers, there is a wealth of information explaining what can and cannot be achieved by the process; two chapters are devoted to the machining of castings and one to "Design Suggestions," which could be usefully read by all designers of castings, whether for investment manufacture or not. For the metallurgist, there are four excellent chapters dealing with ferrous and non-ferrous materials.

The section of the book related to "Investment Materials and Techniques" could be improved, and should a second edition be necessary, the authors could expand this chapter considerably and thus broaden the scope and interest in their work. There are minor errors and a few statements with which the reviewer cannot agree, but the only one worthy of note is that "vibration and fatigue resistance of the cast structure are usually superior to that of the forged and machined metal," which is contrary to the findings in this country.

Apart from these minor matters, this is an excellent book, written with a certain object in view, which is achieved admirably. It should be read and studied by all who are interested in the utilization and buying of castings; also by the technicians engaged in the investment-casting industry.

D. F. B. T.

Oxidation of Metals and Alloys. By Kubaschewski and Hopkins. Published by Butterworths Scientific Publications, 4, Bell Yard, London, W.C.2., price 35s.

This excellent book is a credit to the authors and to the National Physical Laboratory, and it should appeal to ferrous and non-ferrous metallurgists and to all engineers who are interested in the surface behaviour of any metals used at temperatures above boiling point. The book is confined to the oxidation of metals and alloys at temperatures of about 100 deg. C. and above, and by the term "oxidation" the authors mean any surface process that is accompanied by a delivery of electrons to the metal. It thus includes surface reactions leading to the formation of oxides, hydroxides, nitrides, sulphides, etc., etc. The first chapter commences with a piece of information which will be probably new to many metallurgists, *viz.*, that with the exception of gold, no pure metal (including platinum) and no alloy is stable in air at room temperature, and that all metals tend to form oxides and that many tend to form nitrides, although in many instances the rate of reaction is very slow at room temperatures. The authors then go on to discuss the factors that have to be taken into account when dealing with the mechanism of oxidation. An interesting section is the one dealing with electrical conductivity in which it is pointed out that electrical conductivity in ionic and semi-conductors is closely related to the mechanism of diffusion, and considerations involving conductivity data are therefore of major importance to the theory of oxidation.

In the second chapter, the experimental side of the investigation of oxidation reactions is dealt with, and a number of methods for the examination and measurement of oxidation products are described. Chapter 3 deals with Wagner's theory of parabolic oxidation, with the formation of several oxide layers, with the oxidation of binary alloys and with internal oxidation. In Chapter 4, the authors give particulars of the reactions of 31 metals (including arsenic) with oxygen, nitrogen and air. The effects of a number of alloying elements are also considered. The work concludes with 549 references.

The authors are to be congratulated on having produced an excellently written book, which is "readable" and will be a most useful reference book for many years.

J. F. K.

Album de Défauts de Fonderie (Album of Foundry Defects). Vol. I. Grey Cast Iron and Miscellaneous. Edited by Guy Hénon. Published by Editions Techniques des Industries de la Fonderie, 12, Avenue Raphaël, Paris 16. Price 2,650 French francs post free.

The work which is detailed in this album has been carried out under the auspices of the International Committee of Foundry Technical Associations. It is uniform in size with the one published by the Institute of British Foundrymen, but, although it is mainly devoted to cast iron, it runs to almost 200 pages, whereas the other was about 75. Whilst the main object of these albums is to illustrate and diagnose the causes of typical defects showing up in castings, they serve a second purpose, which is to create a dictionary of technical words of high merit. The Editor has drawn on many countries to complete his survey, yet by and large, the examples are mainly French. The addition of small sketches is a good innovation. The illustrations are of a high order and, because of the use of high quality art paper, show up at their best. Mr. Le Thomas, of the *Centre Technique,* has written an interesting preface. Though the price from the British point of view seems rather high, it must be remembered that it is *ab initio* an expensive book to produce. The reviewer deems this to be an excellent piece of work and recommends it to all grey-iron and malleable foundrymen.

V. C. F.

Ferrous Analysis by E. C. Pigott (second edition). Published by Chapman & Hall, Limited, 37, Essex Street, London, W.C.2. Price 84s. net.

The first edition of this book published in 1942, bore the title "The Chemical Analysis of Ferrous Alloys and Foundry Materials." Of it the present reviewer said "A book of this type requires the dual test of utility and reliability in the actual laboratory before final judgment can be given. The reviewer has every confidence that it will respond to both." The response must have been very favourable, as not only was the first edition quickly sold out, but the second edition is very much larger (690 pages), has a vastly wider scope, and costs nearly double. The additional matter included in this second edition has, so far as is possible, answered the suggestion made by the reviewers of the earlier volume and the book is now thoroughly up to date. It can be regarded as a reliable text-book for those engaged in the laboratories catering for iron and steel works and foundries. For metallurgical students, too, it is a reliable and helpful work of reference.

Electrostatic Painting of Castings

By Francis J. Knight

The electrostatic painting technique is rapidly gaining favour as an economical method of finishing batches of castings to a greatly improved degree of efficiency. Recent developments in this comparatively new method have now made it possible to use electrostatic painting for work of practically all shapes and sizes—only the most minute castings being unsuitable. The basis of the electrostatic technique is the elementary principle of physics that oppositely charged particles attract one another and *vice versa*. In practice, the principle is used in the spray booth to cause atomized paint particles forced from spray guns to fly straight to the object to be finished.

Castings to be painted are positioned individually on to racks or workholders, adapted for the needs of the particular product. These racks are moved by an overhead chain conveyor, the cycle of movement of which passes them from the loading bench slowly through the paint booth, thence to the drying oven. From the oven, the finished castings travel to the unloading and despatching benches. The distance from the oven to these benches needs to be sufficient to allow the castings to cool off on the way. Inside the painting booth run two electrodes of fine wire mounted on either side of the conveyor and these set up an electrostatic field between themselves and the castings.

Spray guns, which may be operated automatically, face the conveyor on either side and are positioned to direct the paint particles in an oblique line almost parallel with the path of the objects to be painted. As the atomized paint spray leaves the gun nozzle it enters the electrostatic field, picks up a negative charge and is consequently attracted to the line of castings which are given opposite polarity. So great is this attraction that some paint particles turn as much as 180 degrees—completely reversing their direction. This ability of the particles to deviate from their original direction accounts for the almost uncanny success of the method in painting inside edges and other parts difficult to reach with an ordinary hand brush.

Advantages

In order to ensure complete coverage without waste, the castings are rotated slowly on their holders as they pass through the booth. In actual operation, the electrical attraction precipitates about 95 per cent. of the paint on the castings, thus reducing paint wastage to the absolute minimum. Another factor making for economical working is that the spray guns can be automatically operated by push-button control, thus dispensing entirely with spray-gun operators. Once the optimum speed to give complete and adequate paint coverage without waste has been worked out, all that is needed is for one operator to make occasional adjustments as, for example, to vary the speed when different types of work are being treated. Because the paint particles are so small and reach their objective individually, coverage is remarkably even. Inside edges and recesses are covered more satisfactorily than is normally practicable by orthodox hand-spraying methods.

A water curtain may be fixed at the inside wall of the booth to pick up and dispose of the small percentage of sprayed paint that fails to find its target, and an efficient exhaust air system is required to create and maintain correct air velocity inside the booth. At a typical plant of medium size, the oven to which the paint castings will be led will be of such a size that the conveyer needs to be looped in order to allow continuous movement during the twenty minutes or so occupied in the baking process. An oven temperature of around 200 deg. C. is usual.

Besides doing a better job at a lower cost, the speed-up made possible by the use of the conveyor belt and electrostatic painting technique enables foundries to cope with considerably increased production without the need for additional painting and baking facilities. With floor space at a premium, this is not the least of the advantages of the technique.

Securing Loose-pieces

By "Chip"

Loose-pieces are necessary on a number of patterns to enable the pattern to be easily extracted from the mould. Often the method adopted by the pattern-maker to secure the loose-piece in position during ramming leaves much to be desired. For example, the possibility of misplaced ribs or webs on jobs moulded in three parts is very likely if the rib is simply dowelled to the lower flange as is so often done.

Fig. 1 shows such a case, the joints in the mould being taken at A and B. If rib C, Fig. 2, is simply dowelled to the flange D, it is a difficult job for the moulder to be sure that it is not rammed out of position as shown by the broken lines. A better plan would be to cut away a piece from the boss E, as at F, and make the rib with a projection as G, Fig. 3. This ensures that during ramming the piece is secured in its relative position to the boss.

Such a modification is not very costly in pattern-makers' time, but is the means of ensuring correct castings without undue care on the part of the moulder.

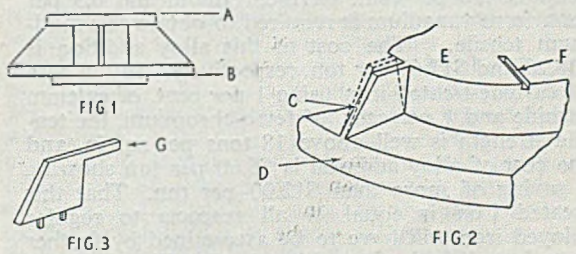


FIG. 1.—*Elevation of a Pattern to be Moulded with Parting Lines at A and B, for which Loose-pieces are provided to form the webs; Displacement of the Loose-piece is possible, as shown by the Broken Lines in Fig. 2, unless it is positively located (F.); in that case, it would be as shown in Fig. 3, where part G is arranged to fit into the recess F. Suitable design is adopted for the Loose-piece so as to give adequate strength to the Projecting Piece.*

Calcium Carbide Injection

In a supplement to the *Iron Worker*—the house organ of the Lynchburg Foundry Company—a technical article by Harvey E. Henderson and Philip M. Hulme bearing the above caption is printed. The authors have summarized their researches on the addition of calcium carbide to molten cast iron in the following statements:—

The general interest of this new metallurgical process of calcium carbide injection may be divided into four fields:—

Desulphurizing from 0.10 *to* 0.20 *per cent. sulphur to* 0.07 *to* 0.08 *per cent. sulphur.*

This method of desulphurizing, in the same range of other methods, offers the advantage of ease of controlling the metallurgical specification with varying materials. In other words, more certainty of reduction of sulphur from one level to a lower level is assured which enables a more versatile use of cast scrap and foundry returns.

Desulphurizing from 0.10 *to* 0.20 *per cent. sulphur to less than* 0.02 *per cent. sulphur.*

To reduce sulphur to less than 0.02 per cent. sulphur in acid-melted cupola iron is difficult with any of the commonly used desulphurizing agents. It is possible with magnesium or cerium alloys but they are expensive and difficult to control. With calcium carbide injection, sulphur under 0.02 per cent. may be obtained economically and with little difficulty. Acid cupola iron desulphurized to such an extent with calcium carbide shows much less chilling tendency than regular iron of the same composition. This treated iron will have a lower chill depth and Brinell hardness number for the same or greater tensile strength. There is the added possibility of substituting lower-priced alloys for the more expensive alloy additions, due to this reduction in chilling tendency. For example, for regular A.S.T.M. class 40 iron requiring 18 tons per sq. in. minimum tensile strength in the total carbon range of 3.35 to 3.45 per cent., an alloy addition of 1 per cent. ferro-molybdenum and 0.50 per cent. V-5 alloy or 0.50 per cent. ferro-molybdenum, 0.50 per cent. ferro-chromium and 0.3 per cent. ferro-vanadium is required to obtain this minimum tensile. The cost of this alloy addition is $18.23 and $17.67 per ton, respectively. In the case of carbide-treated iron using 1 per cent. of calcium carbide and 1 per cent. of ferro-chromium, the tensile strength is well above 18 tons per sq. in. and the cost of alloy addition is $5.60 per ton showing a saving of more than $12.00 per ton. That this treated iron is equal in all respects to regular alloyed iron will have to be ascertained by further tests, but all indications show that it will be as good if not better.

Desulphurizing to less than 0.02 *per cent sulphur as a base for spheroidal-graphite cast iron.*

It is difficult to make spheroidal-graphite cast iron with "as cast" ductility over 3.0 per cent. elongation from acid cupola melted iron which is not desulphurized. By desulphurizing to less than 0.02 per cent. sulphur with injected calcium carbide it is possible to ensure over 3.0 per cent. elongation from this iron. Nickel/magnesium treatment of iron at this low sulphur content produces more uniform properties at lower alloy costs and enables the casting of thinner sections in spheroidal-graphite cast iron and helps in maintaining ductility. For example, to make engineering castings of spheroidal-graphite cast iron by the present method costs $32.29 for alloys per ton of molten metal, whereas, the cost of adding calcium carbide and then treating with nickel/magnesium alloy would be $11.20 per ton, or a saving in alloy costs of $21.19 per ton.

To upgrade and spheroidize by injection calcium carbide or a mixture of calcium carbide and other spheroidizing agents.

