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APRIL 16, 1953

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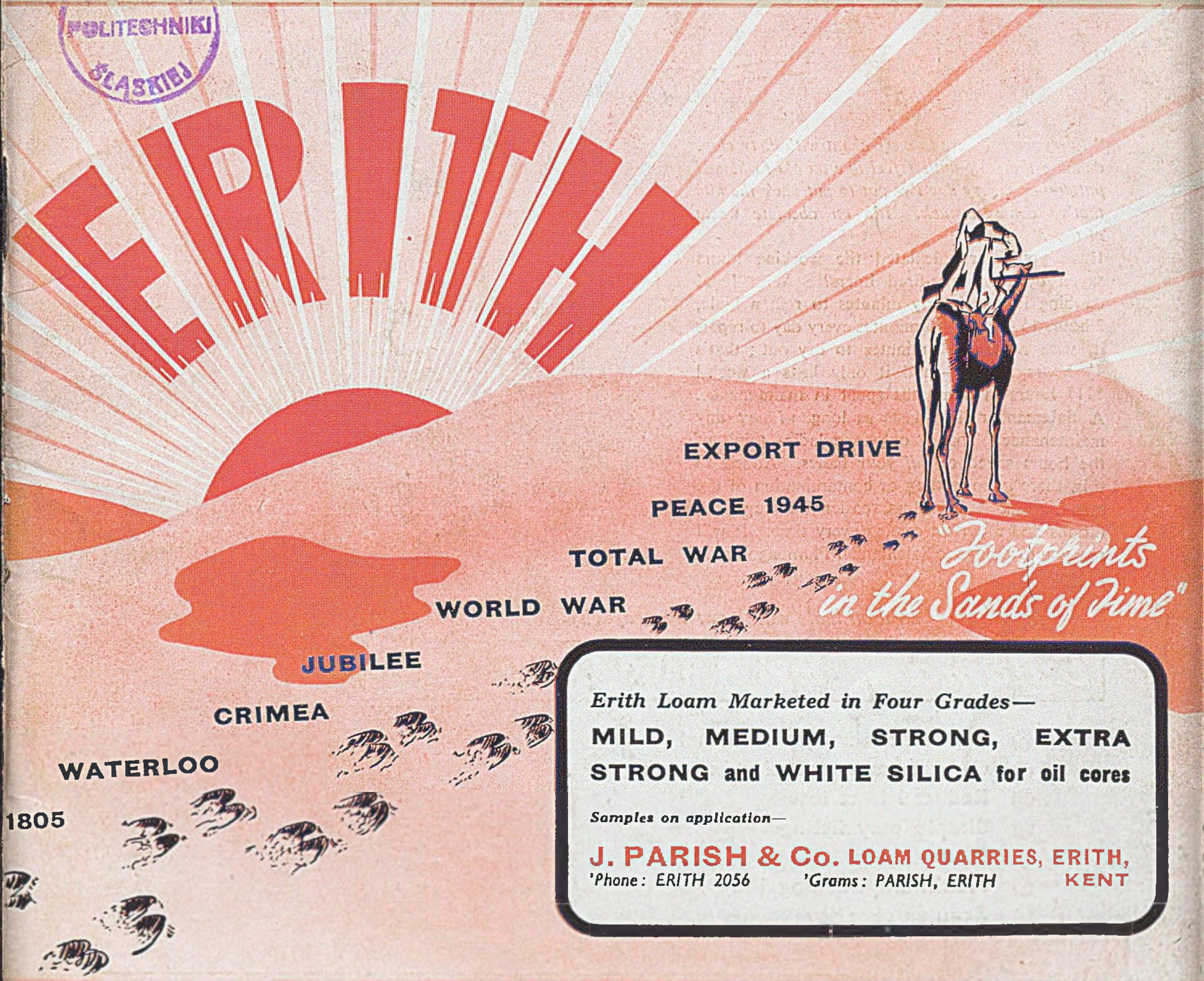
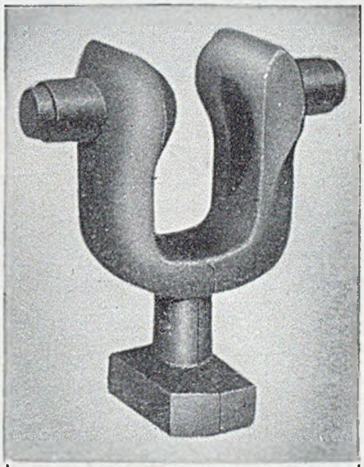


FORDATH'S WORD IS THEIR BOND

—and GLYSO is their word

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



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

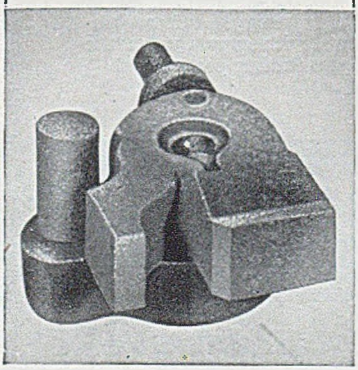
Semi-Solid Compounds give a high green bond covering a wide range of sand characteristics.

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

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

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

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

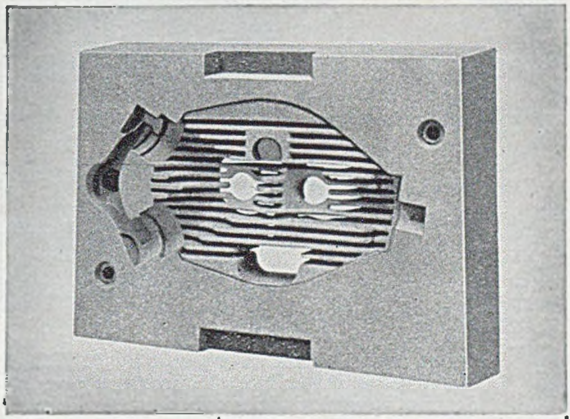


Glyso XL Core Powder, a pure film-dried cereal, produces high green strength in the mix and is best used with Permol Core Oil.

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.



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

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

Full details obtainable from

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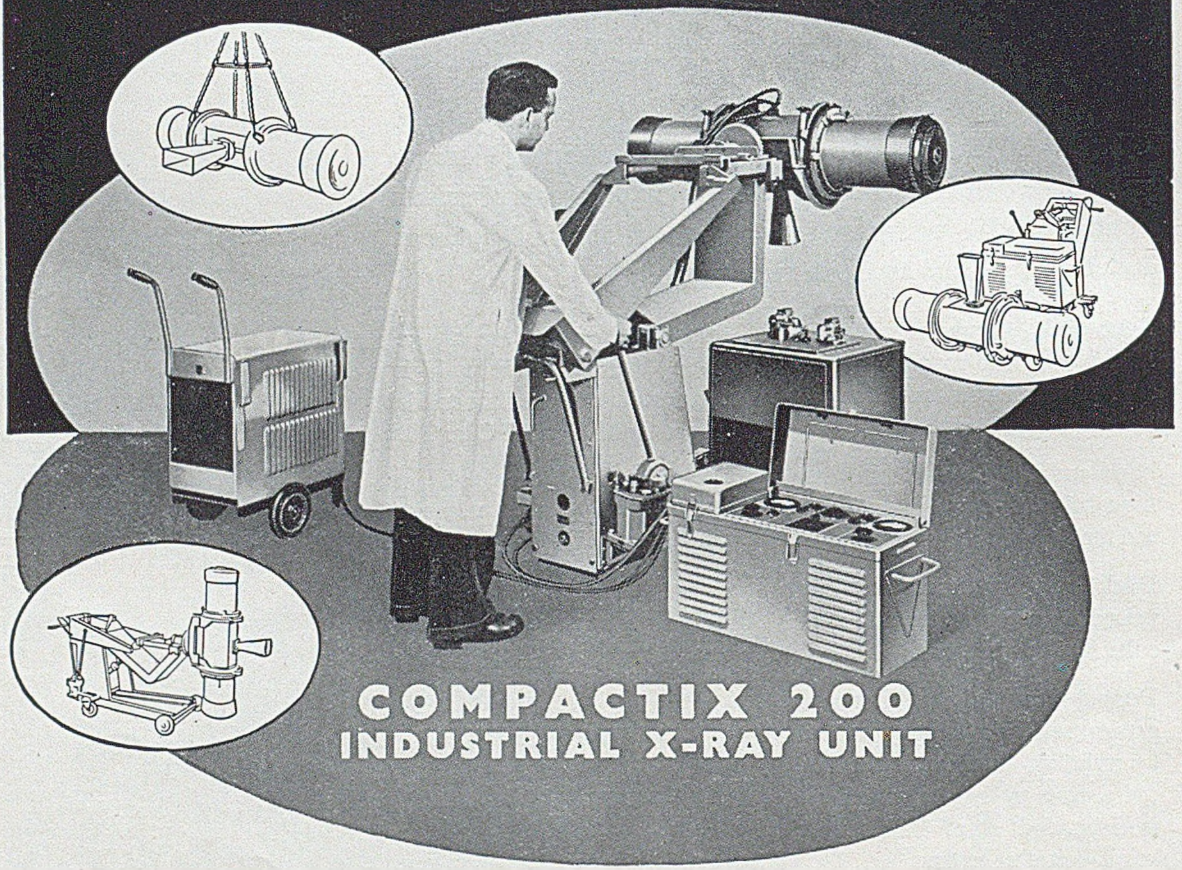
A NEW APPROACH–TO YOUR X-RAY INSPECTION PROBLEMS



THIS new industrial X-ray unit by PHILIPS shows an insight into the problems of non-destructive testing which only the experience of a quarter of a century can provide. The 'COMPACTIX 200' is praised and admired by engineers everywhere for its *engineering*.

It is completely self-contained, high tension source and X-ray tube being housed together in a cylindrical tank. The continuous rating is 200 kVp 10MA. There are no valves and no cables. Connection to the control box is by low tension supply only.

The 'COMPACTIX 200' has versatility to an hitherto unknown degree. It is equally well suited to inspection work out-of-doors as it is in the foundry or factory. It is rugged and trouble-free and designed for service anywhere in the world. May we send you further particulars?