By melting a 100 per cent. steel charge in a basic cupola and subsequently treating with calcium carbide and magnesium oxide injected as a mixture, it is possible to upgrade an 110 tons per sq. in. tensile grey iron to a fully spheroidal-graphite cast iron which, cast into a 1 in. "keel" block gives properties of 34 tons per sq. in. tensile, 5.0 per cent. elongation, 3.5 per cent. reduction of area and 196 Brinell hardness. It is also possible to obtain these improved properties with calcium carbide and other spheroidizing agents, such as rare-earth oxides. It is possible to obtain various tensile strengths and elongations by varying the silicon content of the iron. Properties similar to pure iron/silicon alloys as investigated by Yensen and Hadfield are given.

The savings in the above costs do not include the cost of the equipment necessary to employ the process of injecting calcium carbide. This equipment is covered by Patents. The carbide processes are also protected by pending and issued Patents of the Air Reduction Company.

Film Review

"Making Iron" and "What goes into the Blast Furnace."—The iron and steel manufacturers in recent years have been turning their attention to training of youthful entrants to their industry. Iron and steel making involve strenuous work and it was the practice to fill the lower ranks with unskilled men who worked themselves into the higher positions. The skilled men were and are amongst the most intelligent of industrial workmen, despite the absence of an apprenticeship. However to attract youth to-day, there must be an organized system of training and one phase of this system is the production of process films for showing to those studying the City and Guilds of London Institute operatives' examinations. Two have recently been shown privately—"What goes into the Blast Furnace" and "Making Iron." Produced by the educational department of the British Iron and Steel Federation, they warrant no other comment than excellent. They are quite short, requiring 15 mins. for showing, and are essentially simple, yet undoubtedly will whet the appetite of the youngster to learn more. If teachers of foundry subjects think it desirable for their students to have a sound background knowledge of the making of pig-iron—which the reviewer deems desirable—they could not do better than ask the Federation (Steel House, Tothill Street, London, S.W.1) for the loan of these two films. V.C.F.

Flow of Metal into Moulds

Discussion of T.S.35 Sub-committee Report and Film by I.B.F. Branches

(*Continued from page* 271)

LONDON

MR. E. M. CURRIE, chairman of sub-committee T.S.35, presented the report to the London branch of the Institute of British Foundrymen, together with a film in colour showing the progress of the work in the study of the subject of the Flow of Metal into Moulds. Mr. D. Graham Bisset was in the Chair.

Subsequently, THE BRANCH PRESIDENT opening the discussion said the members were glad to have had the opportunity to see so wonderful a film, and he congratulated both Mr. Currie and his sub-committee.

MR. B. LEVY said it was quite evident that although in the past patternmakers had made a success of runners and ingates based on experience and trial and error, they could now, with the aid of the information disclosed, embody better principles into their products.

MR. CURRIE felt that the patternmaker should have few "come-backs" because, particularly with the type of mass-production pattern plates that were used on moulding machines, it was up to the patternmaker to know enough about gating and risering technique to be able to advise the foundryman and put on the proper type of ingate before the pattern got into the foundry. He would say from his experience that ingates were certainly by far the best when made by the pattern and not cut by hand. The ingate should certainly be made in the same sand or even a better sand than the mould, because obviously it had to withstand greater erosive attack and had to do more work.

MR. GLADWELL commented on the fact that in the case of the spoked wheel where the ingate was situated between two spokes, there was a very satisfactory flow pattern. In the next series, a circular disc or gear-blank, there was a plain ingate, and the metal went round as in a spoked wheel and it had to go over a hump and through a depression; but it did not go over the hump as evenly as it went through the depression.

MR. CURRIE suggested the explanation might be that in the case of the gear-wheel where the ingate was directly between two spokes, there was obviously an even flow of metal around the periphery. In the case of the last series, however, where there was a gate in the centre, there was no runner-bar, but a direct ingate, so that, to some extent, the increased velocity of metal in a straight downgate and direct ingate might have affected the metal flow-pattern. Frankly, he did not think it was significant. The sub-committee had hoped to obtain more information from that series using direct ingates with depressions and humps in the moulds; they had not gained all that was expected, but they had left the record in the film so that the members could see what actually happened.

Use of "Y" Alloy Queried

MR. F. H. SMITH said it had also occurred to him, when watching the film, where there was a thin ingate which gave a high directional velocity, that one could predict fairly accurately where the metal would run. In that connection he asked how reproducible were the shots that had been shown. It seemed to him that quite a number of factors determined the metal flow, and turbulence at any corner of the mould must tend to affect the future flow of the metal. It seemed to follow from the last point made that, when filling up round an outer rim, there was no obvious reason why the overflow should start at a particular point. One might take six shots and get six answers. Again, it appeared from the film that not only could one control the way the mould filled by the type of gate used, but one could do the same thing by putting a slight tilt on the mould; this could be very useful in practice.

The pictures showing metal running into an open mould suggested to him that it would be very useful in the foundry to make such a test and so get an idea, before starting production, of how the metal would run with the type of gate that was to be used. A demonstration of this kind would be an excellent form of instruction for students and apprentices.

In mild criticism, Mr. Smith said it was a little unfortunate that the alloy chosen by the sub-committee to represent the aluminium alloys was "Y" alloy, which was probably the least representative of all of them. There was a marked surface skin-effect, because the alloy contained about 1½ per cent. magnesium, which must affect the flow of the metal stream.

MR. CURRIE commented that, when making that type of study and weighing up where the metal would flow, one could not altogether ignore the impetus that was given to the metal by the shape of the ingate. To a certain extent, even in the case Mr. Gladwell had mentioned, the first line of flow was round to the side by the ingate rather than towards the opposite side. Therefore, probably the explanation in that particular case had something to do with the impetus given by the gate system to the metal before it began to lose velocity in flowing to the further parts of the mould.

Expressing agreement with Mr. Smith's remarks on the tilting of the mould, he said there were obviously many examples and variations which could be tried but the sub-committee had dealt with simple shapes. If a foundryman had to make a casting which was rather long in relation to its thickness and width, he would usually cast it on a slope, as was done for very many castings. The sub-committee, however, were up against limitations

in trying to show what occurred as a pictorial record. Obviously, if one tilted the mould forward one naturally could get the metal flowing more quickly to the end of the mould, but they had wanted to make sure that the patterns produced were as far as possible just a function of the ingate shape and the runner systems chosen. Again, he was entirely in agreement with the use of the open mould for instruction purposes. During his moulding apprenticeship he happened to have been fortunate in having a foreman who had allowed him to make some scrap castings by taking off the top parts and watching what happened to the metal. In these days of ever-increasing demands for higher production in foundries, and at competitive prices, there was little time or inclination to allow the young trainee moulder to make many such open moulds as were shown on the film; that practice also increased the scrap casting percentage and decreased yield, and there were not many firms who were willing to allow the use of as much metal as the sub-committee had used. When it was appreciated that the experiments shown in even so short a film had involved the use and scrapping of more than a ton of metal, it would be realized that grateful thanks were due to those who had allowed the work to be done. He considered that that sort of work was by far the most instructive way of finding how the metal behaved when flowing in a mould, and he hoped that if any technical organization or firm, interested in the casting of metals of all types, would expose a short length of film whenever the opportunity presented itself, the industry might be able to build up in due course a very composite and extensive instructional film which would be of real benefit to the cast metal industry.

With regard to Mr. Smith's comment on the use of "Y"-alloy in the experiments, to some extent the sub-committee had wondered how a high-surface-tension metal would behave and, whilst there was not a great deal to be learned from it, one noticed that, with the type of ingate used, the metal had flowed forward just as in the case of steel and cast iron. What one could interpret from that it was up to each individual to decide; everybody had their own opinions. The sub-committee could possibly have chosen another type of aluminium alloy, but the "Y" alloy happened to be convenient and available.

Ferrostatic Pressure

MR. A. R. PARKES said that at the outset he had gathered that Mr. Currie had suggested that perhaps too little attention was given to the effect of ferrostatic pressure in recording the flow patterns. Also, normally working against the effective head pressure in a closed mould, there was pressure built up in the mould cavity, which tended to counteract the effects of head of metal. He asked how significant was the end result of those effects as shown by (say) the comparative time of running recorded for (*a*) a mould of the type filmed, (*b*) a closed but otherwise similar mould, and (*c*) for a normal pressure head on an open mould of the same job.

MR. CURRIE said he had not stated that too little attention was given to the question of ferrostatic pressure. He had mentioned that it was a factor which had been considered, but in the circumstances, where the sub-committee were forced by the limitations of photography into photographing an open mould, they had obviously to put up with such limitations. Candidly, he did not think the extra difference in ferrostatic pressure in a closed box, in a mould of the size chosen, which would only mean another 4 in. or 5 in. head, would make a great deal of difference; and with regard to the build-up of gas pressure inside, there was very little such build-up in that type of mould, taking examples such as he had chosen, because gases could escape through the joint, and if the moulding sand were porous, the gas would get out through the sand as well. The metal itself had a greater specific gravity and velocity, which he did not think would be affected by any resistance of air or steam or gas pressure in the mould. To try it out and prove it was a matter which must be left to another day. He agreed that if the sub-committee could carry on and use larger moulds and greater heights of runner basin and downgate, they might obtain some further interesting patterns. He did submit, however, that at least they had made a good start.

Running Temperatures

MR. SMITH, referring to the pouring of the spoked wheel, asked whether observations were made of the temperature of the metal at different parts of the mould after pouring, using the various metals.

MR. CURRIE replied that such observations were not made; he was afraid it would have made quite a complication to have put thermocouples into different sections of such small moulds. The sub-committee had tried to cast the metal within a reasonable range of temperature, which was around 1,420 deg. C. most of the time; it might have been 20 deg. on either side. In ordinary cast iron he did not think that made any real difference. He agreed with Mr. Smith's observation particularly where some of the metal flowed up from the centre boss of the spoked wheel into an arm and then met the flow of metal from the outer rim. If the metal were a little on the "dull" side, obviously there would be a mis-run at that particular junction; one would assume that the metal was near solidification point and obviously would not knit together, and, therefore, on the cooling down of the casting, one would look first for a crack in the arm. Whilst he agreed that from the scientific point of view it would have been interesting to have ascertained the exact temperature of the metal in different parts of the mould after pouring, he pleaded that the work was difficult enough to do as it was.

A MEMBER was surprised that, where there were three ingates from the runner bar, the central ingate was starved. In one example, however, it looked as if the runner basin was draining itself; could that have been brought about where the area of the larger ingates was greater than the area of

the downgate ? If there were a direct runner-bar, he supposed all the ingates would deliver similarly into the mould.

MR. CURRIE agreed that, had there been a runner-bar in the top part to even things out, it would have been as suggested. In all cases, the runner-bars were in the bottom part and the ingates were cut to a size, which was half-way up the depth of the runner-bars. With the runner-bar in the top, the metal must flow to each end and gradually build up to the same level of each of the three ingates; but where there was a runner-bar in the bottom, the end ingates, taking a greater volume (and velocity) of metal than the centre one, must flow first. So that, if it was required for each ingate to deliver the same volume of metal, one should also use a top runner-bar.

Location and Types of Ingates

THE BRANCH PRESIDENT asked if Mr. Currie would regard it as good or bad practice to have an ingate immediately opposite the downgate, or did he think it was better to have the downgate in between the ingates.

MR. CURRIE, having in mind, particularly, the problem of keeping slag and dirt out of the usual type of runner-bar that was made, and, therefore, the necessity of keeping the ingates well away from the downgate, said there was the question of sometimes making up the basin quickly, without making it properly. If the pourer were pouring slowly at the start, then obviously any sand in the basin must go straight down. If the ingate was directly underneath the downgate, nothing could stop this sand from going forward into the mould.

That was one of the reasons why he personally condemned the ordinary, often shallow, type of basin cut in the top part of a mould, because there were very few men who could pour such a basin and keep it full. Usually, when ingates were cut out by hand, they were full of loose sand, which must go straight into the casting. The argument then arose, if one were trying to make better castings, higher strength castings, and so on, why put sand into the metal ?

Incidentally, reverting to Mr. Smith's question, he hoped no-one had tried to judge the temperature of the metal by light and colour in the film, because that was absolutely impossible with the type of film which had to be used, and because of colour differences between artificial light and daylight, and so on. If one tried to do that, in practically all the cases illustrated, one could be wrong to the extent of maybe 50 deg. either way.

MR. BOND asked Mr. Currie whether in his opinion the use of the horn-gate was dying out. He said it seemed to him that slag or dirt rose to the top. One put the runner-bar over the top of the inlet of the horn-gate. To reverse the normal horn-gate was another very good idea, and it gave a small entrance from the runner-bar, making it difficult for slag to get in.