PHILIPS

PHILIPS ELECTRICAL

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X-RAY EQUIPMENT FOR ALL PURPOSES · ELECTRO-MEDICAL APPARATUS · LAMPS & LIGHTING EQUIPMENT · RADIO & TELEVISION RECEIVERS · SOUND AMPLIFYING INSTALLATIONS

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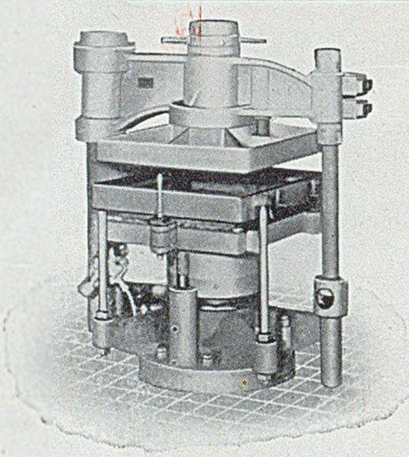
(XD 934D)

3 BIG SAVINGS IN FOUNDRY COSTS

BICC Magnetic Moulding Machines are automatically controlled by a fool-proof push-button system. Skilled operators are unnecessary. Saving number one!

Each machine is a self-contained unit, ready for work day after day, for maintenance is negligible . . . no pipe-lines to service; no compressor equipment to maintain. Saving number two!

Electric power is only used for the momentary squeeze operation period . . . a matter of seconds. Saving number three!

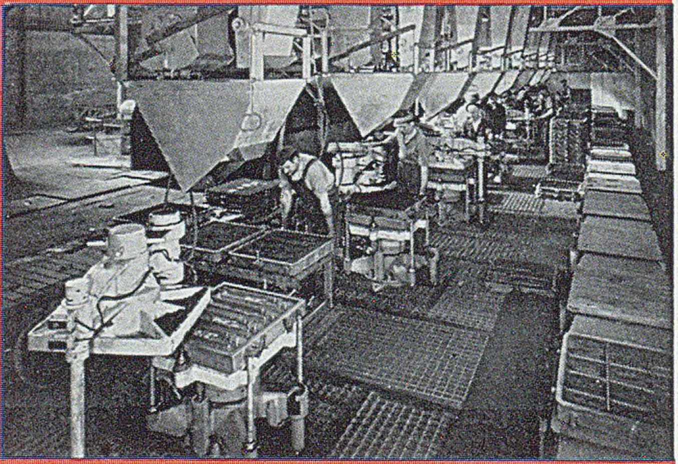


Consider these features. Consider the sum of these savings in foundry running costs and you will appreciate why BICC Magnetic Moulding Machines are used by such firms as Richmonds Gas Stove Co. Ltd., to add speed with economy to production lines.

Write for Publication No. 276 giving further information.

B.I. Callender's

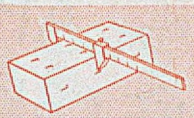
MAGNETIC MOULDING MACHINES



Battery of BICC Magnetic Moulding Machines in use at Richmonds Gas Stove Co. Ltd. (branch of Radiation Ltd.), Warrington.

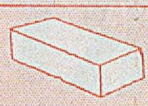
BRITISH INSULATED CALLENDER'S CABLES LIMITED
21 BLOOMSBURY STREET, LONDON, W.C.1

ABSOLUTE ACCURACY OF SHAPE AND SIZE



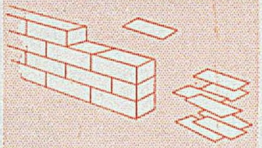
Manufacturing methods employed ensure regularity of shape and size.

AVOID LOSSES FROM DAMAGED BRICKS



Metal-cased on 4 sides during manufacture, Ferroclads are fully protected against damage during all handling and transporting operations.

SAVE HANDLING AND FITTING OF LOOSE PLATES

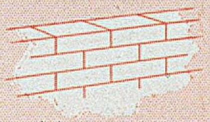


The separate ordering, stocking and fitting of loose plates creates several handling operations, which are avoided by the use of Ferroclad.

AVOID LOOSE PLATE WASTAGE

Loose plates are easily damaged, and a high proportion are rendered useless during handling and installation.

SAVE TIME AND COST IN BRICK-LAYING

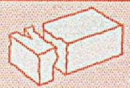


Ferroclads are quickly and easily installed and allow of considerable saving in rebuilding time.

ELIMINATE COST OF JOINTING CEMENT

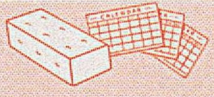
The installation of Ferroclad bricks is carried out without the need for any jointing cement.

SPALLING TENDENCY REDUCED TO A MINIMUM



The spalling caused by temperature variation and iron oxide bursting is markedly reduced and in many cases eliminated.

INCREASE IN FURNACE OPERATION LIFE



The monolithic character of Ferroclad installation in service ensures reduced rate of wear.

8 REASONS WHY IT PAYS TO USE GR FERROCLAD

(CHEMICALLY-BONDED METAL-CASED BASIC BRICKS)

G.R. Ferroclad are chemically-bonded basic bricks. During manufacture the four-sided metal case and the graded brick material are pressed together to the required shape by controlled hydraulic pressure. Thus, perfect keying, absolute uniformity and accuracy of size and shape are assured. *G.R. Ferroclad are made in normal standard sizes and are recommended for use in front walls, back walls and ends of basic open hearth furnaces; walls and ends of copper reverberatory furnaces; in certain cases for electric furnace side walls, etc.*

BRITISH PATENT No. 546,220

FERROCLAD '10' CHEMICALLY BONDED CHROME BRICK

FERROCLAD '30' CHEMICALLY BONDED CHROME MAGNESITE BRICK

FERROCLAD '70' CHEMICALLY BONDED MAGNESITE CHROME BRICK

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Telephone: SHEFFIELD 31113

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for Foundry Efficiency
TRADE MARK

APRIL 27TH MAY 8TH
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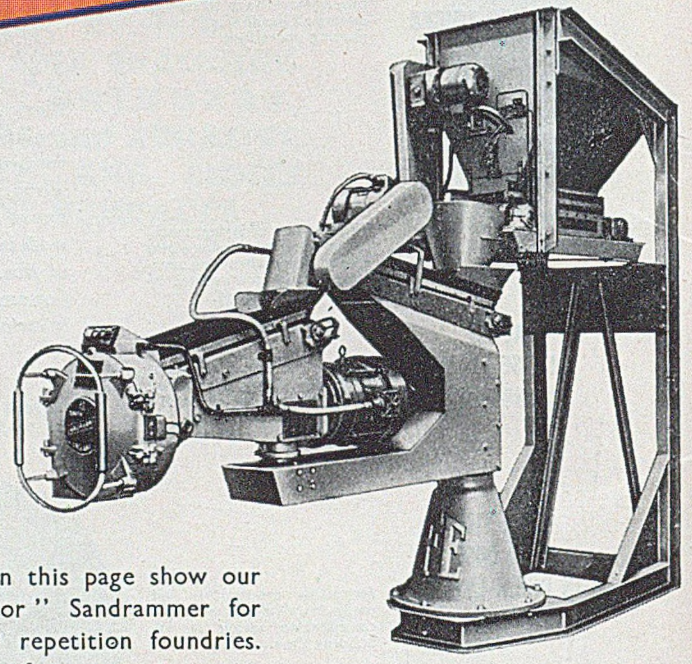
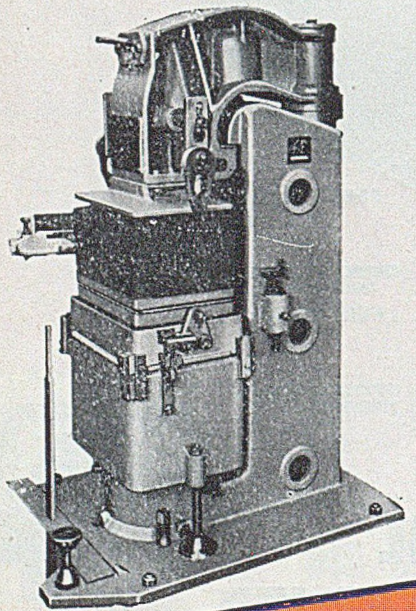
BRITISH INDUSTRIES FAIR

This year we have 1,400 sq. ft. of space packed with new and improved machines to aid foundrymen throughout the world. We shall give practical working demonstrations of the machines illustrated, together with many other items of equipment. Our Representatives will be in attendance to give you every possible service.



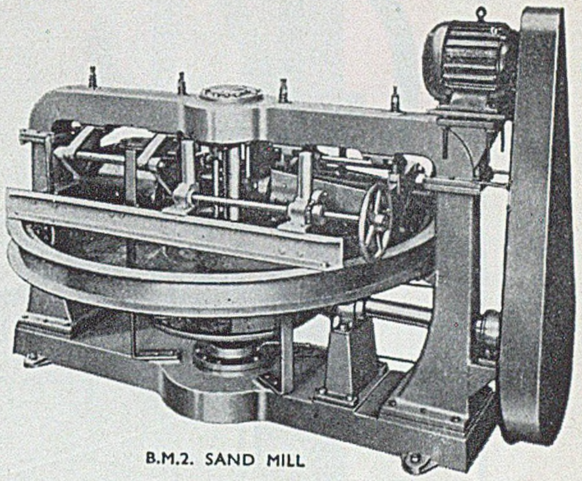
"JUNIOR" SANDRAMMER



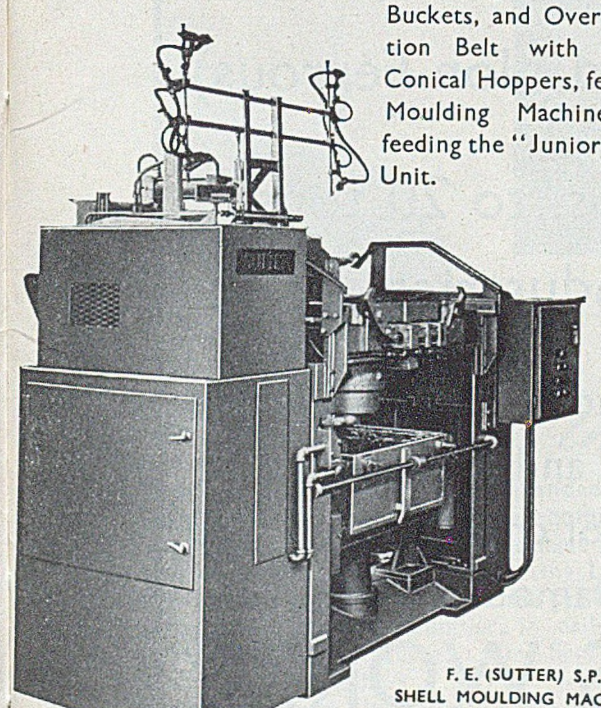
B.1. MOULDING MACHINE

The illustrations on this page show our well-known "Junior" Sandrammer for use in jobbing or repetition foundries. This is one example of our extensive range of Sandrammers. The machine on the left is our famous B.1 Hydraulic Boxless High Speed Moulding Machine now available, for the first time, with Independent Oil Hydro-Electric Pump Unit, dispensing with expensive large pumps and accumulators and long pipe lines. Visitors will also be able to see our F.E.2 Hydraulic Under Sand Frame Moulding Machine operated, for the first time, with a similar compact unit.