MR. CURRIE agreed that that was so, provided that, as Mr. Bond had said, one used a runner-bar and took the horn-gate off the runner-bar. In the film, however, it would be noted that the sub-committee had done the same as many others, *i.e.*, they had put the downgate straight on top of the horn-gate entry through the mould and up into the mould cavity. In such a case, unless one were particularly careful how one kept the runner basin filled, no power on earth would keep dirt and slag from going into the casting. He had seen too many horn-gates used that way. However, as Mr. Bond had suggested, provided one ran the metal into a slag-trap first and then into the horn gate, one would get a clean and satisfactory entry of metal.

The problem of its use was, to some extent, one of economics. He believed the reason why the horn-gate had become not quite so popular as it was previously, was simply that, if used properly, the moulder required to spend very much more time on setting the horn-gate correctly on to the pattern and on withdrawing it out of the mould than when using a normal type of ingate with the runner-bar. If he were casting the gearwheel, he would probably not put the runner bar in the bottom and have the downgate connecting the top end, because in such a case, as had been illustrated, slag and dirt might enter the casting. If one ran the ingate from underneath the runner-bar, there was every chance of slag and dirt rising out of harm's way.

Mr. Currie added that, in the case of the particular gearwheel mentioned, no attempt whatsoever was made to portray any one particular or " best " way. He could think of at least a dozen other ways in which that gearwheel could be run perfectly safely, to give a good, clean casting, and he did not think it would be difficult for other members to do the same.

Foundry Limitations

MR. EMMERSON said that whilst the film was a very good one, yet where the work in the foundry was likely to break down sometimes was in choosing the size of box used for a particular job. It might not be safe to use a 12 by 16 in. box, but one usually had to consider whether one could make a safe job of it that way, or whether one should make sure by going to a 22-in. box. The loss entailed in production by using the bigger box was then a problem to be reckoned with and one started to compromise. He felt that most foundrymen realized the right way to run a particular job, but they had to compromise somewhere.

MR. CURRIE had no answer to Mr. Emmerson's comment. If one were determined to use the wrong size of box, then there was nothing anybody else could do about it. After all, he said, the final aim of all good moulding practice was to produce the perfect casting, and it was of no use spending hours in making a perfect mould and then ruining it by hastily-cut gates, or by putting them in the wrong places, using a box too small for the job, and so on. That did not seem to him to be logical. He would agree, and he had done it more than once himself, that rather than go outside to find another box and to drag it into the foundry, one would use any box which was on the floor already to save time and labour, but that was no excuse.

MR. A. TALBOT said the film had shown definitely that rectangular plates should be cast on a bank, but

he was not sure that that would apply also to the circular discs. He asked for Mr. Currie's opinion.

MR. CURRIE did not think it was so obvious that a square plate should be cast on a bank. He asked that those who saw the film would not be misled by the fact that it was in slow motion. Normally speaking, in casting the size of plate shown, which was about 10 by 8 in., and using the normal size ingate, and so on, the bottom of the mould was covered in less than four seconds, and he did not think that "banking" would make a great difference in that particular case. So that he would not argue, just from the film, that all such rectangular plates should be cast on a bank.

The circular type of casting was a different proposition; but he felt that members would find it of greater interest to work on the theories of what happened when casting the gearwheel than on what happened in the case of the plate, because if one had a circular plate of that type to cast a downgate directly on the top would probably do all that was necessary. Throughout the film, the sub-committee were trying to show examples which would interest young trainee moulders and start them thinking about what happened when using different shapes of ingate; from there they could go back to consider the right way of casting, to the proper placing of the mould, whether or not to put it on a slope, whether to use more than one ingate, and so on. The main purpose was to direct more attention to basic gating principles, rather than to use the film as a lesson for some of the more complicated and difficult types of moulds. He agreed that when one came to practical considerations in the foundry, provided one had understood the basic principles (and these must all have been learned in apprenticeship), there was at least a good basis on which to consider which was the right type of ingate to use for making any type of casting.

Breaking-off Points

A MEMBER said he had noticed with interest that, in each case depicted in the film, the ingate was shown passing straight through from the runner-bar. In mass-production practice, one liked to have a small breaking-off point so that subsequently one was able to break off the castings quickly. He asked for Mr. Currie's opinion with regard to breaking-off points and how they interrupted metal flow.

MR. CURRIE replied that it was always a sensible precaution to form a breaking-off pad, and he did not think one should ever use an ingate without it, particularly on some of the biggest moulds, to ensure that the ingate would not break into the casting. As to its effect on flow-pattern, that question was answered in the case in which the sub-committee had used the "venturi" shape, where the flow and shape of the metal was controlled by the narrow central portion, and not by the frontal shape of the ingate.

MR. B. LEVY asked whether Mr. Currie had considered the possibility of using shell moulds in order to obtain further information. He had not seen the shell-mould poured, but he understood that when it was poured, especially when it was held only by bent nails, without any shot or backing, it was possible to see the metal flowing into the mould; and inasmuch as one was using, with the shell mould, a different type of runner practice altogether, *i.e.*, a mould cast on end, some very useful information might be obtained.

MR. CURRIE was not prepared to enter upon a discussion of gating for shell-moulding on that occasion; he did not think it was really within the subject with which the sub-committee was concerned. To a certain extent it was true that one could guess at the position of the metal actually running through the mould, but he did not know how that could or would be worth photographing.

THE BRANCH PRESIDENT, at the conclusion of the discussion, said Mr. Gladwell had put his finger on the spot when he had said that we should understand more about the subject when we had had more time to think about it. Mr. Currie had made it clear throughout that he was not preaching what kind of gate should be used on any particular kind of job. He had set out to make members think right from the start on this question of ingates, and it would be agreed that he had succeeded. He had proved that ingates played a most important part in the production of a good sound casting. It was left to his audience, having seen what the sub-committee had done, to think about it and apply it as they considered it ought to be applied in each different type of job, of which there was a big variety. Obviously, all could not be run in the same way or with the same kind of gates, but Mr. Currie must feel highly gratified that he had got members thinking on that particular line.

Vote of Thanks

MR. W. WILSON (junior vice-president of the branch) proposed a hearty vote of thanks to Mr. Currie for his most interesting talk and for the film he had shown, and said it was an added pleasure to do so as one who had known him for some 14 or 15 years. Mr. Currie had said that runners should be built better than the mould, and he had given a great deal of excellent advice generally.

MR. A. R. PARKES, seconding, said that a fact that should be borne in mind, having heard Mr. Currie's address, witnessed the film, and having noted the trend of the discussion, was that it was very easy to be wise after the event. In such a case, it was very easy to say that one had thought the metal would flow like that, whereas previously one probably did not know at all how it would go. A matter on which members could all congratulate themselves was that the report which Mr. Currie had presented was a preliminary report, and all would look forward to hearing more at some future date of the progressive work of the sub-committee. Mr. Parkes then extended the vote of thanks to include the other members of that sub-committee; they had done some real pioneer work in finding out what happened to the metal when it ran into a mould.

(The vote of thanks was heartily accorded.)

MR. CURRIE, responding, said he was glad to have had the opportunity to present the work of the sub-committee to the branch. He should have made it clear at the start that he had no intention of lecturing the meeting, because he knew full well that amongst his audience there were many practical foundrymen who could teach him a lot about gating and risering, and so on. He had just hoped to stimulate thinking; and he hoped also that, if any of the members had the opportunity to help their apprentices or young trainee moulders, they would borrow a copy of the film to show them and assist in widening their knowledge and outlook.

On behalf of the Technical Council of the Institute and his colleagues on sub-committee T.S.35, and all who had given helpful advice and had done some really hard work—particularly Mr. Frank Hudson, who had photographed the whole series, the instructor at the Meehanite Apprentices' School at the Butterley Company's works, who had made and poured all the moulds, and the Mond Nickel Company's laboratory staff who had made the last sequence—Mr. Currie expressed appreciation for the meeting's very sincere gratitude.

Before closing the meeting, THE PRESIDENT expressed a warm welcome to Mr. J. N. Rice, a visitor from the East Midlands branch of the Institute. He also welcomed very heartily quite a large number of apprentices and students who were present, and expressed the hope that they would feel like attending on other evenings, to listen to the discussions and to take part in them if they would like to do so.

THE HON. SECRETARY (Mr. W. G. Mochrie) announced that membership of the branch on that date was exactly 800, the highest figure it had ever reached.

Retirement from I.C.I.

The resignation from the board of Imperial Chemical Industries, Limited, of Sir Arthur Smout last Saturday ends an association of 48 years with the company and its predecessors. (He joined Elliotts Metal Company in 1905.) From 1934 until 1942. Sir Arthur was chairman of the delegate board of ICI (Metals), Limited, and was appointed to the board in 1944. In the same year he became the metals division director, and in July, 1951, took over responsibility for the Nobel Division of ICI.

Sir Arthur, who is 64, has spent his working life in industry and public service. He was knighted in 1946 for his services as Director-General of Ammunition Production from 1942 to 1945. He has been president of the Institute of Metals and of Birmingham Chamber of Commerce and vice-president of the Institution of Mining and Metallurgy, and is a life member of the council of Birmingham University. Sir Arthur is a director of several other companies.

Newsletter. Journal of the David Brown Companies. Vol. 5, No. 3.

The reviewer was attracted by the last page which lists " cash for bright ideas," because the payments are on a really worthwhile scale. " Interest continues to develop " is a comment appearing in the introductory paragraph, and that is the main object of the scheme.

Hot Spots

By " Coroner "

Hot spots in moulds can cause defective castings, due to the heat keeping a portion of the solidifying metal fluid longer than surrounding parts. Thus, on final freezing, a " draw " takes place and, on machining, the defect appears as a porous patch in an otherwise sound casting. Occasionally, hot spots in a mould are the cause of defects the suspected reason for which, at first, has often been something entirely different.

For example, a small vee pulley of uniform design was required in fair quantities and, judging from past experience of this type of work in which absolute soundness in the vees is necessary, it was thought that bottom running with a heavy feeding riser would be the ideal way to ensure optimum results. Consequently, the first batch was produced this way and, on machining, a slight defect was observed in each of the vees. It was thought that the risers had not been effective and considered that, if the job were cast in the reverse direction, better results would accrue.

This method, however, proved no improvement and it was then that the job was studied as a whole. It was observed that the down-runner was situated quite close to the casting and the opinion was advanced that this was the cause of the trouble. The heat of all the metal passing through the runner into the mould raised substantially the temperature of the sand between the runner and the casting so that on cooling there was a delay in the solidification of the metal in this area, resulting in a " draw." Although this was of only minor proportions, it was sufficient to cause the casting to be scrapped. By removing the runner further away from the casting or, alternatively, using a top runner, this defect was eliminated.

Record February Steel Output

Britain's steel output reached unprecedented heights last month, both for the weekly average and annual rate of production. At the present rate of progress, the objective of 20 million tons a year in 1957 or 1958 should be attainable without much difficulty.

The British Iron and Steel Federation have announced that the February weekly average was 352,400 tons compared with 346,300 tons in January and 313,100 tons in February last year. The annual rate was 18,325,000 tons, compared with 18,009,000 tons in January and 16,281,000 in February last year.

Pig-iron production in February was at a weekly average of 213,500 tons, compared with 213,900 tons in January and 197,400 tons in February, 1952. The annual rate was 11,104,000 tons, against 11,121,000 tons in January and 10,263,000 tons in February last year.

Glasgow Firm Expands

Cockburn & Company, Limited, valve makers, of Glasgow, are to open a branch works at Back Union Road, North Shields, on March 23. These works will undertake valve production, but are primarily intended for the maintenance and service requirements of the firm's north-east coast customers. The new branch will be under the management of Mr. L. W. Noble, who is at present the company's north-east coast representative. Only modern plant has been installed in the factory, and only highly-skilled technicians are being employed.

Dorman Long's Trading

A scarcity of some raw materials had an adverse effect on the operations at the iron and steel works of Dorman, Long & Company, Limited, states Sir Ellis Hunter, chairman of the company, in his statement accompanying the report and accounts for the year 1951-52. Production of basic iron increased by 88,394 tons, but this was not nearly sufficient to counterbalance the acute shortage of scrap, and the ingot make fell by 58,422 tons to 1,638,728 tons, rolled steel being down by 33,261 tons to 1,383,931 tons.

Capital expenditure during the year amounted to approximately £4,250,000, including £2,800,000 in respect of the new open-hearth steelworks at Lackenby, now nearing completion. These works will be in operation in the coming summer and will provide the company with 500,000 tons per annum of highly efficient ingot-making capacity. The remainder of the expenditure relates to the company's programme of large-scale modernization of plant at existing works. This has continued according to plan.

Group trading profits improved from £6,238,267 to £6,579,693 after transferring £52,586 (£193,599) to provision for relinings, repairs, etc. Trade investment income brought in an additional £39,540 (£40,420) and miscellaneous income £47,213 (£9,066). With the past year's surplus of £99,627 (£158,890), the group total of £6,766,073 compares with £6,446,643. After placing £1,650,000 (£1,250,000) to general reserve, the parent company carries forward £145,237, against £126,002 brought in.

Krupp Deconcentration Plan Approved

An agreement for breaking up the Krupp organization was signed in Bonn on March 4. Details were given in the House of Commons the same day. There have been protracted negotiations, with extensive discussions between the three Allied High Commissioners, the Federal Chancellor, Dr. Adenauer and representatives of Herr Alfried Krupp.

The former Krupp coal and steel interests, which were separated in 1947 from the rest of the Krupp organization, are being transferred to three new companies, two for coal and one for steel. Herr Krupp's shareholdings in these companies will be sold. He will thus be deprived of ownership and of any controlling interest. An undertaking has been obtained from Herr Krupp that he will not through the use of the proceeds of the sale of securities acquire or own any securities of or any interest in any enterprise engaged directly or indirectly in the steel or iron producing industries in Germany or in the coal-mining industry in Germany. He has also undertaken that he will not, directly or indirectly, acquire or own a controlling interest in, or occupy a controlling position in, any enterprise engaged directly or indirectly in the steel or iron producing industries in Germany or in the coal-mining industry in Germany.

TWO STABILIZER FIN SHAFTS of stainless steel, each weighing 14¼ tons and 26 ft. long, produced from ingots weighing about 22 tons, are being supplied for the new royal yacht by Hadfields, Limited, Sheffield.

THE NEW PLANT of the Koppers Company, Inc., at Fontana, California, was opened on February 5. Operated by Koppers' tar products division, the new plant is now producing a general line of products made from the crude tar which comes from the Kaiser Steel Corporation's chemical-recovery coke ovens.

Expansion of Lancashire Steel Corporation

The progress of the development of the Lancashire Steel Corporation, Limited, and its subsidiary companies, has been extended to include the programme up to 1957, states the report of the corporation's directors for the year ended September 27, 1952. Permission has been given to increase the steel output of the undertaking by a further expenditure over the period of £6,000,000 to £6,500,000, which, when completed, will make the corporation independent of outside steel supplies. Capital expenditure for the year amounts to £1,645,854, which includes expenditure on the new rod and bar mill at Warrington, and, at the Irlam Works, on the complete renewal of the steam-raising plant, the installation of a modern power plant, the building of 19 new coke ovens, and a new slag works. The group manufacturing and trading profit of the corporation amounted to £2,225,951 in the year ended September 27, compared with £2,095,844 in the previous period of 39 weeks.

Flame-plated Tungsten Carbide

A new process of flame-plating has recently been developed by Linde Air Products Company capable of plating tungsten carbide in thicknesses of from 0.0005 to 0.020 in. According to an article in the *Journal of Metals*, steels of all types, cast iron, aluminium, copper, brass, bronze, titanium, and magnesium have all been successfully coated with tungsten carbide. Chromium plate, sintered tungsten carbide, and flame-plated surfaces, however, cannot so far be coated. Surfaces up to 6 in. wide by 40 in. long may be handled, and the plated part used as-coated or finished ground. One of the principal advantages of the process is that the temperature of the base metal does not exceed 400 deg. F. (200 deg. C.) during the plating. Flame-plated parts, it is stated, can be used wherever an undiluted coating of tungsten carbide is required for protection from severe abrasion and frictional wear.

U.S. Metal Price Increases

The U.S. Government has decided to allow manufacturers and processors of nickel, chromium, beryllium, and cobalt products to raise their prices to cover recent price increases for the basic metals. Nickel, chromium, and beryllium are still under price control. Cobalt is not subject to a price ceiling, but there are still controls on most products in which cobalt is used.

The Office of Price Stabilization has authorized manufacturers and sellers of stainless steel to raise ceiling prices by approximately 2 to 3 per cent. to cover the higher costs of nickel and chromium used in the metal.

Manufacturers of prime aluminium products have recommended the complete decontrol of aluminium, apart from military and atomic needs, by April 1 "or earlier if practicable."

Swedish Iron and Steel Record

Sweden's production of iron and steel during 1952 was a record. Pig-iron output reached 1,052,600 metric tons compared with 851,400 metric tons in 1951, and the output of steel ingots, scrap steel castings, etc., amounted to 1,668,900 metric tons compared with 1,505,400 metric tons the previous year. Rolled and forged iron and steel was 1,091,700 metric tons, 113,600 metric tons more than in 1951.

New Patents

The following list of patent specifications accepted has been taken from the "Official Journal (Patents)." The numbers given are those under which the Specifications will be printed and all subsequent proceedings will be taken. Applications for copies of the full Specifications (2s. 8d. each, post free) should be made to the Patent Office, 25, Southampton Buildings, Chancery Lane, London, W.C.2.

686,097 BIRMINGHAM SMALL ARMS COMPANY, LIMITED, LAWRENCE, P. H., RAINSFORTH, R., and BRAYBROOK, A. Production of coatings on ferrous articles.

686,110 DIFFUSION ALLOYS, LIMITED. Process for the diffusion of metals.

686,180 JESSOP & SONS, LIMITED, W. Alloys.

686,322 SANKEY & SONS, LIMITED, J. Continuous casting apparatus.

686,413 SANKEY & SONS, LIMITED, J. Continuous casting mould and lubrication method therefor.

686,442 UNITED ENGINEERING & FOUNDRY COMPANY. Apparatus for cutting materials while in motion.

686,528 CALAMARI, E., and CORAZZOL, R. Electric induction furnaces.

686,559 NATIONAL SMELTING COMPANY, LIMITED, WILLIAMS, G. K., and DERHAM, L. J. Separation of metals, alloys, or compounds from a molten metallic system.

686,644 HOSMER, R. S. Foundry mould.

686,731 TITAN COMPANY AKTIESELKAP. Treatment of manganiferous iron ores.

686,766 SHEPHERD, G. R. (Westinghouse Electric International Company). Austenitic alloys.

686,781 METALLGES. AKT.-GES. Lacquering of iron or steel.

686,790 STORA KOPPARBERGS BERGSLAGS AKTIEBOLAG. Blast-refined steel with low carbon content and method of producing it.

686,810 ELECTRIC FURNACE PRODUCTS COMPANY, LIMITED. Process of manufacturing low-carbon chromium steels.

686,831 SOC. ANON. DE COMMENTRY FOUR-CHAMBAULT & DECAZEVILLE. Process for manufacturing hypereutectic cast iron and products thereof.

686,893 UNITED STATES STEEL COMPANY. Plating thickness regulator.

686,959 ALLMANNA SVENSKA ELEKTRISKA AKTIEBOLAG. Method of heating longitudinally extending metal articles in electric high-frequency induction furnaces.

687,040 JUNGHANS, S. Continuous casting of metal billets.

687,058 KOPPERS GES. H. Door-handling mechanism for doors of horizontal coke ovens.

Industrial Safety Training Scheme

Established by the Birmingham and District Industrial Safety Group, an industrial safety training centre was opened in Birmingham by the Lord Mayor (Ald. W. T. Bowen) on March 2. The centre adjoins the Birmingham Museum of Science and Industry and three rooms have been set up as lecture-room, machine-shop and exhibition room. Local member firms have made gifts of machine-tools and equipment, and safety officers in the area, as well as inspectors of factories and other specialists, are to give their services and assistance in organizing short courses in a safety training educational scheme. Courses have already been planned for new entrants to industry; works safety committee members; maintenance men; supervisory staffs; powerpress tool-setters and so on. Not more than 25 students attend each course. It is envisaged that the centre will be of use to the small firms who do not have their own training facilities.

Ideal Home Exhibits

At Olympia, London, for the Daily Mail Ideal Home Exhibition which opened on March 3, the Gas Council, supported by a gas section in which 10 prominent manufacturers of gas and coke-burning equipment have stands, sets the theme of its own exhibits as "All the Year Round with Mr. Therm." The gas pavilion has been set out in sections devoted to various types of appliance—water heaters, cookers, space heaters, laundry equipment, and coke-fired appliances. At the same exhibition the British Electrical Development Association portrays its story with kaleidoscopic lighting in halls of mirrors. One hall holds nine types of electric cooker and the other nine types of electric water-heater, every one multiplied thousands of times down to a distant imperceptible minuteness by the mirrors and the changing lights. Visitors go on to examine a revolving demonstration of water-heating, thence to a range of small electric appliances set in rainbow-lighted honeycomb alcoves, and big appliances on show around an inner hall. Another prominent feature at this year's exhibition is the Coal Utilisation Council's display of the latest solid-fuel burning appliances. Examples of the newest types of convector open fires, inset open fires for easy replacement, free-standing openable stoves, cookers, water heaters and boilers, etc., are all on show. The council publishes a list of recommended appliances compiled in consultation with the Ministry of Fuel and Power, and copies of this can be obtained on the stand together with the names and addresses of the council's authorized appliance distributors. The stand itself is surrounded by the stands of manufacturers of solid-fuel appliances, resulting in a large variety of the most modern fires, etc., being on view.

Moulder's Damages for Eye Injury

At Leeds Assizes, on March 3, Mr. Justice Cassels awarded damages of £750, with costs, to John Tomlinson, a moulder, of Halifax, against Modern Foundries, Limited, Highroad Well Works, Halifax, for loss of sight in one eye, after Mr. H. R. B. Shepherd, Q.C., had asked for judgment by consent for the plaintiff of £750. Tomlinson was stated to be employed as a moulder at the factory of Modern Foundries, Limited, and on December 9, 1949, while working on a moulding box, a piece of molten metal or slag struck him in the right eye, as a result of which he lost the sight of that eye. It was claimed that the firm was negligent by failing to provide adequate guards to prevent workmen from being struck by flying particles from the furnace. Tomlinson was standing 60 ft. from the furnace when he was struck.

Industrial Instruments Exhibition

An exhibition of industrial instruments will be held in the Heriot-Watt College, Edinburgh, on March 14 and 16. It has been arranged for the students of a course of lectures on industrial instruments now in progress at the College, but will be open without charge to others interested.

A large variety of instruments will be on display, including those for pressure, temperature, and flow measurement. The instruments are being provided by the various manufacturers, and the exhibition has been arranged in conjunction with the British Industrial Measuring and Control Apparatus Manufacturers' Association. The exhibition will be of particular interest to those concerned about the efficient use of fuel.

Personal

FORMERLY manager of the firm's Birmingham branch, MR. D. E. GRAHAM has been appointed an executive director of Crompton Parkinson, Limited.

MR. EDWARD TULLOCK has been elected assistant general secretary of the Iron, Steel and Metal Dressers' Trade Society, Manchester. He has been secretary of the north-east committee of the society.

MR. F. WILLIAMS (Markham & Company, Limited, Chesterfield) has been elected president of the Chesterfield and District Foremen's Association; MR. J. H. RODGERS has been re-elected chairman.

COLONEL CHARLES DAVID, who has been appointed a Deputy Lieutenant for the County of Glamorgan, is European representative of Luria Brothers & Company, Inc., iron and steel scrap contractors, of Philadelphia, Pa.

MR. ARTHUR GRIFFITHS, production director and general manager of F. Perkins, Limited, Diesel-engine manufacturers, of Peterborough, received the C.B.E. from her Majesty at the investiture at Buckingham Palace on February 24.

MR. C. L. HILL, deputy chairman of Heenan & Froude, Limited, has been appointed chairman in succession to the late Mr. A. P. Good. Mr. Hill is also chairman of Folland Aircraft, Limited, and was, until he retired on medical advice in 1949, a director of the Brush Electrical Engineering Company, Limited.

MR. RONALD W. T. BRAY, managing director of W. E. Bray & Company, Limited, contractors' plant manufacturers, of Isleworth (Middx), will leave on April 23 on a tour of the U.S. and Canada to study the latest trends in the design and use of various types of plant, and manufacturing methods and procedures.

MR. F. L. NOBES joined the board of the Carborundum Company, Limited, on January 7. Mr. S. G. Blake becomes a director emeritus from the same date. MR. NORMAN V. CRABTREE has been appointed manager for the Coated Abrasives division, which is shortly to begin the manufacture of a broad line of surface coated products in this country.

SIR PATRICK HAMILTON, chairman of Henry Simon (Holdings), Limited, has been elected a director of Lloyds Bank, Limited. Sir Patrick, who is 44, is on the boards of several other companies in the Simon engineering group. He is also a director of the Renold & Coventry Chain Company, Limited, and Expanded Metal Company, Limited.

MR. A. C. GEDDES, a director of the Brush Electrical Engineering Company, Limited, Loughborough, and of other companies in the Brush Aboe Group, has been appointed a director of the Monks Investment Trust. He is also a director of Sir W. G. Armstrong Whitworth & Company (Engineers), Limited, W. G. Bagnall & Company, Limited, and of Geddes & Company, Limited.