The B.M.2 Sand Mill needs no introduction, and this will be seen in operation together with the Electro-Vibratory Screen, Feeder Belt with Magnetic Pulley, Vertical Elevator fitted with our latest self-cleaning and clearing Stripper Buckets, and Overhead Distribution Belt with spring loaded Conical Hoppers, feeding our two Moulding Machines, and also feeding the "Junior" Sandrammer Unit.



B.M.2. SAND MILL



F. E. (SUTTER) S.P. 1000
SHELL MOULDING MACHINE

For the first time in Europe, foundrymen will be able to see a British made F.E. (Sutter) Shell Moulding Machine producing complete shells in automatic cycles. The latest design of Resin Sand Mixer will be shown in conjunction with this machine. We have already announced our appointment as sole manufacturers and distributors for the whole of Western Europe and other territories for all machines previously manufactured and sold only by Sutter Products Company of Dearborn, Michigan, U.S.A.

STAND No. D.301/200

SUTTER

FOUNDRY EQUIPMENT LTD.

LINSLADE WORKS,
LEIGHTON BUZZARD, BEDFORDSHIRE

Telephone: LEIGHTON BUZZARD 2206-7-8 Telegrams: "EQUIPMENT" LEIGHTON BUZZARD

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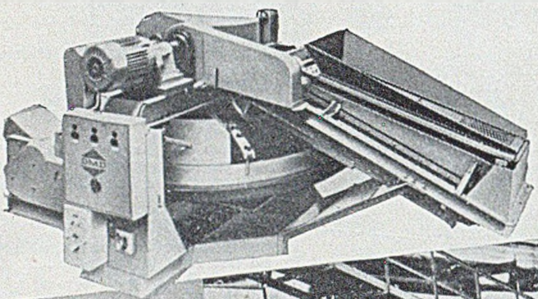
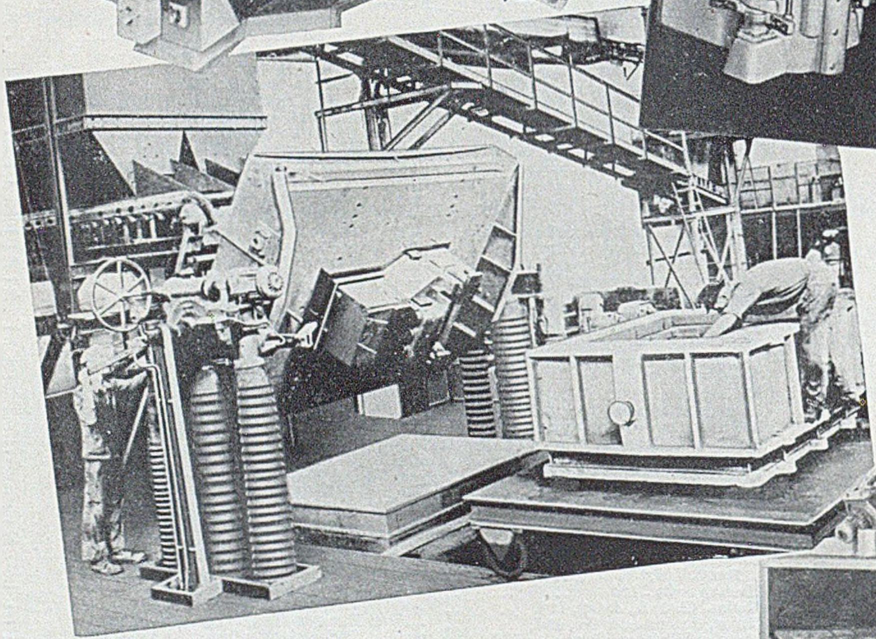
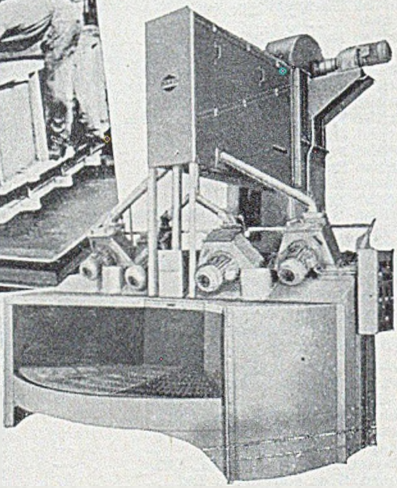
FOUNDRY MACHINES FOR ANY CAPACITY FULLY- AND SEMI-MECHANIZED FOUNDRY INSTALLATIONS

Sand Preparing Installations
Fettling Machines and Installations







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Cupolas forehearths charging installations pig iron breakers, moulding sand preparing machines moulding sand and foundry refuse reclaiming plants, conveying units and roller paths, continuous mould casting conveyors, vibratory knock-out grates, moulding machines (flaskless), jolt, squeeze and turnover moulding-machines, core sand mixing and preparing installations, core moulding machines, core blowing machines, tumbling barrels, centrifugal sand blast machines (air-less), sand blast apparatus, cleaning chambers, hydraulic fettling installations, git cutters, compressors and accessories, dust removal plants, and so on.

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Established 1902
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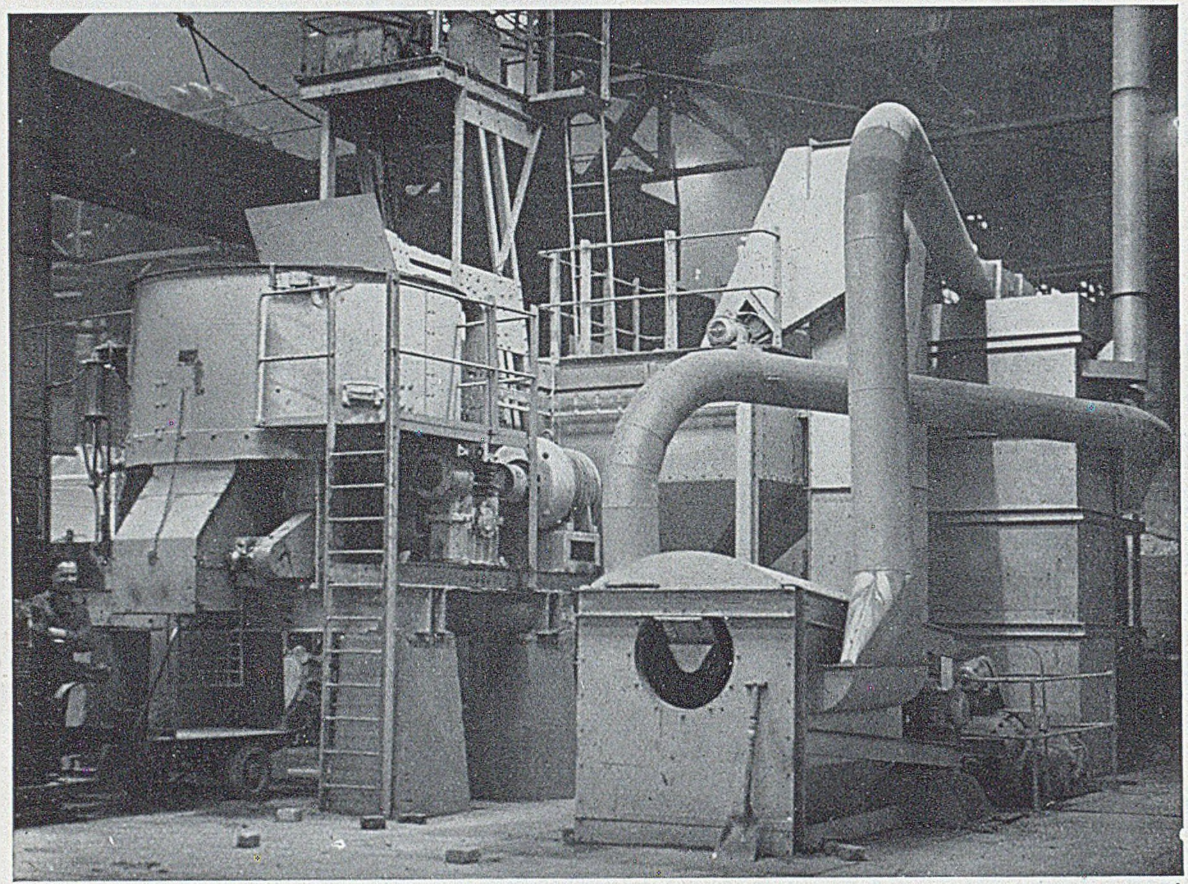

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Established 1902

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PRINCIPAL CONTENTS

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Non-ferrous Research

We recently had the opportunity of re-visiting the laboratories of the British Non-Ferrous Metals Research Association and were impressed with both the quantity and quality of the work done. The Association has to cater for all the non-ferrous metals—lead, zinc, copper, and so forth—both in cast and wrought forms. The brass and bronze section of the foundry industry receives a very good service, but it only supports the Association to the extent of 5 per cent. of its numbers. Moreover, the Association is spending something of the order of £15,000 a year on researches germane to castings production and yet receives from the industry only about £5,000.

The plant required for carrying out some quite practical tests is too expensive for the general run of non-ferrous foundries, but, when it is used on a co-operative basis, results can be obtained quite cheaply. The Association is nowadays taking a real live interest in foundry practice and one of the staff was a member of the productivity team which visited America. Moreover, the Association's participation in the Harrogate Conference, and at district meetings, of the Association of Bronze and Brass Founders, has been thoroughly appreciated. Again, a recent series of trials in foundries by the Association is of considerable value to the industry, as it provided a special insulating feeder sleeve, made from foamed plaster of Paris. The sleeve results in lowered metal costs, for yield ratios of castings to metal poured have been returned increasing from 50 to 80 per cent.

We are aware that there is an increasing desire amongst the heavy non-ferrous foundries for more co-operative research and thought is being given to ways and means of raising on a wide basis the necessary finance. To the individual small or medium-size foundry the cost of joining the Association is not high, usually about £50 per annum. For this, there is not only a stake in the original research carried out, but also a free confidential consulting service to help with individual problems, and finally an information service from a large comprehensive library which last year loaned 10,000 items to members. Obviously, if a problem has been solved previously and the solution printed, that is at least worth trying out before indulging in further work. If the Association is to gain and retain the membership of a large number of smallish foundries, then they will expect an ever-increasing liaison with the work of their technical institute, its committees, and those of the employers' association. At the moment, it is technology rather than fundamental research that is needed, though the latter must never be neglected. We congratulate the Association on the good work they have initiated and hope that much more support will be given by the non-ferrous founders than has hitherto been the case.

"Waterteller"

The Harry W. Dietert Company have developed a continuous electrical moisture-determination machine, which uses a continuous-flowing sample of core or moulding sand from a conveyor or mill. This unit is being marketed under the trade name of "Waterteller." A stream of riddled sand falls on a rubber-faced rotating disc. The sand is struck off to a constant volume and then rammed by a roller to a predetermined hardness. This controlled ribbon of sand is then subjected to a high-voltage potential and the current flows through the ribbon. The higher the moisture content, the greater the distance the electrical current will flow and the moisture content is thus expressed in distance over a well expanded scale.

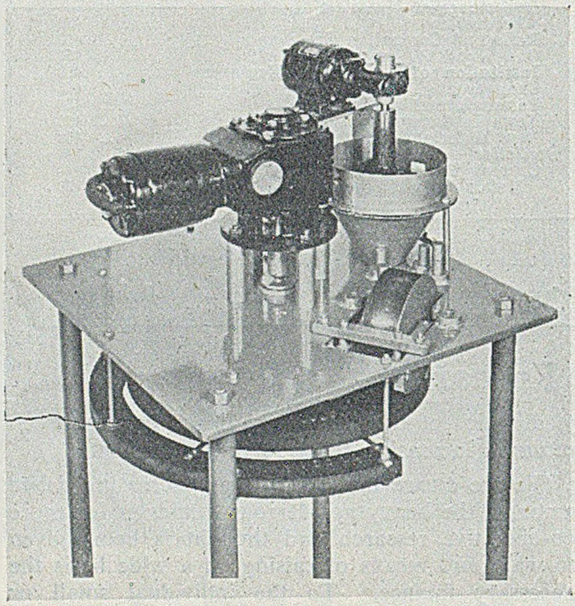

FIG. 1.—*Model Set-up of the "Waterteller" Device for the Continuous Recording of the Moisture of Moulding Sand.*

A simple electrical relay circuit is employed in conjunction with the "Waterteller" to control the rate of flow of water into a sand mill, either of the batch or continuous type, to temper the sand to a predetermined moisture content. This flow of water tapers off as the sand reaches temper, thus avoiding over-moistening.

The "Waterteller" may also be used to dump a measured quantity of water into a mill. For this purpose, the machine is placed ahead of the mill, where it determines moisture of incoming sand and dispenses the required water to temper the batch. When hot sand is being prepared, a "Watertemp" instrument can be used with the "Waterteller" to measure out the necessary water to make up for loss due to evaporation from the sand. The new machine can also be used to record continuously the moisture content of sand from a mill or on a conveyor.

A BROCHURE, descriptive of its origin and objects, has been prepared by the Scottish Engineering Employers' Association, in celebration of its diamond jubilee.

Comparative Machinability

In a paper "The Technique of Carbide Tooling," which Mr. L. K. Lord, B.SC., A.M.I.MECH.E., gave to the Bombay section of the Institution of Production Engineers, there is included a Table of comparative machinability which is reprinted below:—

TABLE I.—*Relative Machinability of Engineering Materials.*

Material and Condition.	Cub. in. per h.p per min.
Aluminium alloys	6.0
Copper	3.0
Cupro-nickel	2.0
Soft brass	1.5
Cast iron (200 Brinell)	1.25
1 per cent. nickel-iron casting	1.25
Spun cast iron	1.25
Malleable iron (low steel content)	1.25
Cast brass	1.2
Phosphor-bronze	1.15
Aluminium-bronze	1.13
Manganese-bronze	1.01
Malleable iron (high steel content)	0.9
0.3 to 0.4 per cent. carbon-steel bars and forgings	0.85
0.7 per cent. carbon-steel bars and forgings	0.72
0.3 to 0.4 per cent. carbon-steel castings	0.70
Normalized 1 per cent. chrome-manganese steel	0.70
55 tons tensile 1 per cent. chrome steel	0.70
65 to 75 tons tensile nickel-chrome steel	0.65
3 per cent. nickel steel	0.6
100 tons tensile nickel-chrome steel	0.6
Stainless-steel bars and forgings	0.5
Stainless-steel castings	0.4

It is explained that the power required to secure a certain rate of metal removal with carbide-tipped tools can readily be derived from the Table, which gives the approximate number of cub. inches of material per min. which can be removed by the application of 1 h.p. The way in which the Table should be used in practice, is to determine what horsepower is available *at the chuck* of the lathe or other machine, select a speed and feed in accordance with the tool manufacturer's recommendations for the material being cut and the finish required, and hence calculate the maximum permissible depth of cut using the appropriate metal-removal efficiency figure.

Naval Gas Turbine Testhouse

Great Britain is already well ahead of other nations in the production of gas turbines for marine propulsion, and is battling to keep that lead. The announcement recently made by the Admiralty that a new testhouse for naval gas turbines had been completed at the national gas turbine establishment at Farnborough, Hants, is significant of the efforts being made. According to the Third Sea Lord and Controller of the Navy, Admiral Sir Michael M. Denny, when he made his first visit to the testhouse, important decisions concerning the future use of the gas turbine in the Royal Navy have been made, the consequences of which throughout the marine world will be far-reaching. The impact might well prove as revolutionary as the partial suppression of the steam-reciprocating engine, at the end of last century, by the steam turbine, he said.

DEPARTMENTAL REPORTS presented to a meeting in Cardiff on March 31 of the Welsh Board for Industry stated that the Board of Trade was continuing its efforts to introduce new industries into the western section of the South Wales development area to assist in absorbing the large number of men who would become unemployed as a result of the steel and tinplate modernization scheme.

Economical Use of Metals in the Foundry*

By D. W. Hammond, A.I.M., M.Inst.F.

Foundrymen are mostly concerned with the production of sound clean castings, and this in itself is no mean task. It is, however, necessary for them at all times, to seek ways of making the best use of available materials so as to bring production costs down to the lowest levels, and to conserve materials which are in short supply. In this Paper, the Author examines a number of methods for the better utilization of raw materials in the foundry and in particular, the conversion of swarf and borings into useful metal.

The urge to study ways of reducing production costs is not as strong in times when there is a seller's market (such as during the last few years) as when trading conditions are more difficult. During the next few years, however, production costs may become, once again, the deciding factor governing the prosperity or otherwise of the foundry industry and one cannot afford to overlook any means whereby the cost of a casting may be lowered.

In the production of a casting there are involved simply: material cost, labour cost, and standing or overhead charges. The object of this Paper is to examine one aspect of material costs, that is, the cost of the metals used. Metals are very expensive these days, and, therefore, must not be wasted. First it is of interest to compare prices to-day with those existing in 1913, *viz.*,

	Price per ton in					
	1913.			1953.		
	£	s.	d.	£	s.	d.
No. 3 foundry pig-iron	2	10	4	13	1	6
Hematite	3	1	0	16	2	0
Copper	68	0	0	285	0	0
Tin	171	0	0	962	0	0

These figures are sufficient to show that the price of metals has increased 5 to 6 times over this period, equally as much as labour costs, during the same period. Therefore, whilst every effort is made to improve methods of production with a view to reduction of labour costs, at the same time founders should examine means to reduce the metal cost. A point of particular interest relating to the use of metals for castings, is the wide difference between the value of the metal bought as pig-iron or ingot or scrap and that of the same metal in the form of borings or swarf. The latter product arises in the machine-shops and is usually disposed of to metal merchants or direct to metal refiners. The swarf arises from castings supplied by an attached foundry or from castings from an outside foundry.

If one considers the case of an engineering company with its own iron foundry; this company will produce iron for castings at, say, approximately £15 per ton, but any metal sold as cast-iron swarf will only yield about £3 10s. per ton. Again, if such a company has a non-ferrous foundry which uses phosphor-bronze ingot metal, which was purchased at £350 per ton, on selling the swarf from such castings, serious losses of up to £100 per ton can be experienced. These losses are, of course, normally taken care of in the price of the machined component, but if they can be to some extent avoided, the capacity for competitive selling is increased.

Years ago, the fact that large quantities of metal were being lost to the industry, or sold to merchants or refiners at unremunerative prices, caused concern, as is evidenced by the numerous past efforts to reclaim borings for foundry use. This Paper is mostly concerned with the reclamation of cast-iron borings but first it is germane to examine the position relating to steel and non-ferrous metals.

Steel and Non-ferrous Metals

Steel is excepted from the uneconomical situation outlined for cast iron and non-ferrous metals, as machinings from steel castings and forgings are readily dealt with and turned into castings or ingots

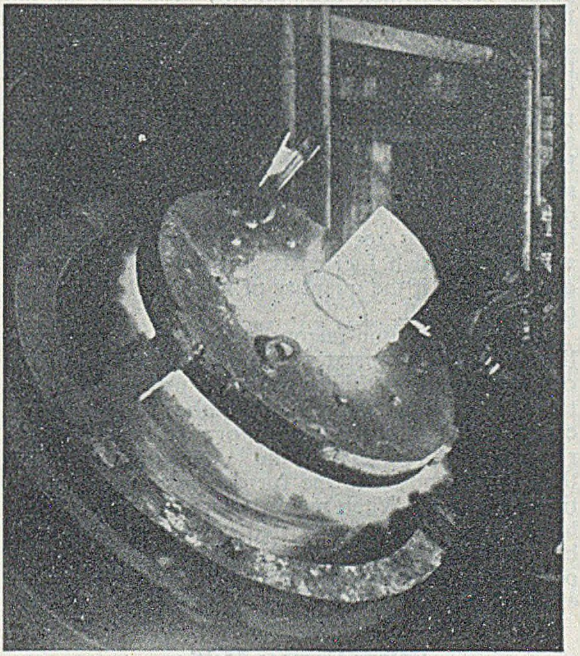

FIG. 1.—*Rotary Tilting Crucible Furnace of the Type used successfully for melting Non-ferrous Swarf.*

* Paper presented to the West Riding of Yorkshire branch of the Institute of British Foundrymen.