DR. H. B. OSBORN, technical director of the Ohio Crankshaft Company, Cleveland, U.S.A., is arriving in this country on March 27. He is primarily interested in visiting Electric Furnace Company, Limited, who are the European agents and concessionaires for TOCCO equipment. During his visit, which will last about five weeks, Dr. Osborn will be visiting installations carried out by EFCO in this country and abroad.

MR. A. STEPHENS, of Walsall, was on March 2 elected chairman of the Midland area of the National Union of Manufacturers in succession to Mr. W. Blackwell, who has become president. Mr. Stephens is managing director of Metal Casements, Limited, which he founded in 1932, with Mr. W. R. Wheway. Mr. Stephens has been chairman of the Walsall Committee of the N.U.M. since its formation three years ago.

SIR ARTHUR SMOUT retired from the board of Imperial Chemical Industries, Limited, last month. He was appointed to the board in 1944 and in the same year became metals group director. In July, 1951, he also took over responsibility for the Nobel Division. Sir Arthur Smout served for 48 years with the company and its predecessors, having joined Elliotts Metal Company, Limited, in 1905. From 1942 to 1945 he was Director-General of Ammunition Production at the Ministry of Supply, being knighted for his services in 1946.

THE POST of chief metallurgist to the Dorman Long group has been filled by the appointment of MR. JOHN WRIGHT, who was formerly chief chemist at the company's Cleveland works. He is a member of a family which has earned considerable distinction in the iron and steel industry on Tees-side. His father, the late Mr. Harold Wright, who held the same post at the time of his death, was a former Bessemer gold medallist. His brother, Mr. Leslie Wright, is chairman of Gjers Mills & Company, Limited, Ayresome Ironworks, Middlesbrough.

MR. G. P. CLAY has been appointed chief engineer of the Metals Division of Imperial Chemical Industries, Limited. Though a relative newcomer to this division, Mr. Clay has spent almost the whole of his professional life with the company. Educated at Manchester University and Cambridge, he completed his engineering trade apprenticeship in 1933 and joined I.C.I. Alkali Division three years later. Military service occupied the whole of the war period, and in 1945 he returned to I.C.I.—this time to head office, on the staff of the technical department, central instrument section. Mr. Clay came to Metals Division in 1949 as instrument manager, and two years later was appointed assistant to Mr. J. T. Smith, whom he now succeeds.

Obituary

MR. WILLIAM INGLIS BILSLAND, of Glasgow, who died on March 5, invented and patented improved machine-tool equipment.

MR. HAROLD EDWIN BENNET, chairman of Alder & Mackay, Limited, brassfounders, of Edinburgh, died on March 2 at the age of 54.

MR. BENJAMIN BUTTERS, who died on March 6 in Glasgow, was managing director of Butters Bros. & Company, Limited, crane-makers, Glasgow. He was 76.

MR. GEORGE LEWIS BANCROFT, sales director of Manlove Alliott & Company, Limited, engineers, Nottingham, died on March 6 at the age of 55. Mr. Bancroft, who had been with the firm for 40 years, was a member of the Nottingham Society of Engineers.

MR. JAMES B. MUIR, of Falkirk, has died within a few weeks of his 85th birthday. He was engaged in iron-founding until his retirement in 1927. He went to Falkirk in 1918 as foundry manager with the Carron Company, but several years later returned to his former firm, David King & Sons, Glasgow, where he remained until his retirement.

THE DEATH has occurred in Milwaukee, Wisconsin, U.S.A., of MR. IRVING RICHARD SMITH, governing director of Sterling Foundry Specialties, Limited, since the formation of the Company 33 years ago. Mr. Smith was also president of the Sterling Wheelbarrow Company of Milwaukee, a firm that have been making the Sterling rolled-steel moulding box in the United States since 1908.

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News in Brief

THE WORLD'S LARGEST IRON-ORE SHIP, the Tarfala, built at Götaverken, in Gothenburg, has made her trial trip. Belonging to the Graengesberg Company, she can load 26,000 metric tons of ore.

AS AN IMMEDIATE RESULT of the recent increases in the prices of coal and power, the prices of ordinary and rapid hardening Portland cement have been raised by 2s. per ton as from March 5.

THE DIRECTORS have decided to pay an interim dividend of 5 per cent, less income tax, on the ordinary share capital of Thos. W. Ward, Limited, Albion Works, Sheffield, in respect of the financial year ending June 30.

AT THE CASTLE BROMWICH B.I.F. this year, from April 27 to May 8, G.P.A. Tools & Gauges, Limited, will be among the members of the Gauge and Toolmakers' Association sharing a combined stand.

DUTCH AUTHORITIES have thanked the South Durham Steel & Iron Company, Limited, of Middlesbrough, for its efficiency and co-operation in completing within a few days a further order for 1,000 metres of 24-in. dia. steel pipe for use in the flooded areas of Holland.

IT IS ESTIMATED that Mr. William Allan, who died recently, walked 80,000 miles to and from his work during 46 years' employment at the East Hecla works of Hadfields, Limited. He was a former president of the walking section of Sheffield United Harriers.

A RESEARCH AND DESIGN BUILDING, covering 185,000 sq. ft., erected by C. A. Parsons & Company, Limited, engineers, of Heaton, Newcastle-upon-Tyne, will be completed in April and marks another stage in the large-scale development plan, costing £4,000,000, carried out by the company since the war.

MR. A. A. MATTHEWS, managing director of Non-ferrous Founders, Limited, Morden, wishes to refute rumours which seem to be current in some quarters that his foundry is closing down. As a matter of fact, the local council has approved the building of extensions, which will be completed this year.

IT IS ANNOUNCED by Metropolitan-Vickers Electrical Company, Limited, Manchester, that they have been responsible for the development and production of telemetry equipment, which is being widely used for the development of rockets and guided missiles. The equipment is being made for the Ministry of Supply.

THE BELGIAN GOVERNMENT has cancelled the tax on exports. Originally imposed to cover special expenditure which is no longer incurred, it had been continued for revenue reasons. The steel industry paid about 70 per cent. of the proceeds of the tax, which was chargeable at the maximum rate of 3 per cent.

ABOUT 600 PEOPLE ATTENDED the recent reunion of members of the Accles & Pollock Limited Fellowship at Oldbury, when Mr. Walter W. Hackett, in presenting fellowship badges to 49 workers to mark the completion of 25 years' service (each had earlier received a gold watch), said that 841 watches to mark long service had now been presented by the firm.

THE DIRECTORS of Peter Brotherhood, Limited, engineers and ironfounders, of Peterborough, propose to increase the capital of the company to £515,000 by creating 350,000 new ordinary 10s. shares and to capitalize £175,000 from general reserve, in order to distribute the new shares to ordinary shareholders in the proportion of one for every ordinary share now held.

SIR ROBERT MCALPINE & SONS, civil engineering contractors, of London, W.1, announces that with Treasury approval it has formed a new company in Canada. The company, which will be called Sir Robert McAlpine & Sons (Canada), is a private company, as is the parent concern, with an initial capital of $2,000,000. It will undertake industrial and public works construction in the Dominion.

A NEW WAGON TIPPLER designed to Railway Clearing House standards has just been completed by the Fraser & Chalmers Engineering Works of the General Electric Company, Limited. Fully automatic in tipping operation, the machine is designed to handle wagons up to the standard Ministry of Transport pattern of 24½ tons capacity, and will also deal with smaller wagons down to 8 tons capacity.

THE COUNCIL OF IRONFOUNDRY ASSOCIATIONS, 14, Pall Mall, London, S.W.1, have now issued "Co-operation between purchaser and supplier of iron castings (design and research aspects)" being a full report of the open discussion at the annual convention of the Joint Iron Council at the Connaught Rooms last October. It is understood that copies are being circulated to members of the Association.

THE EXHIBIT of Venner, Limited, and Venner Accumulators, Limited, at the Electrical Engineers' Exhibition, Earls Court, March 25 to 28, embraces time switches, process timers and automatic switching devices covering municipal, commercial and aeronautical applications together with a large range of alternative clocks which can be used as prime movers, also made by this company. Venner Accumulators, Limited, are exhibiting an ultra-small lightweight silver/zinc accumulator.

THE MACHINE TOOL TRADES ASSOCIATION has appointed a Committee to study the Metalworking Productivity Team Report recently issued. In the meantime, attention is drawn to the fact that the recommendations, conclusions and views in the Report are put forward by the team for consideration and discussion and are not necessarily to be regarded as being endorsed by the machine-tool industry, the Association, or the firms who lent the services of the members of the team.

LANARKSHIRE has gained a new light industry in precision engineering, which offers scope for considerable development in meeting a definite need in the home and overseas markets. The complete manufacture of the "Cyclaid" two-stroke engine, originally designed by British Salmson Aero Engines, Limited, of Raynes Park, London, has been transferred to their Larkhall factory, and the present production of 100 engines per week is expected to rise in the next few months to 150-200 and provide employment for an additional 50 workers.

AT THE INTERNATIONAL MAGNESIUM EXPOSITION to be held in Washington from March 31 to April 2, and which has been organized by the Magnesium Association, New York, Magnesium Elektron, Limited, will be represented together with virtually all their licensees, both British and foreign, on a large stand covering 1,400 sq. ft. Not since 1937 (in Berlin) has so comprehensive a display of magnesium cast and wrought products been on view. This will also be the first occasion on which the individual members of the Elektron group will provide a collective display.

MATHER & PLATT, LIMITED—Mr. G. B. Alvey has been appointed to the board; he remains responsible for the work of the electrical department.

Raw Material Markets

Iron and Steel

The new blast furnace at Shotton has been lit. There were unforeseen delays in the final stages of its construction, but these have now been overcome and with a total of 107 blast furnaces now in operation the aggregate rate of pig-iron production may be raised for the first time to 11,000,000 tons per annum.

Foundry pig-iron supplies are not affected. Production of this grade is now concentrated almost exclusively in the Midlands and deliveries are keeping pace with the somewhat reduced requirements of the foundries, whose order-books present a less healthy appearance than they did a few months ago. On the other hand, there has been a shrinkage in the output of hematite and consumers experience growing difficulty in obtaining adequate supplies.

The most striking feature of the trade returns is the high rate of imports of crude and semi-finished steel. Notwithstanding the resounding achievements of United Kingdom steelmakers in raising the aggregate output of ingots and castings to record heights, it is still apparently necessary to draw extensively upon foreign sources of supply. Of total imports amounting to 200,000 tons in January, 43,000 tons came from America, and nearly 40,000 tons from Belgium. To stem the intake of this high-cost material by providing more home-produced steel is one of the most urgent responsibilities of the steel industry. There are abundant outlets for the disposal of billets, blooms, slabs, and sheet bars, and demand for first-class re-rolling scrap is also very brisk.

Steelmakers cannot be tempted to add to their commitments for the current period. The indications are that there will be a considerable carry-over of uncompleted contracts at the end of the month. Experience, in fact, discounts the idea that there will be a speedy end to the steel shortage, although the position is easier, and should continue to improve. Negotiation of new contracts for the second period is complicated by uncertainty regarding price levels. Buyers must accept the liability to pay the price ruling at the time of delivery, but this form of trading is very unsatisfactory, and, indeed, is only generally practicable on a seller's market. Pressure for prompt deliveries of all descriptions of finished steel is maintained and in most instances from the users of light plates and sheets.

Exporters have begun the year in promising style. Shipments to Denmark and Holland are expanding and more favourable conditions are developing in the South African trade.

Non-ferrous Metals

Both zinc and lead prices were marked down in the United States last week, the former by ¼ cent to 11 cents and the latter by ½ cent to 13 cents. These downward adjustments followed weakness in London. Zinc was firmer in London yesterday (Wednesday), when the March and June official prices were level. In lead the premium for March has increased considerably and yesterday the official quotation showed a backwardation of £3. Just why this position should obtain is not at all clear, for there is no lack of lead in this country at the present time. Tin has fluctuated in quiet trading.

The copper price situation in the States is confused, and it was reported over the weekend that something like half-a-dozen different quotations are current at the present time. During last week there was a seller as low as 27½ cents, but one Custom smelter, at any rate, was reported to be asking as much as 33 cents. It seems likely that the high price will stimulate production of marginal properties and it is, of course, known that a very large tonnage of scrap is likely to come out during the next month or two. As to the level at which the price will settle that is not so easy to judge, but some observers believe that stability will be reached at around 30 cents within the next few months.

If this should prove to be the export price also then we may expect some reduction in the United Kingdom quotation, which is at present based on a figure of 33½ cents, equal to £268, plus £17 to cover the Ministry's charges from f.a.s. New York. The last E. & M.J. weekly average available as we write shows a reduction of fully ¼ cent on the previous figure, but so long as Chile can continue to sell at 35½ cents f.o.b. the E. & M.J. export average cannot come down very much. However, there is a real doubt whether the Chileans will be able to market all their copper at this level, for, as already suggested, more copper is going to be available in the States from domestic production and it is very doubtful whether any European buyer would pay 35½ cents. At the moment the price on the Continent seems to about £270, or 33.75 cents.