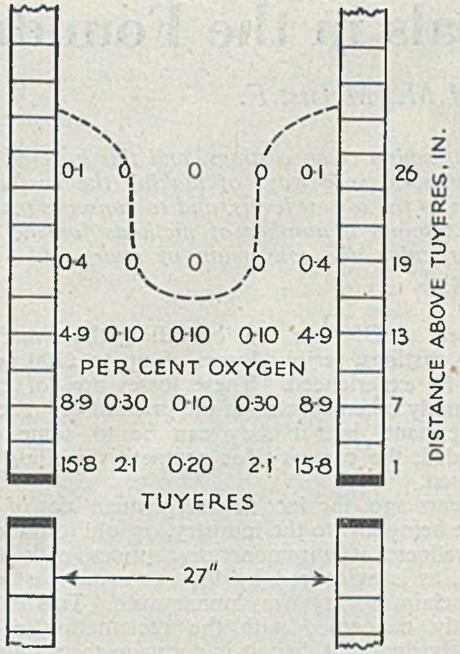

FIG. 2.—*Diagram showing the Distribution of Free Oxygen in a Cupola 27-in. dia. (Belden).*

by the open-hearth and electric-melting furnaces now in use. The development of power-operated bundling presses and chip-breaking machines, has done much to deal with the large quantities of light-gauge scrap which accumulates here and in the United States.

In the non-ferrous field it is often found possible to reclaim gunmetal or bronze borings by adding them to the usual ingot and scrap charge when melting in crucibles in pit furnaces. This is not always satisfactory, however, as the swarf tends to bridge, and a large amount of poking is often necessary. The swarf is a poor conductor of heat, and does not melt down at all readily under static conditions. Such reclamation methods are usually attended by high fuel costs, but the method is frequently used if the quantity of swarf to be disposed of is only small.

Remelting of non-ferrous swarf can be accomplished in a reverberatory furnace, either oil, gas or coke fired, but this operation is not without certain difficulties. First, it is rather awkward to charge swarf into a reverberatory furnace, and the risk of oxidation, due to the large surface area of the swarf, exposed to the furnace gases, is an additional trouble. When melting swarf in a reverberatory furnace, it is found that refractory costs can be high. The furnace brickwork for roof and bridge often consists of sillimanite material and this is very expensive to maintain in good condition.

Rotary Furnace Melting

The introduction of the rotary and tilting crucible furnace consisting of a retort-type crucible with

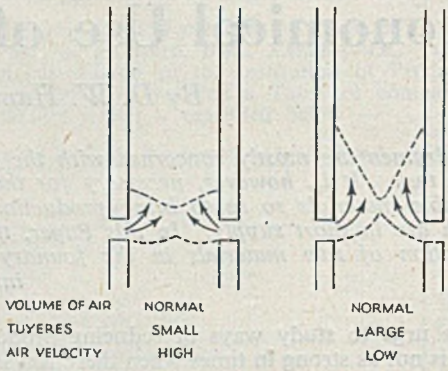

FIG. 3.—*Shape of the Free Oxygen Zone in a Cupola as affected by Air Velocity.*

stationary oil or gas burner, firing through a port in a fixed top cover, into an outer combustion chamber surrounding the crucible, has been a notable achievement. The standard type of furnace carries a crucible having a capacity of approximately 700 lb. of gunmetal, bronze, or other non-ferrous metal. As the crucible rotates, while seated firmly on the bottom of the refractory casing and

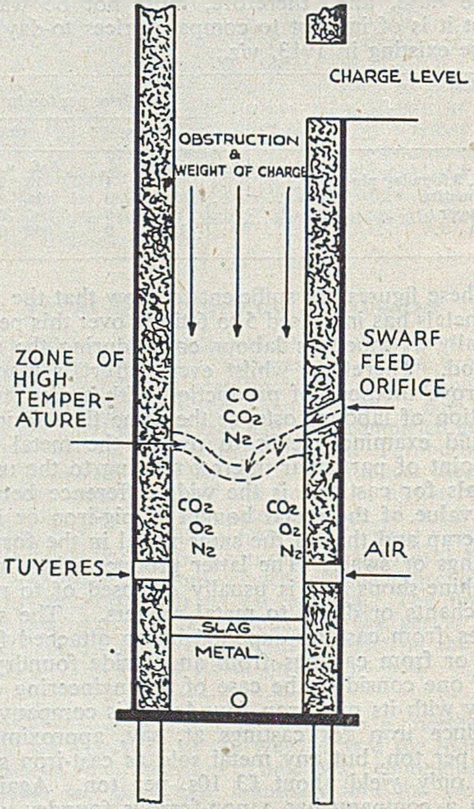

FIG. 4.—*Representation of Reactions occurring in a Cupola during Operation, showing the Zone of High Temperature and Low Oxidation selected for the point of Swarf Injection.*

held on its sides by grip bricks, the finely-divided swarf is brought into intimate contact with the heated walls of the crucible and is rapidly melted in an atmosphere free from fuel or atmospheric gases. Non-ferrous swarf can be melted successfully in this type of furnace for £6 per ton, this cost covering labour, fuel, refractories, crucible replacement, and maintenance. Fig. 1 illustrates the type of furnace referred to and it will be noted that the crucible is inclined at about 60 deg. during melting and is tilted forward for pouring. This furnace is also used for melting borings from white bearing alloys and in this case a small percentage of cleaning flux is charged with the swarf. As the furnace is not of the lip-axis tilting type, it is necessary to use a crane ladle or second crucible to contain the metal melted before ingoting or casting direct.

Recovery of Cast-iron Borings

An estimate of the available quantity of swarf in the ironcastings industry can be obtained from an examination of ironfoundry production statistics. Three and three-quarter million tons of castings were produced in 1951 and, after a careful assessment of the uses to which these castings were put, it is clear that approximately half of these enter industrial use in the unmachined state. The remainder will yield, on machining, approximately 150 to 200,000 tons of swarf and of this amount statistics show that only 21,500 tons is used as an addition to the sinter one used at the blast furnaces, the remainder being used by the chemical and dyestuffs industry, road surfacing, special concretes, etc. The amount of swarf available at individual firms varies widely, so that, whilst some large producers produce 5,000 tons per annum, others have 50 tons and less per annum for disposal. In both cases, however, the return of this metal to the foundry industry is a desirable objective.

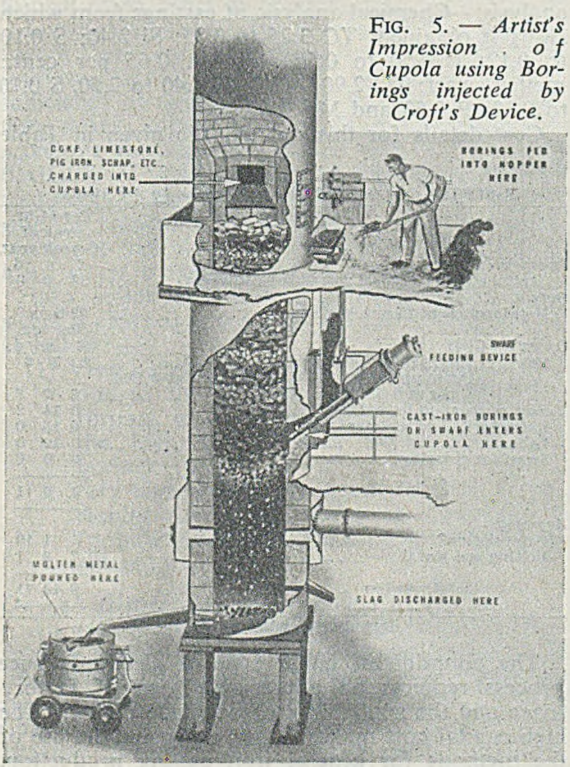

FIG. 5. — *Artist's Impression of Cupola using Borings injected by Croft's Device.*

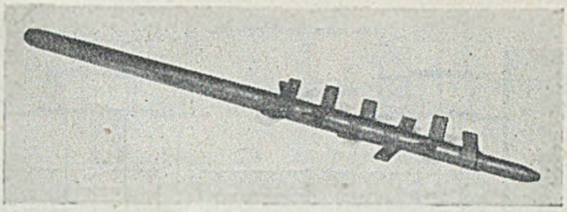

FIG. 6.—*Feed Ram, which reciprocates in the feeding Mechanism to push the Borings into the Cupola.*

As previously stated, there has been a consistent demand for an adequate method of remelting cast-iron swarf for at least 50 yrs. and when during the last few years the material supply position deteriorated, consideration was given to the various methods available for carrying out this work. It was found that four methods were available:—(1) briquetting and cupola melting; (2) canistering and cupola melting; (3) electric-furnace melting and (4) rotary-furnace melting.

Briquette Melting

The preparation of swarf briquettes entails the purchase of a suitable type of briquetting press, and experience has shown the necessity for such a press to be capable of producing a hard, solid briquette. Those made with the toggle-type press are not always satisfactory, as this press produces briquettes of varying density. Those with a density below 70 per cent. solid metal are liable to break up when charged to the cupola, with a resultant high oxidation loss on melting and a high loss due to ejection by the cupola exhaust gases. Die and press maintenance is also a factor to be considered. Some users of briquettes have adopted bonding materials such as cement, silicates, and even chlorides to obtain harder briquettes but such methods involve higher labour costs. The use of bonds which cause oxidation, such as by addition of chlorides and weathering, is liable to increase metallurgical difficulties. The capital cost of a press depends, of course, on its capacity, but a usual cost to-day is approximately £10,000. A hydraulic type of briquetting press is now being installed by a large motor-car manufacturer, designed to produce 15 cwt. of high-density briquettes per hour. The main ram exerts a pressure of 48 tons per sq. in. on the material which is said to attain a density of 85 per cent. of that of solid metal. Although at very high capital cost, this method of production may prove more efficient than older types of briquetting machines. A cost of using briquettes by such a machine could be estimated as given in Table I.