Official zinc prices were as follow:—

March—March 5, £77 10s. to £77 15s.; March 6, £77 5s. to £77 10s.; March 9, £79 5s. to £79 7s. 6d.; March 10, £77 15s. to £78 5s.; March 11, £79 10s. to £79 15s.

June—March 5, £77 15s. to £78; March 6, £77 10s. to £77 15s.; March 9, £79 5s. to £79 7s. 6d.; March 10, £77 17s. 6d. to £78 2s. 6d.; March 11, £79 10s. to £79 15s.

The following official tin quotations were recorded:—

Cash—March 5, £956 to £958; March 6, £957 to £958; March 9, £958 10s. to £959; March 10, £958 to £958 10s.; March 11, £957 10s. to £958.

Three Months—March 5, £940 to £942; March 6, £941 to £942; March 9, £941 to £941 10s.; March 10, £942 to £943; March 11, £943 to £944.

Official prices of refined pig-lead were:—

March—March 5, £88 10s. to £88 15s.; March 6, £88 to £88 5s.; March 9, £91 10s. to £92 10s.; March 10, £92 10s. to £92 15s.; March 11, £93 5s. to £93 10s.

June—March 5, £87 to £87 5s.; March 6, £86 7s. 6d. to £86 10s.; March 9, £89 to £89 10s.; March 10, £89 10s. to £89 15s.; March 11, £90 5s. to £90 15s.

New Catalogues

Technical Data on Refractories. It is a little difficult to find from this booklet that it has been issued by the Oughtibridge Silica Brick Company, Limited, Oughtibridge, near Sheffield. It is a most useful publication and gives much data of great use to foundrymen. Its 24 pages of useful tables and formulæ will be much appreciated by technicians. Readers are advised to write to Oughtibridge for a copy.

Temperature-indicating Paints. Allied Colloids (Bradford), Limited, 11, Great St. Thomas Apostle, Queen Street, London, E.C.4, have issued an eight-page pamphlet, which details the methods to be used in preparing the paints from powders, and their application to components to be heated. The range covered by "Thermocol," their trade mark, is from 40 to 560 deg. C. These powders are a German innovation. With this pamphlet there is enclosed a leaflet dealing with Thermochrom coloured crayons which have a similar use. Their range is from 65 to 670 deg. C. The reviewer has in the past used such aids to temperature evaluation and found them well suited to his purpose. These publications are available to our readers on writing to Queen Street.

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Illustrations of Supinex "R" in use by courtesy of Messrs. S. A. Rhodes, Ltd., Hyde, Cheshire.

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

(Delivered unless otherwise stated)

March 11, 1953

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2:—Middlesbrough, £13 8s.; Birmingham, £13 1s. 3d.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent. P, £16 8s., 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, £16 12s. 3d.

Scotch Iron.—No. 3 foundry, £16 1s. 6d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £17 18s.; South Zone, £18 0s. 6d.

Refined Malleable.—P, 0.10 per cent. max.—North Zone, £18 18s.; South Zone, £19 0s. 6d.

Cold Blast.—South Staffs, £18 2s.

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 2s.; Scotland (Scotch iron), £16 8s. 6d.; Sheffield, £17 3s.; Birmingham, £17 9s. 6d.; Wales (Welsh iron), £16 8s. 6d.

Basic Pig-iron.—£13 19s. all districts.

FERRO-ALLOYS

(Per ton unless otherwise stated, delivered).

Ferro-silicon (6-ton lots).—40/55 per cent., £57 10s., basis 45 per cent. Si, scale 21s. 6d. per unit; 70/84 per cent., £86, 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., 22s. 10d. to 23s. 6d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 25s. 9d. to 28s. 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. per lb. Cr; max. 1 per cent. C, 2s. 2½d. per lb. Cr; max. 0.15 per cent. C, 2s. 3½d. 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.

Ferro-manganese (blast-furnace). — 78 per cent., £48 12s. 11d.

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 4s. 6d.; tested, 0.08 to 0.25 per cent. C (100-ton lots), £25 14s. 6d.; hard (0.42 to 0.60 per cent. C), £27 12s.; silico-manganese, £33 8s.; free-cutting, £28 8s. 6d. SIEMENS MARTIN ACID: Up to 0.25 per cent. C. £32 4s.; case-hardening, £32 12s.; silico-manganese, £34 9s. 6d.

Billets, Blooms, and Slabs for Forging and Stamping.—Basic, soft, up to 0.25 per cent. C, £29 8s.; basic, hard, over 0.41 up to 0.60 per cent. C, £30 8s.; acid, up to 0.25 per cent. C, £32 12s.

Sheet and Tinplate Bars.—£25 3s. 6d.

FINISHED STEEL

Heavy Plates and Sections.—Ship plates (N.-E. Coast), £29 14s.; boiler plates (N.-E. Coast), £31 1s. 6d.; chequer plates (N.-E. Coast), £31 3s.; heavy joists, sections, and bars (angle basis), N.-E. Coast, £27 17s.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., untested, £31 15s. 6d.; flats, 5 in. wide and under, £31 15s. 6d.; hoop and strip, £32 10s. 6d.; black sheets, 17/20 g., £41 12s. 6d.; galvanized corrugated sheets, 24 g., £51 1s.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £50 18s. 3d.; nickel-chrome, £71 7s. 9d.; nickel-chrome-molybdenum, £79 2s. 6d.

Tinplates.—57s. 1½d. per basis box.

NON-FERROUS METALS

Copper.—Electrolytic, £285; high-grade fire-refined, £284 10s.; fire-refined of not less than 99.7 per cent., £284; ditto, 99.2 per cent., £283 10s.; black hot-rolled wire rods, £294 12s. 6d.

Tin.—Cash, £957 10s. to £958; three months, £943 to £944; settlement, £958.

Zinc.—March, £79 10s. to £79 15s.; June, £79 10s. to £79 15s.

Refined Pig-lead—March, £93 5s. to £93 10s.; June, £90 5s. to £90 15s.

Zinc Sheets, etc.—Sheets, 15 g. and thicker, all English destinations, £105 10s.; rolled zinc (boiler plates), all English destinations, £103 10s.; zinc oxide (Red Seal), d/d buyers' premises, £110.

Other Metals.—Aluminium, ingots, £166; magnesium, ingots, 2s. 10½d. per lb.; antimony, English, 99 per cent., £225; quicksilver, ex warehouse, £70 10s. to £71 (nom.); nickel, £483.

Brass.—Solid-drawn tubes, 26d. per lb.; rods, drawn, 34½d.; sheets to 10 w.g., 279s. per cwt.; wire, 32d.; rolled metal, 265s. 9d. per cwt.

Copper Tubes, etc.—Solid-drawn tubes, 32¾d. per lb.; wire, 317s. 9d. per cwt. basis; 20 s.w.g., 346s. 3d. per cwt.

Gunmetal.—Ingots to BS. 1400—LG2—1 (85/5/5/5), £206 to £218; BS. 1400—LG3—1 (86/7/5/2), £218 to £238; BS. 1400—G1—1 (88/10/2), £320 to £375; Admiralty GM (88/10/2), virgin quality, £325 to £380 per ton, delivered.

Phosphor-bronze Ingots.—P.Bl, £350 to £385 L.P.Bl, £250 to £275 per ton.

Phosphor Bronze.—Strip, 412s. 9d. per cwt.; sheets to 10 w.g. 434s. 6d. per cwt.; wire, 49¾d. per lb.; rods, 44½d., tubes, 42¾d.; chill cast bars: solids 3s. 8d., cored 3s. 9d. (C. CLIFFORD & SON, LIMITED.)

Nickel Silver, etc.—Ingots for raising, 2s. 8½d. per lb. (7 per cent.) to 3s. 11d. (30 per cent.); rolled metal, 3 in. to 9 in. wide × .056, 3s. 2½d. (7 per cent.) to 4s. 5d. (30 per cent.); to 12 in. wide × .056, 3s. 2¾d. to 4s. 5¼d.; to 25 in. wide × .056, 3s. 4¾d. to 4s. 7¼d. Spoon and fork metal, unsheared, 2s. 11½d. to 4s. 2d. Wire, 10 g., in coils, 3s. 9½d. (10 per cent.) to 4s. 11d. (30 per cent.). Special quality turning rod, 10 per cent., 3s. 8½d.; 15 per cent., 4s. 1¾d.; 18 per cent., 4s.6¼d. All prices are net.

Forthcoming Events

MARCH 17

Institute of British Foundrymen

Coventry and district students section :—"Works Study Applied to Foundry Operations," by Prof. T. U. Matthew, 7.15 p.m., in Room A.5, Coventry Technical College.

East Anglian section :—"'C' Shell-moulding Process," by J. Fallows, 7 p.m., at Central Hall, Public Library, Ipswich.

Slough section :—Annual General Meeting at 7.15 p.m., followed by "Flow of Metal into Moulds," film introduced by R. W. Ruddle, 7.30 p.m., at the Lecture Theatre of High Duty Alloys Limited.

Association of Bronze and Brass Founders

Lancashire and Cheshire area :—Informal meeting of members, 12.30 p.m., at the Midland Hotel, Manchester.

Institute of Metals

South Wales section :—Annual general meeting, followed by films of metallurgical interest, 6.30 p.m., at University College, Metallurgy Department, Singleton Park, Swansea.

Sheffield Metallurgical Association

"Intergranular Corrosion of 18/8 Cr-Ni Stainless Steels," by R. Butcher, 7 p.m., in the Grand Hotel.

Purchasing Officers' Association

Croydon group :—"Foreign Manufacturing Conditions as seen through British Eyes," 7.15 p.m., at the Greyhound Hotel, High Street.

Watford and Harrow group :—"Standardization, Simplification, and Specification," by F. Kay, 7.15 p.m., at the Railway Hotel, Wealdstone.

Wolverhampton branch :—Evening visit to the works of English Electric Company, Limited, Stafford.

Institution of Production Engineers

Sheffield graduate section :—"Radiant Heat Drying, and its Influence on Painting Techniques," by Dr. G. H. Willis, 6.30 p.m., at the Royal Victoria Station Hotel.

Institute of Industrial Supervisors

Newark section :—"American Foremanship Report," by W. J. Izzard, 7.30 p.m., at the County Technical College.

MARCH 18

Institute of British Foundrymen

London branch :—Joint meeting with the Institute of Vitreous Enamellers Southern section (see later).

North-east Scottish section :—"Progress in British Ironfounding," by W. W. Braidwood, 7.30 p.m., at Imperial Hotel, Keptie Street, Arbroath.

Institute of Vitreous Enamellers

Northern section :—"Cast Iron for Enamelling," by K. E. Walker, at the Queen's Hotel, Manchester.

Southern section :—Annual general meeting, followed by a joint meeting with the Institute of British Foundrymen, London branch, on "Requirements for Producing a First-class Enamelled Iron Casting," 7.30 p.m., at the Howard Hotel, Norfolk Street, London, W.C.2.

Institute of Welding

North London branch :—"Hard Facing and Reclamation of Worn Parts," by M. Riddihough, 7.30 p.m., at the South-west Essex Technical College, Walthamstow.

Manchester Metallurgical Society

Visit to Thomas Bolton & Sons, Limited, Froghall, Staffs.

Incorporated Plant Engineers

Western branch :—Annual general meeting, followed by "Some Aspects of Metallurgy in Plant Engineering," by J. Hinde, 7.15 p.m., at the Grand Hotel, Bristol.

MARCH 19

Institution of Production Engineers

Glasgow section :—"Increased Productivity by the Use of Compressed Air," by C. Willcox, 7.30 p.m. at the Institution of Engineers and Shipbuilders in Scotland, 39, Elmbank Crescent, Glasgow, C.2.

Institute of Industrial Supervisors

Coventry section :—"Factory Morale and Discipline under Full Employment," by L. Leonard, 7.30 p.m., in the Craven Arms Hotel, High Street.

MARCH 20

Institute of British Foundrymen

London branch :—"Men Only" Dinner, 7 for 7.30 p.m., at the Horse Shoe Hotel, Tottenham Court Road, London, W.1.

Institute of Vitreous Enamellers

Midland section :—Dinner/dance, 7 for 7.30 p.m., at the Star and Garter Hotel, Wolverhampton.

Institution of Production Engineers

Stoke-on-Trent sub-section :—Annual general meeting, followed by "Noise and Vibration in Machinery," by Dr. A. J. King, 7.30 p.m., in the Town Hall, Hanley.

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

SENIOR EXECUTIVE, fully experienced in all grades of Malleable Castings production. Well known in the trade and a Member of National Committees. Accustomed to full control. Desires change to small/medium Midland Company. Could introduce proven staff if required.—Box 3312, FOUNDRY TRADE JOURNAL.

FOUNDRY ENGINEER EXECUTIVE, experienced design, development, maintenance, tech. sales, keen, energetic. Investment considered.—Box 3309, FOUNDRY TRADE JOURNAL.

FOUNDRYMAN, age 49, seeks position with small jobbing iron foundry; experienced moulder; managerial qualifications ferrous and non-ferrous production; wide experience of trade; accustomed to full control; A.M.I.B.F.—Box 3305, FOUNDRY TRADE JOURNAL.

REPRESENTATIVE (Indian), 32, A.M.I.B.F., A.M.I.I.M., A.I.Ec.E., etc., fully technically and commercially qualified for last four years in England, seeks representation of Indian concern in U.K. and Continent or *vice-versa*.—Box 3322, FOUNDRY TRADE JOURNAL.

FOUNDRY METALLURGIST desires change, to anywhere South of Birmingham. Fully experienced grey iron, nodular and austenitic irons, and all non-ferrous except light alloys. Laboratory and sands control. Good foundry experience, green, dry, mechanised. Salary £750 p.a.—Box 3319, FOUNDRY TRADE JOURNAL.

GENERAL MANAGER, aged 40, married, with family, M.I.B.F., experienced aluminium, yellow metals, iron, mechanised and general, accustomed complete control works and administration, sales, buying, costs, etc., would consider any senior appointment any area. House required.—Box 3297, 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.

WORKING FOREMAN required for small Jobbing Foundry in North-East country town. Excellent opportunities for advancement in view of current expansion programme.—Full details, salary, etc., to Box 3323, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT—*Contd.*

FOUNDRY CHEMIST required, preferably with experience of malleable iron.—Please apply by letter, stating age, details of past experience, and salary required, to BAGSHAWE & CO., LTD., Dunstable Works, Dunstable.

QUALIFIED METALLURGIST, between the ages of 25/35, with technical control and research experience, to take charge of laboratory and development Section in progressive Mechanised Grey Iron Foundry in the North-West.—Box 3293, FOUNDRY TRADE JOURNAL.

METALLURGIST, with practical foundry experience, required by Grey Iron Foundry in Tipton. This vacancy offers a first-class opportunity to a man of 25/30 years of age. Superannuation scheme in operation, and first-class canteen facilities available.—Apply, giving details of experience, to Box 3324, FOUNDRY TRADE JOURNAL.

SALES EXECUTIVE (aged 30-40) required by Polygram Casting Co., Ltd. Close association and good contacts with the foundry industry essential. Knowledge of stock control advantageous, and some practical founding experience essential. A substantial salary will be paid to suitable applicant possessing drive and organising ability.—Reply, giving fullest details of experience, to POLYGRAM CASTING CO., LTD., Terminal House, Victoria, S.W.1.

FOUNDRY MANAGER required for a new Foundry operating in Madras India, specialising in Automobile castings. Good pay and prospects, with furnished bungalow. Applicants must be between 30 and 35 years of age, and preferably single men.—Write, giving full particulars of training and experience stating age, Box 3308, FOUNDRY TRADE JOURNAL.

THE GLACIER METAL CO., LTD., KILMARNOCK, has a vacancy for a Superintendent in their Non-Ferrous Foundry which is being re-organised and equipped with new and modern plant. The post is a responsible one calling not only for sound engineering training and knowledge and experience of foundry work and techniques, but also for a high degree of managerial skill and administrative competence. Previous experience in a similar managerial position is not essential but applicants must give proof that they possess potentialities which will enable them to administer the department in a sound and efficient manner. The Company is an expanding one and excellent opportunities exist for promotion to more senior appointments. A house may become available in the near future. Commencing salary not less than £800. Applications to the Personnel Manager.

SITUATIONS VACANT—*Contd.*

ASSISTANT METALLURGICAL CHEMIST required by a large Machine Tool Company in Coventry. Must be experienced analyst with sound metallurgical training. Apply giving qualifications, full experience, age and approximate salary required to Box 3317, FOUNDRY TRADE JOURNAL.

WEST YORKSHIRE FOUNDRIES, LTD., Sayner Lane, Leeds, 10, require ASSISTANT CHIEF METALLURGIST for technical control in their Grey Iron, Aluminium and High Frequency Steel Foundries. Qualification to A.I.M. standard or equivalent. Salary according to age, qualification and experience.—Apply in writing to CHIEF METALLURGIST.

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The Board does not bind itself to accept the lowest or any Tender, and reserves the right to accept part only of any Tender.

FRANK LAW, B.Sc.Tech.,
A.M.I.C.E.,
Engineer.

Sefton Street, Blackpool, Lancs.
3rd March, 1953.

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THE Proprietor of Patent No. 630560, for "Method and Apparatus for Cooling a Powder Formed from a Molten Metal," desires to secure commercial exploitation by licence or otherwise in the United Kingdom.—Replies to HASELTINE, LAKE & Co., 24, Southampton Buildings, Chancery Lane, London, W.C.2.

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It is greatly regretted that, owing to acute lack of space both at our offices and at our printer's works, it is not possible to retain in store indefinitely obsolete blocks used in past advertisements in the "*FOUNDRY TRADE JOURNAL.*"

NOTICE IS THEREFORE GIVEN that we shall be obliged to dispose of all advertisement blocks that have not appeared in the Journal since **December 31st, 1949**, if no application has been received for their return on or before **March 31st, 1953.**

March 12th, 1953

Foundry Trade Journal
49, Wellington St.,
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PATTERNMAKERS' Section

SINEX HIGH FREQUENCY VIBRATORS AND VIBRATING SCREENS

3 Ton Model Illustrated

Larger and smaller machines available

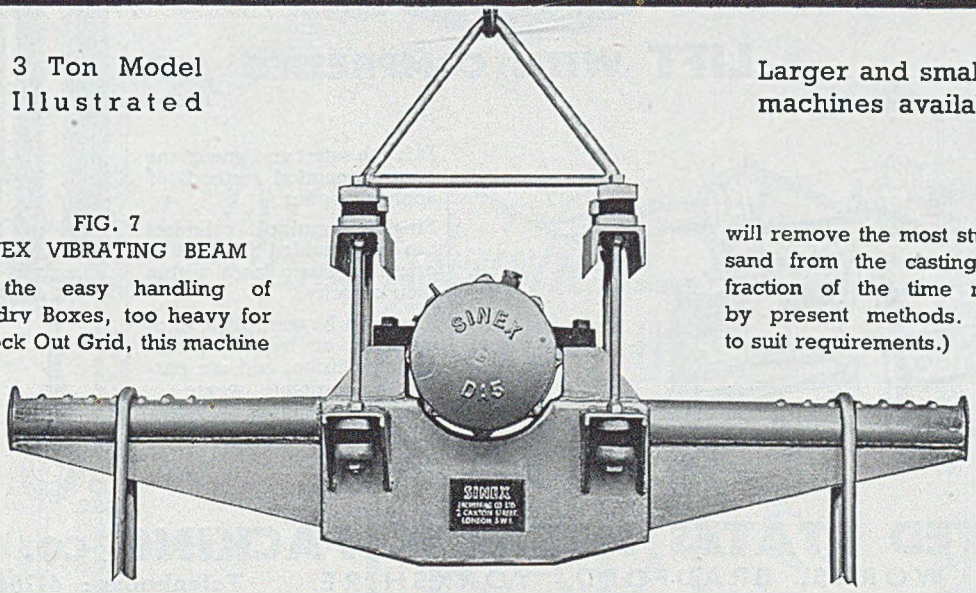


FIG. 7
SINEX VIBRATING BEAM

For the easy handling of Foundry Boxes, too heavy for a Knock Out Grid, this machine will remove the most stubborn sand from the casting, in a fraction of the time needed by present methods. (Links to suit requirements.)

We have an extensive prefabrication department and will be pleased to quote you for alteration or addition to your existing plant, and if Hoppers, Chutes and Roller Conveyors and Ancillary Equipment is required, please contact Sinex Technical Department

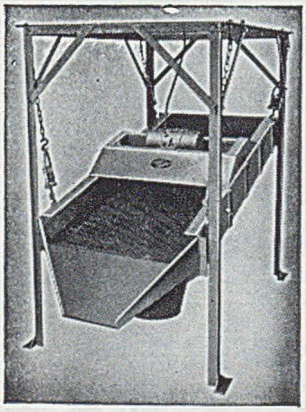


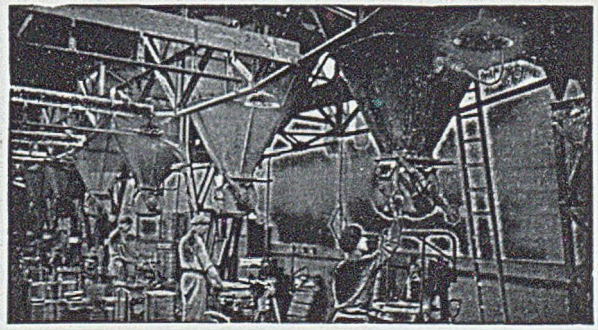
FIG. 10 (on left)

Sinex Vibrating Screen 6ft. × 3ft. Single Deck. Hourly output—15 tons of sand through ⅜in. mesh.

This screen is also manufactured in sizes to suit requirements.

FIG. 8 (illustrated below)

An important function of Sinex High Frequency Vibrators is the application to Sand and Storage Hoppers. To facilitate the rapid discharge of the material, long experience has shown that the fitting of a Sinex Vibrator to a Hopper containing the most stubborn material will avoid "arching" or "funnelling" of the material in the neck of the Hopper and assure a regular flow. Fig. 8 shows a batch of moulding Sand Hoppers fitted with Sinex Vibrators. These machines are manufactured in various sizes suitable to the capacity of the Hopper, and are wound suitable for any electric supply, single or 3-phase A.C.



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Telegrams: VICTORIA 7503 *Telephone: VICtoria 7503-4-5*

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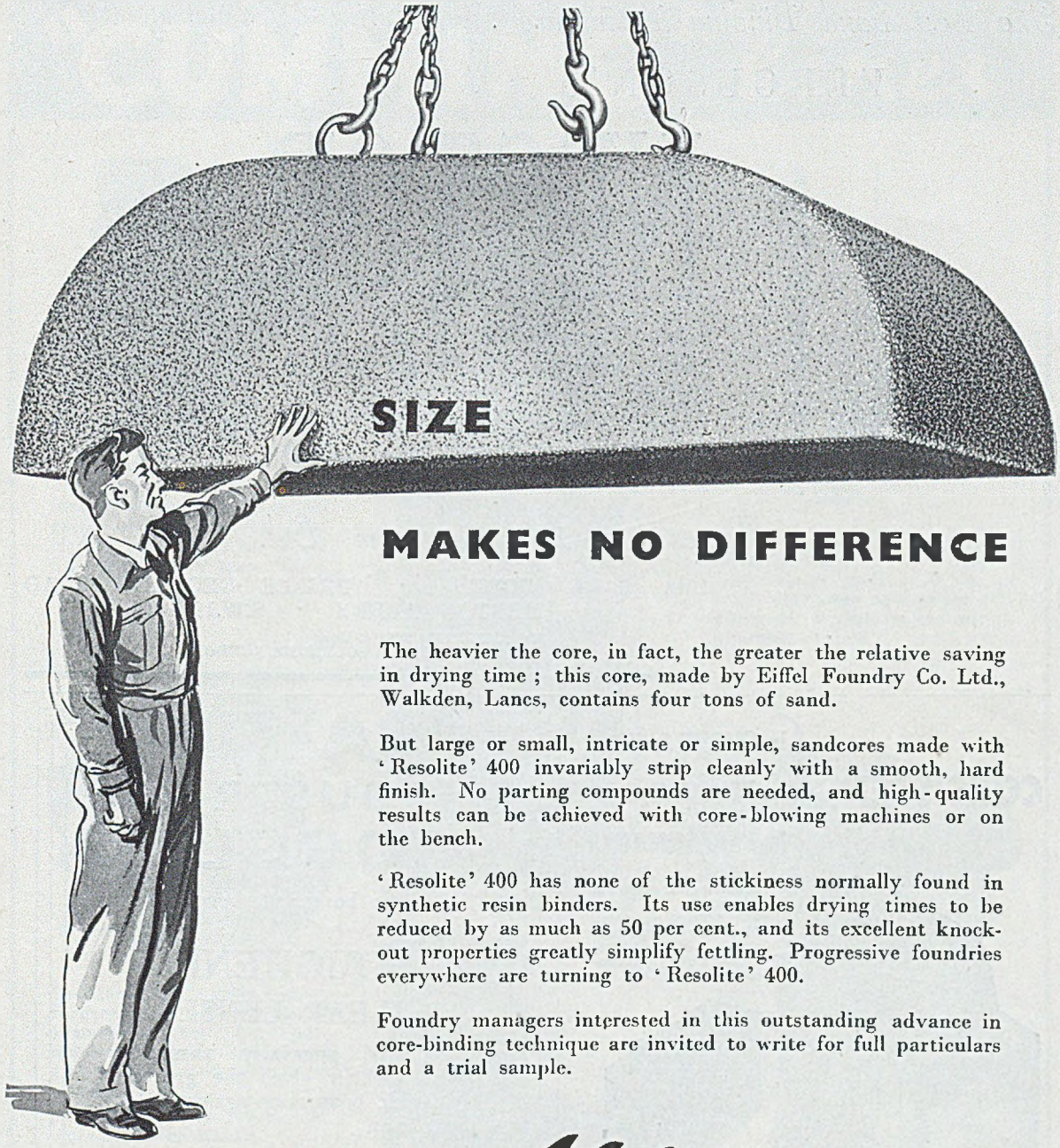

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The heavier the core, in fact, the greater the relative saving in drying time ; this core, made by Eiffel Foundry Co. Ltd., Walkden, Lancs, contains four tons of sand.