Alternative Methods

Canistering

The placing of the swarf in canisters suitable for

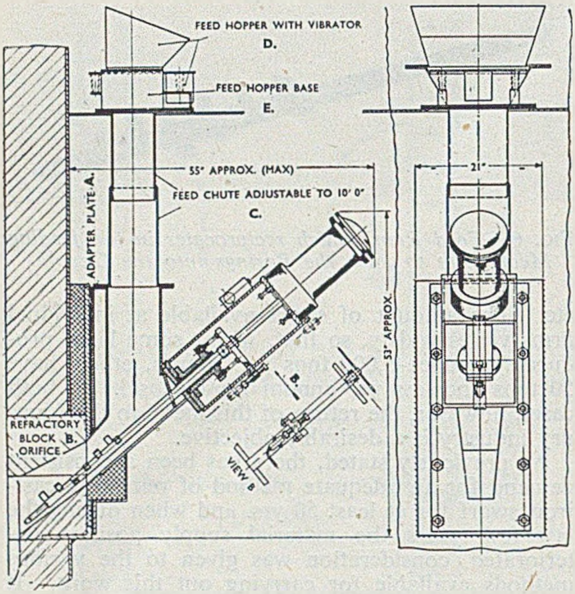

FIG. 7.—*General Arrangement of Feed Chamber, Air Cylinder Feed Ram and Orifice of the Swarf Injector.*

inclusion by hand with the rest of the cupola charge materials involves the provision of suitable steel cans or containers. Although metal-can producers are in a position to supply suitable containers, these

TABLE I.—*Empirical Cost Chart of Briquette Production and Use, from Cast-iron Borings.*

	Per 44-hr. week of 50-week year. £	s.	d.
Depreciation :			
Capital cost* of £11,780 spread over 10 years	23	11	0
Output :			
Briquette production at 100 per cent. efficiency: 400 per hour at 4 lb. each	31 tons		
Ditto, at 70 per cent. efficiency	22 tons		
Operating Costs :	£	s.	d.
Electric power (based on 130 h.p. at 40 per cent. full load for 44 hours—a total of 1,682 kw at 1d. per unit	7	0	0
Direct labour: 2 men at 2s. 6d. per hour	11	0	0
Maintenance labour, say, ...	1	0	0
Total	19	0	0
Aggregate :			
Borings, 22 tons at £3 per ton	66	0	0
Depreciation	23	11	0
Operating	19	0	0
Total (for 22 tons briquettes)	108	11	0
Labour for cupola charging at 2s. 6d. per hour ..	2	15	0
Total cost of charging 22 tons of briquettes	111	6	0
or, per ton	5	1	2

* Cost of installation not included.

are quite costly; cans to hold about 20 lb. of swarf costing approximately 6d. each. Thus, the cost of containers can represent a cost of at least £2 per ton of swarf treated. Labour for filling and packing can also be quite a large item. The risk of premature disintegration of the containers when charged to the cupola is high. If this occurs while the swarf is high up in the cupola burden, the material may be rapidly oxidized and cause cupola troubles and ejection of the swarf by the furnace gases.

Electric Melting

Utilization of swarf by bringing in electric methods of melting may consist of either melting by the arc or high-frequency furnace. The use of the high-frequency furnace produces metal of high quality, but, due to high capital cost, its use for melting grey-iron castings is only justified in the particular circumstances where other methods would produce metal of unsuitable chemical or physical characteristics. The high-frequency method is particularly attractive where total carbon, silicon and sulphur contents have to be held within very close limits. The molten grey iron in a high-frequency furnace can be readily re-carburized, an operation found most difficult in other types of static bath furnaces. The electric-arc furnace can also be used for recovery of metal swarf; like with the high-frequency furnace, the capital cost is high. Both electric furnace methods demand continuous operation to ensure economical power consumption for melting.

Arc Furnace

The usual practice is to provide an initial bath of iron in the arc furnace from a cupola and thereafter make additions of swarf to the molten bath. The iron is tapped off at intervals from the arc furnace for direct casting or for ingotting. There is a tendency when melting all swarf in an arc furnace, to produce iron with rather low total carbon content. Minor adjustments of silicon content are made by the addition of ferro silicon. A founder employing an arc furnace for melting swarf produces iron with the following analysis:—Chemical analysis of castings from which swarf is obtained: TC 3.25 to 3.35; Si 2.40; S 0.10 to 0.12; P 0.50 to 0.55 and Mn 0.65 per cent.; melted swarf: TC 2.90 to 3.0; Si 2.40 to 2.50, S 0.10 to 0.12; P 0.53 and Mn 0.65.

Cost details for this method are given in Table II.

TABLE II.—*Cost Chart of Swarf Utilization by Arc Melting.*

	Per 44-hr. week of 50-week year. £	s.	d.
Depreciation :			
Capital cost* of £18,000 spread over 10 years	36	0	0
Output .			
Metal melted at 15 cwt. per hour	33 tons		
	Per ton		
Operating Costs :	£	s.	d.
Power: Max. demand, 500 kva	0	7	3
Consumption at 610 units per ton at 0.80d. per unit	2	0	8
Electrodes at 10 lb. per ton	0	14	2
Refractories and maintenance	0	15	0
Labour	0	12	0
Swarf for charging	3	0	0
	7	9	1
Aggregate :			
Depreciation	1	1	10
Melting and metal	7	9	1
Total, per ton	8	10	11

* Including installation charges.

The adoption of either type of electric-furnace process requires an appreciable area of factory space and the availability of adequate power. The high capital cost makes rather expensive the use of the methods for general iron casting production.

High-frequency furnaces for swarf melting have, however, been developed more extensively in Scandinavian countries, where cheap electric power is available. Another development of interest among electrical melting methods is the Olivetto method, using molten glass as a melting medium.

Rotary Furnaces

Rotary-furnace methods of swarf usage may employ oil or pulverized fuel, but the remarks given earlier regarding capital cost of electric furnaces also apply to a lesser degree to this type of furnace. A few installations making use of the Sesci type of furnace are in use and, although the iron produced is suitable for general casting production, it is usually prepared for sale as refined pig-iron.

Cupola Melting Methods

It is now proposed to describe the basic ideas which prompted the development of the "Croft" process for melting cast-iron borings, to describe in some detail the apparatus used, to discuss the metallurgical features of the resulting metal (together with observations on foundry technique) and, finally, to indicate the costs and economic results arising from the use of the process over a twelve-month period. This method of melting borings employs loose swarf, as received from the machine-shop, both dry or with a soluble-oil content and without any previous treatment. The swarf is fed into a standard cupola furnace in such a manner as to offset some of the difficulties previously experienced when attempts have been made to melt loose swarf in cupolas.

Investigations were put in hand at the Author's foundry on swarf utilization, bearing in mind the following factors: availability of necessary plant; sufficiency of electrical power; economy of factory floor space; suitability of the cast iron produced; economic melting cost; capital cost of plant; and flexibility of plant installed to meet fluctuation of trade conditions. It was decided then to investigate the possibility of adapting the standard cupola furnace to melt swarf in a loose state without treatment either by briquetting or canistering.

Two major difficulties experienced when loose swarf is charged into a standard cupola furnace are as follow:—

(1) Very high oxidation loss of borings is found, due to the lengthy period of exposure to furnace gases. These losses are caused by the high surface area presented by the borings.

(2) Very high percentage ejection loss of boring results, due to their being carried out of the furnace because of the high velocity of the effluent gases.

Oxygen Distribution in Cupolas

An examination was made of gas samples taken from a cupola in the zone immediately above the tuyere level, and it was noted that at some distance above tuyere level the oxygen of the blast appears to be fully consumed and a zone of comparative freedom from oxygen exists. Fig. 2 shows that the oxygen-free area approximates to the shape of an inverted cone, with its base situated about 25 in. above tuyere level. The gases present in the oxygen-free areas consist of carbon monoxide, carbon dioxide and nitrogen. The figures given refer to a cupola lined to 27 in. dia. in the melting zone, and the shape of the oxygen-free zone is dependant on optimum working conditions inside the cupola. Variations in the ratio of tuyere-area to cupola-diameter alter the velocity of the air blast for a fixed air-volume delivery. The shape of the free-oxygen zone is affected by the air velocity; this is indicated by reference to Fig. 3. With small tuyeres and high velocity, the pattern will be as shown on the left, and with large tuyeres and low velocity the shape will be as shown on the right. In practice, due to unequal coke packing, slag encroachment at tuyere level, etc., variations may occur in the quantity of air delivered through each tuyere, and consequently in many cupolas the shape of the internal free-oxygen region will deviate from the ideal.

Principle of the Croft Process

It was, however, the aim of the new process to introduce the borings into a zone of the cupola which was low in oxygen. It was found possible to specify a position for the insertion of an orifice in the cupola wall which was satisfactory for cupolas working under standard conditions of tuyere ratio and air volume, and this, it was found, afforded a satisfactory position at which borings could be fed into a cupola (Fig. 4). This position, being in a zone of comparative low oxidation tendency, would also be one of intense heat, so that the swarf charged at this point would be rapidly raised to its melting point, merge with the remainder of the charge, and pass into the melting zone. The point of entry of the swarf is also required to be a position of charge movement.

Another most important advantage gained by adding the borings at this point is that the charges of metals, coke, and flux higher up the furnace, act as a baffle largely to reduce the blow-out of borings through the top of the cupola. The height of the

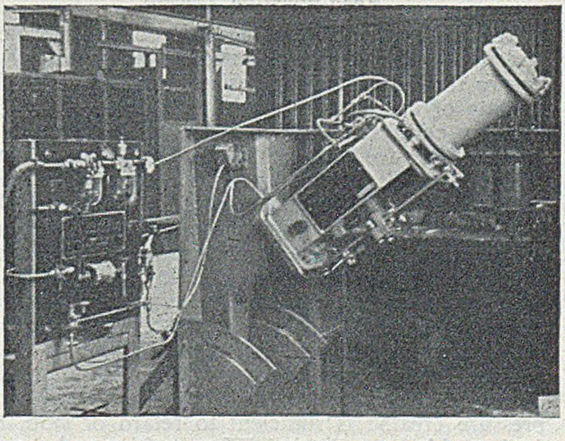

FIG. 8.—*Model Set-up of the Feeder Machine, showing Air Connections and Control Panel.*

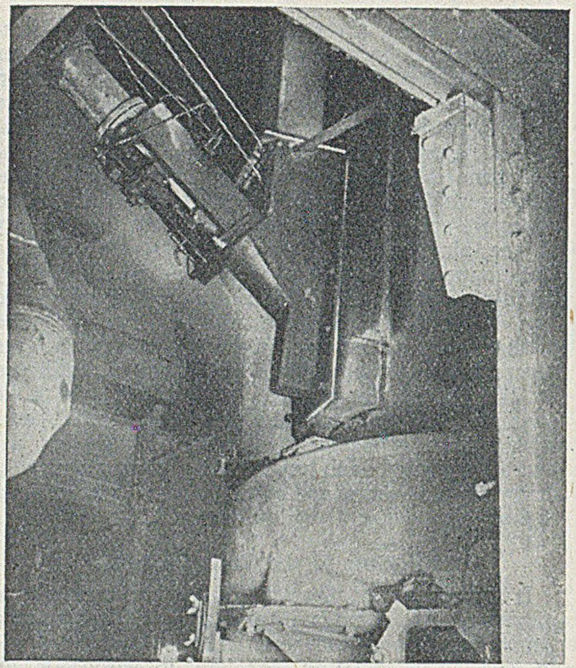

Fig. 9.—*Typical Installation of the Swarf-feeding Device attached to a Cupola Shell. In the lower part of the Illustration is the Wind Belt of the Furnace.*

cupola charging door above the tuyere level should be in accordance with orthodox cupola design, in order to provide adequate burden to resist ejection. It is also desirable that the charge should be maintained in as compact a state as possible by excluding any charge material of too open a nature.

When the borings are fed into the furnace through an orifice at the position described, they pass into the spaces between the pieces of pig-iron, scrap and coke, and, as melting proceeds and the furnace charge moves down the furnace, they are dragged down into the melting zone.

Feed-machine Design

The method to be used to carry out this project had now to be considered, and it was necessary to ensure that any machine designed to carry out the feeding of the borings would be able to withstand foundry conditions. The power unit employed to operate the feeder machine had to be immune from damage, if conditions in the cupola were such as to make the addition of swarf impossible. It will be clear from a description of the apparatus, to be given later, that conditions can arise inside a cupola where an obstruction in the form of a piece of pig-iron or scrap may be temporarily located opposite the inside of the refractory inlet orifice. It is then impossible for the machine to feed borings. The result is that the orifice and feed chamber become packed with borings and the back pressure created is sufficient to retard or stop the feed machine completely. When melting and charge movement causes the removal of the obstruction, the feeder machine should restart and resume normal feeding of swarf. If the machine is working at near maximum input and a stoppage of melting occurs, with consequent stoppage of charge drop, this should result in stoppage of the feeder machine. When melting is resumed, the feeder machine should re-start automatically.

The fulfilment of these requirements excluded the use of any type of positive drive mechanism, and it was found that whilst mechanical slipping devices could be incorporated in a mechanical drive, an air-operated cylinder, powered at 80/100 lb. per sq. in. was the most satisfactory solution. As shown in Fig. 5 the borings are fed through a top hopper, usually at cupola-stage level, either manually or from a storage hopper. Under manual feed conditions, an air-operated vibrator sifts out any over-size material which may be in the borings as received from the machine-shop. The feed chute is completely filled with borings and, as the feed ram reciprocates, the borings are fed into the furnace. As feeding proceeds additional borings are charged. The density of the swarf in the feed chute is usually sufficient to prevent any escape of furnace gases. Occasionally a small amount of gas may pass through if the swarf is coarse and permeable to gas flow, such gas escapes at the top of the feed chute.

Ram and Auxiliary Mechanisms

The feed ram, Fig. 6, is designed to collect and urge the swarf towards and through the refractory orifice on its forward stroke and to comb the swarf in the orifice on its return stroke. The quantity of swarf urged towards the orifice depends on the cross-sectional area of the fingers on the ram and the speed of reciprocation. The feed ram is traversed backward and forward by the double-acting air cylinder. It is essential that the feed ram should be capable of delivering regulated quantities of borings into the furnace and the ram and orifice shape are designed with this object in view. The angle at which the feed chamber enters the orifice is important, to offset any tendency for unregulated feeding. It will be appreciated that the refractory orifice is in a very hot zone in the cupola, and the design of the orifice and the ram has to be such as to limit the possibility of fusion occurring at the entrance to the furnace. The general arrangement of the feed chamber, air cylinder, feed ram and orifice is shown in Fig. 7.

The apparatus necessary to carry out this method of feeding borings into the cupola consists of a feeder machine and control panel shown in Fig. 8; the control panel contains the necessary adjustable valves to enable the speed of the feed ram and thereby the amount of swarf fed to the furnace to be regulated. The feeder machine is attached to the side of a cupola by bolting into an adapter plate which is welded to the cupola in an appropriate position. Fig. 9 shows a typical installation. The standard machine is capable of feeding between 5 and 20 cwt. of borings per hour as required.

(*To be continued*)

Developments in Steel Castings in the Heavy Power Plant Industry*

By F. Buckley, B.Sc.

(*Continued from page* 411)

Heat-treatment

The heat-treatments applied to these ferritic steel castings are the conventional annealing, air or oil hardening, and tempering, followed by stress-relieving after rough machining. The latter treatment assumes major importance when the question of the permanence of dimensions during service is taken into consideration. The operation consists of elevation to a temperature at which the yield point and creep strength are reduced to minor proportions, to allow for the relaxation of internal stresses by plastic deformation. Specifications usually centre around the operation of soaking for 1 hr. per in. of thickness, in addition to a minimum soaking period at temperatures between 600 and 675 deg. C. However, when the modern improved creep-resisting materials are used, it appears that times considerably in excess of these are necessary if subsequent distortion is not to be experienced, and in this connection soaking periods of 50 hrs. do not appear unreasonable.

Hydraulic prime-mover applications present many interesting problems from the composition angle, particularly as applied to runners, both of the impulse and reaction types. For medium conditions, in which cavitation tendencies are not likely to be severe, plain carbon steel is used, protected by stainless-steel welding in vulnerable areas. For higher duties, stainless material is essential and the ferritic 13 per cent. chromium type is most widely adopted, not only on account of its cost advantage over the 18-chromium 8-nickel austenitic types, but also because of its slightly improved resistance to erosive conditions. It is, however, a more difficult material to handle in the foundry due to lack of fluidity, and calls for exceptional vigilance during the moulding and pouring operations. In addition, its air-hardening characteristics necessitate more complicated welding operations than do the austenitic steels. Owing to the relatively high cost of these stainless castings, active research work is proceeding on the study of extensive protection of low-carbon steels under erosive and corrosive conditions, and promising developments include one employing a spray-welding process. Protective coatings of a nickel/chromium/boron alloy are applied by the normal spray-pistol technique followed by localized fusion of the surface.

Features of Design

Extensive experience in service, coupled with propaganda work on the part of steelfounders through the medium of their technical associations, has resulted in the wide publicizing of the basic features constituting a sound design in the sense of ease of founding. Briefly, these summarize the remedial measures that will counteract the natural consequences of the physical changes occurring on solidification of the liquid steel and on cooling down in the solid state. Contraction of liquid steel amounts to 1.6 per cent. per 100 deg. C., and the solidification contraction is 3.05 per cent. of subsequent volume at room temperature. In any steel casting, therefore, cavities, with or without hot-tears, will inevitably occur unless the cooling conditions are such that the last part of the metal to freeze is outside the casting and in the risers. In addition, after solidification there is a great possibility of hot cracking or the formation of tears at

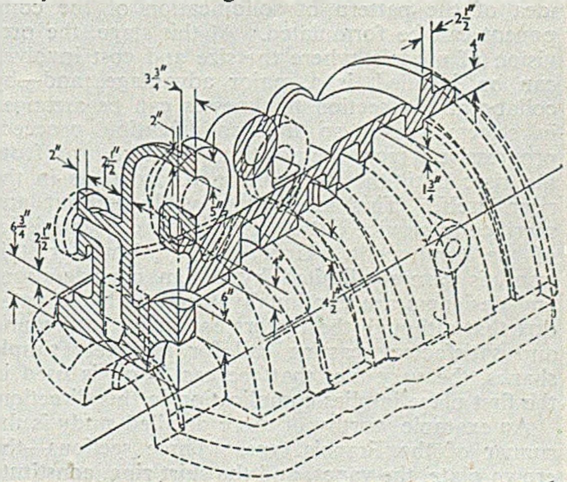

FIG. 12.—30-*megawatt Turbine Casting, illustrating the complicated nature of such Heavy Jobs.*

* Paper presented at a general meeting of the Institution of Mechanical Engineers arranged in conjunction with the industrial administration and engineering production group. The Author is chief metallurgist, English Electric Company, Limited.

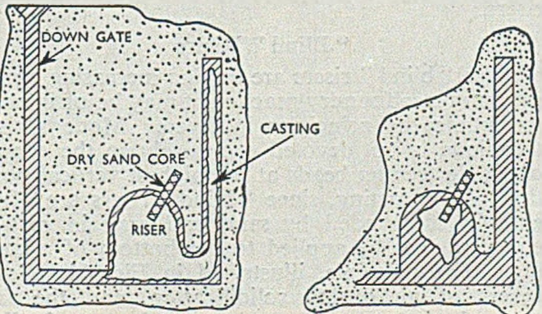

FIG. 11.—*Principle of "Blind"-riser Feeding.*

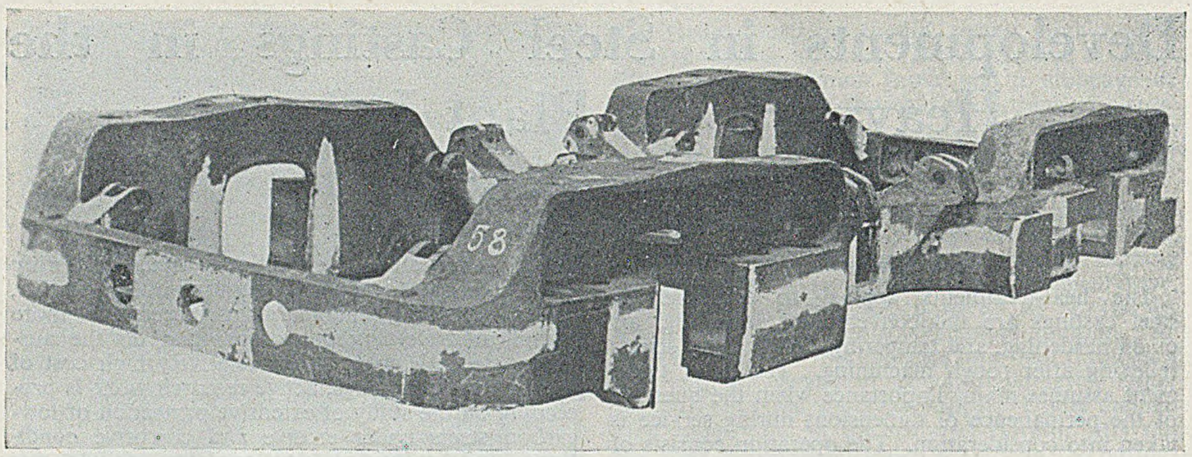

FIG. 13.—*Frame for a Railway Bogie made as a Single Casting.*

a high temperature, unless the component parts are free to contract with a minimum of interference.