But large or small, intricate or simple, sandcores made with 'Resolite' 400 invariably strip cleanly with a smooth, hard finish. No parting compounds are needed, and high-quality results can be achieved with core-blowing machines or on the bench.

'Resolite' 400 has none of the stickiness normally found in synthetic resin binders. Its use enables drying times to be reduced by as much as 50 per cent., and its excellent knock-out properties greatly simplify fettling. Progressive foundries everywhere are turning to 'Resolite' 400.

Foundry managers interested in this outstanding advance in core-binding technique are invited to write for full particulars and a trial sample.

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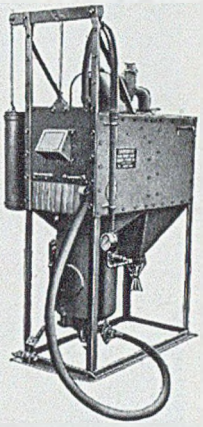

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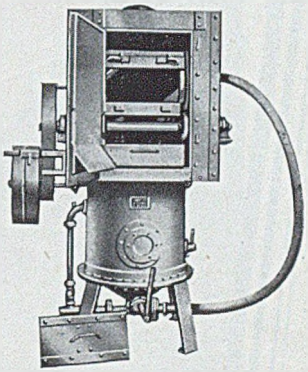

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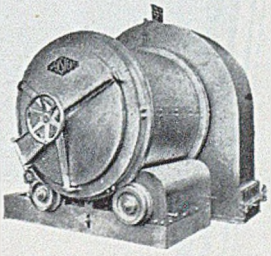

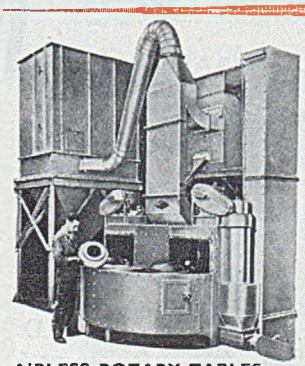

AIRLESS ROTARY TABLES

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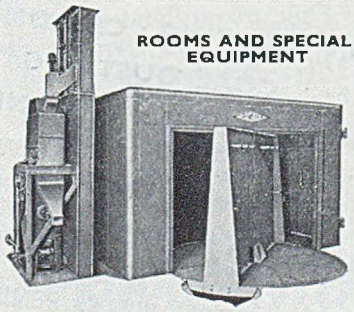

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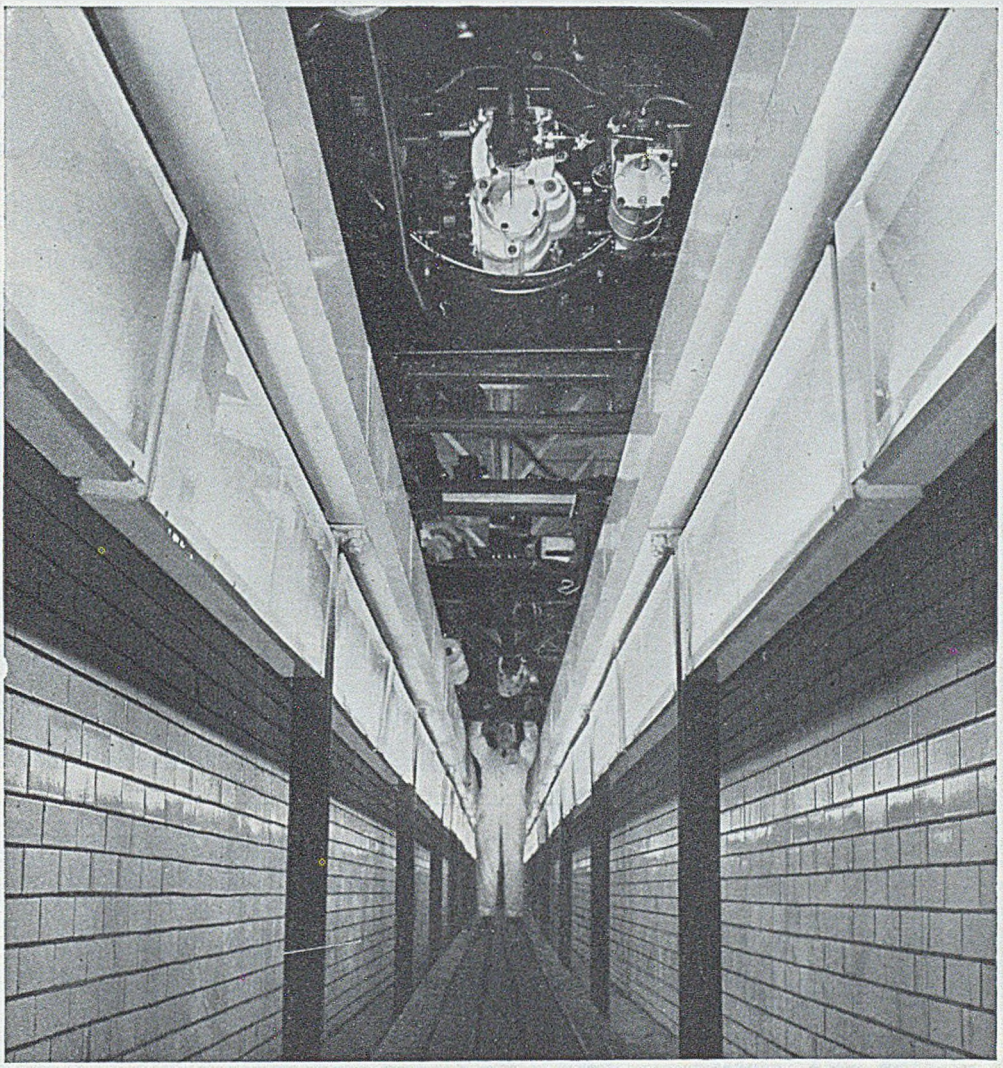

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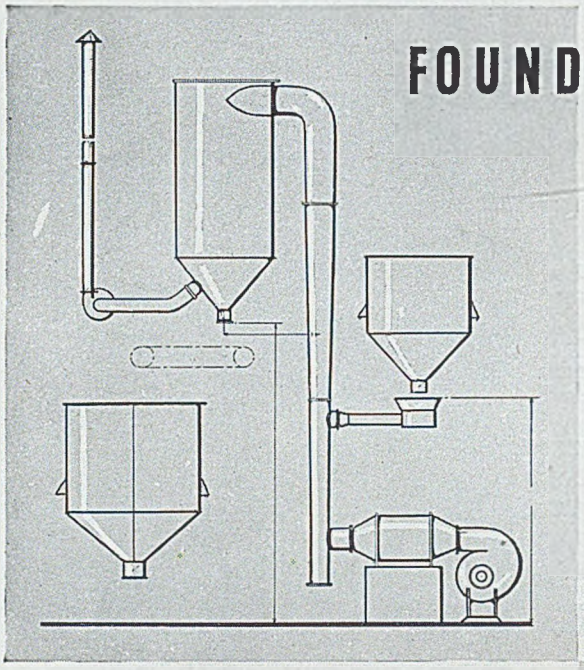

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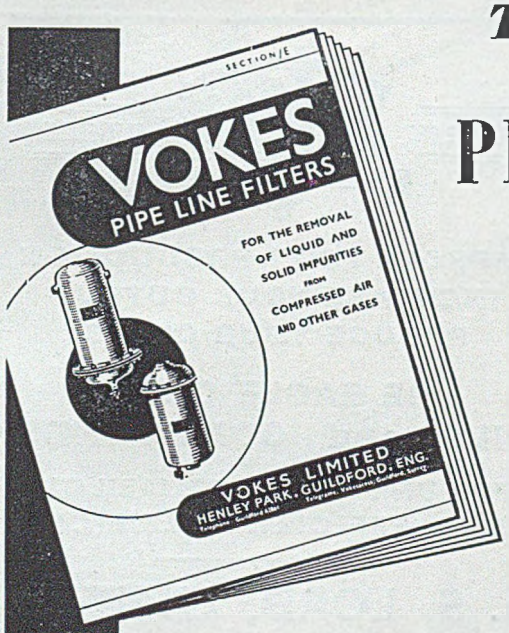

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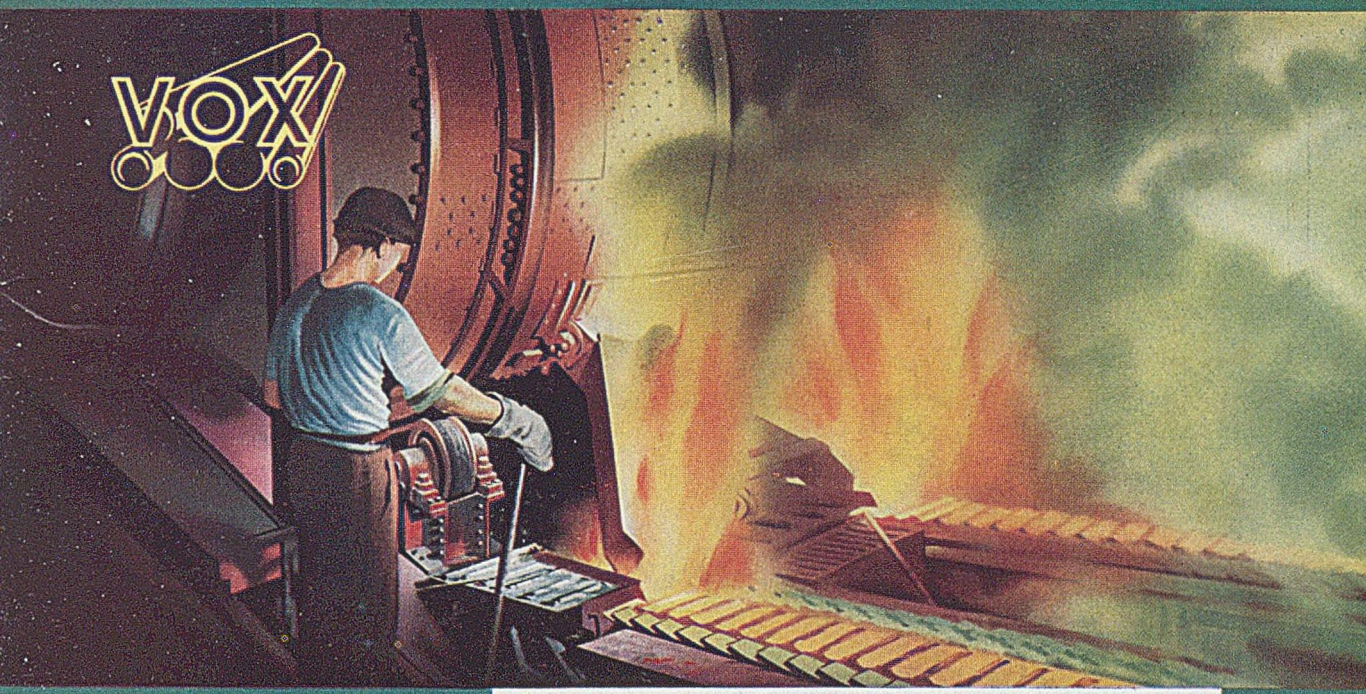

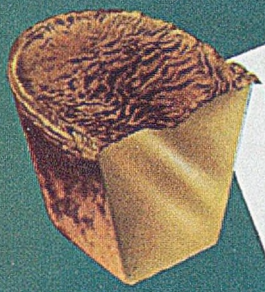

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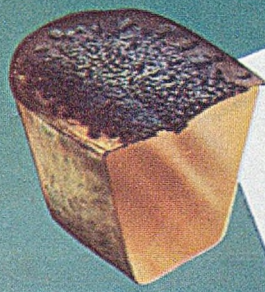

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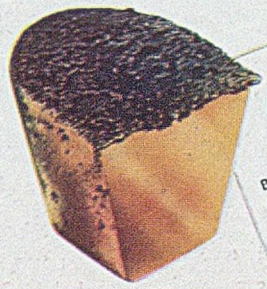

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