The method of approach to the design problem, as applied to steel castings, that has predominated in the literature on this subject is to break down the structures as far as possible into simple hypothetical cases and deal with these separately. Thus the designing of L, Y, or X junctions, the pattern of rib construction, and desirable principles appertaining to cored openings, have been adequately covered in such publications as that by the Steel Founders Society of America (1950). It is unnecessary to repeat these in any detail, but their value to the designer cannot be overstressed. The main point predominating in the specific examples quoted is the avoidance of an isolated liquid mass which, due to the quicker solidification of the surrounding thinner sections, will of necessity result in shrinkage and associated defects.

It is desirable, therefore, that the foundryman, patternmaker, and designer should be aware, jointly, of the method of moulding so that some idea of the pattern of solidification of the component can be formulated. At this stage, the provision of models, where the size and cost involved can be justified, is a major advantage, and—by collaboration—section thicknesses can be arranged in selected cases so that solidification proceeds progressively from the positions furthest away from the riser until the last portion to freeze is in the riser itself. This is often possible without any sacrifice in service duties or strength characteristics of the component. Unfortunately, however, this trend is severely limited by design considerations and designers are continually faced with the paradox that although the factors conducive to a sound and satisfactory casting call for relatively simple shapes, the very fact that the cast form is used in the first place implies complication in this direction.

An example worthy of more detailed study is the runner of the Francis type. Three sections—the crown plate, the vanes, and the skirt ring, constitute the typical casting. The position of the mould at the pouring stage usually corresponds to that shown in Fig. 7; with the crown plate at the top. The soundness and surface finish of the vanes are the predominant factors in all considerations of design and manufacture. These must be of a smooth, streamlined shape requiring a minimum of grinding for finishing and must be as free as possible from laps, blowholes, or junction defects, at the intersections of the vanes and main casting.

The service requirements, therefore, control many of the variables, such as casting temperature, positions of metal entry, etc., everything being subordinated to the stringent factors outlined. The crown plate, being at the top, can be adequately padded or thickened to ensure solidification, but little or no feeding of the skirt ring through the vanes can be accomplished. The critical junction of the vanes and skirt ring essentially must be free from cracks and associated shrinkage defects, and, to avoid these, the foundryman has two counter-measures at his disposal: he can modify the thermal characteristics of the mould, ensuring accelerated cooling in potential danger zones of shrinkage, by embedding metal chills in the sand or applying material of higher thermal conductivity; or he can rearrange the feeding system—the size and type of risers. In the case under discussion it is probable that both methods are necessary, particularly the latter, and this may mean the incorporation of a number of so-called "blind" risers.

"Blind" Risers

Since "blind" risers are finding increasing application in steelfoundry practice, it may be of interest to outline the principles involved. Modern riser technique is not devoted exclusively to the supply of ample feeding heads at the highest vertical position of the casting, since "blind" risers are often entirely surrounded by sand and may in certain circumstances be applied to the bottom of a casting. The principle, illustrated in Fig. 11, allows access of air during solidification, and the full atmospheric pressure guarantees adequate feeding at considerable heights above the riser. The pencil core performs this function by virtue of the fact that, being almost entirely surrounded by molten metal, it functions as a highly efficient heat insulator.

Breakdown of Complicated Castings

With care and experience, the junctions of the skirt ring and vanes can be made sound and free from defects by the application of these methods. However, the inherent difficulties and the diversities of size and design in these major castings have led to the general and important trend of breaking down the runner into separate components and joining them by welding techniques. Thus, in the case under discussion, the crown plate and skirt ring are made as two separate castings of relatively simple shape, the vanes being cast or pressed to contour and welded into the composite assembly (Figs. 8 and 9).

High-pressure cylinders for large steam turbines are representative of the most intricate type of work the steel founder has to handle. The necessity for smooth contoured steam-inlet passages leading to the cylinder, coupled in many cases with elaborate valve seatings and housings, leak-off and exhaust connections, etc., all add to the complexity and dictate this type of construction, whilst at the same time features are unavoidably present that bristle with difficulties in regard to ensuring soundness during the solidification process. In Fig. 12, for example, this effect is illustrated by a section through the centre of a 30-megawatt turbine casting, perpendicular to the face of the joint.

Irrespective of the manner in which the casting is made, which is usually joint-face uppermost, it is obvious that there are sections that cannot be fed by risers placed externally; and thus it will be necessary to carry out extensive chilling, or generally increase certain sections, to ensure uniformity and soundness. The latter condition is essential, and centre-line shrinkage and similar defects must be at a minimum for trouble-free service at the high temperatures and pressures involved. Success is possible only by the careful application of principles and techniques that are in the main acquired only by prolonged experience in the manufacture of this type of work.

Rational Production

The user therefore can assist the founder by primarily concentrating the manufacture of this type of complicated work in a minimum number of foundries for sufficient periods of time to enable the practical technique to be acquired, and, secondly, by simplifying the construction, incorporating the composite welded and cast structure where possible. As a successful example of the former, reference can be made to the cast railway-bogie frames typified in Fig. 13, where large numbers are usually involved and allow the careful standardization of a practical foundry technique. This has resulted in rigid homogeneous structures, which have compared favourably during manufacture and under running conditions with the built-up counterpart.

The breakdown of a complicated structure depends primarily on design considerations, with which are coupled the necessity to avoid as far as possible severe service stress-concentrations in the vicinity of the weld; in addition, factors such as ease of moulding, casting, and machining, of the component parts are taken into consideration. Simplification of the pattern construction, the mode of solidification of the component castings to ensure freedom as far as possible from shrinkage troubles, and the ease of machining, are all of major importance.

The composite casting technique can be illustrated

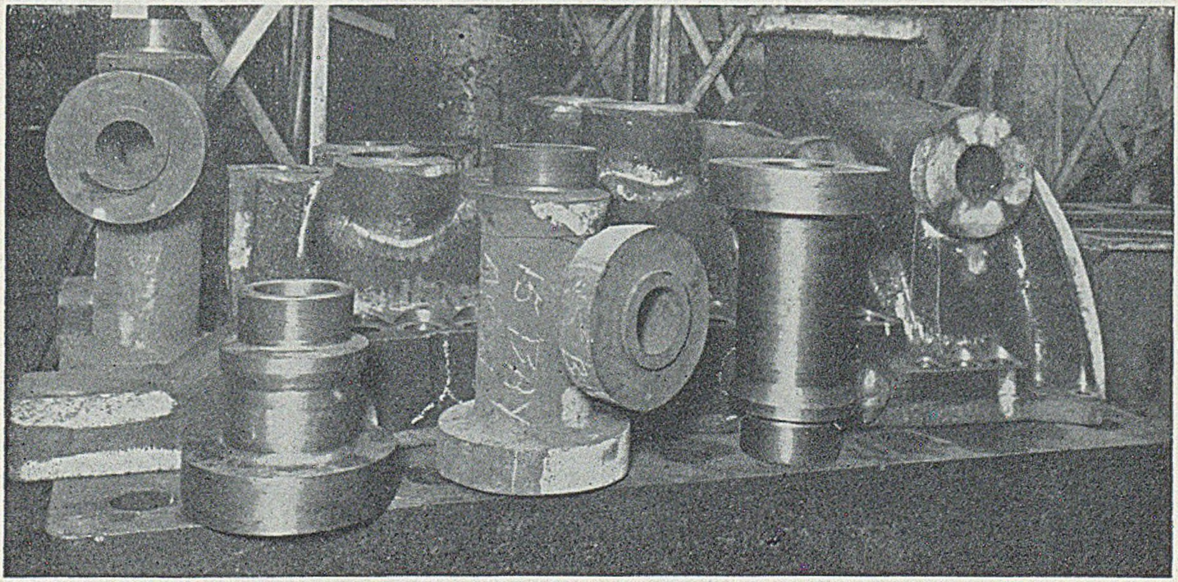

FIG. 14.—*Component Parts of Composite Assembly for a Large Turbine Casting.*

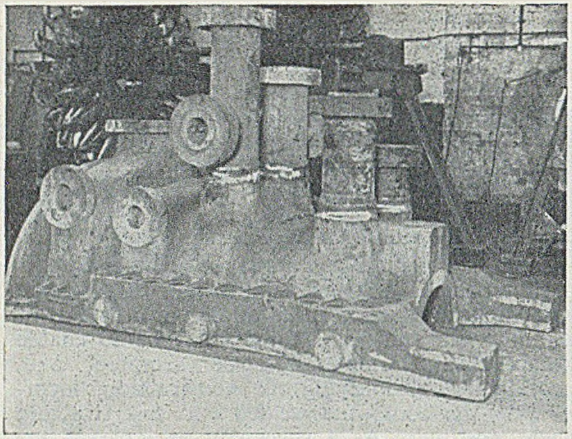

FIG. 15.—*Parts of Composite Turbine Casting Welded in Position.*

by a comparison of Figs. 14 and 15, with Fig. 12. In the first two, all the branch pipes and auxiliary connections are produced separately, partly machined and screw-threaded, and welded or directly butt-welded in position. The extent to which this trend has been developed is typified in Figs. 16, 17, and 18, which represent a complicated steam-chest assembly comprising four separate castings, each a straightforward casting proposition, welded into a composite whole. The relatively small size of the individual components not only increases the potential sources of foundry supply but, in addition, facilitates both manufacturing and inspection problems, extensive pre-machining being possible before welding. The jointing procedure must of necessity be followed by an adequate stress-relieving treatment.

The trend towards this built-up type of construction has of necessity been accompanied by considerable development work in the welding field. In many cases, the problem of joining relatively large masses of air-hardening steels, involving preheating temperatures of 350-400 deg. C., with all the attendant difficulties of manipulation and operation, has been solved only by the establishment of new techniques and the provision of special equipment, backed by radiographic examination.

Future Trends

Methods departments attached to foundries are becoming an increasingly common feature, their function being not only production planning and specification of moulding methods, but also the essential compiling of records and casting histories. Their utility and effectiveness will increase with time, since their ultimate success is so dependent on practical experience. The difficulty of determining the probable zones of weakness and unsoundness prior to casting in a complicated shape, one of their main tasks, cannot be exaggerated.

In addition, the main responsibility for transcribing to practical applications much of the fundamental work that is proceeding on the solidification of metals, as applied to sand moulds, rests with this type of organization. Although practical experience constitutes the basis of consideration in forecasting the behaviour of a particular mould during solidification, the necessity of supplementary information derived from fundamental considerations becomes more and more necessary. It may be of interest, therefore, to outline briefly the methods by which these are being attained.

They range from the relatively simple procedure of studying the freezing of moulds after partial solidification, by pouring out the remaining liquid steel and sectioning the solidified mass, to the more advanced methods utilizing direct temperature measurements. In this case the mechanism of freezing is studied by direct temperature determinations, using embedded thermocouples within

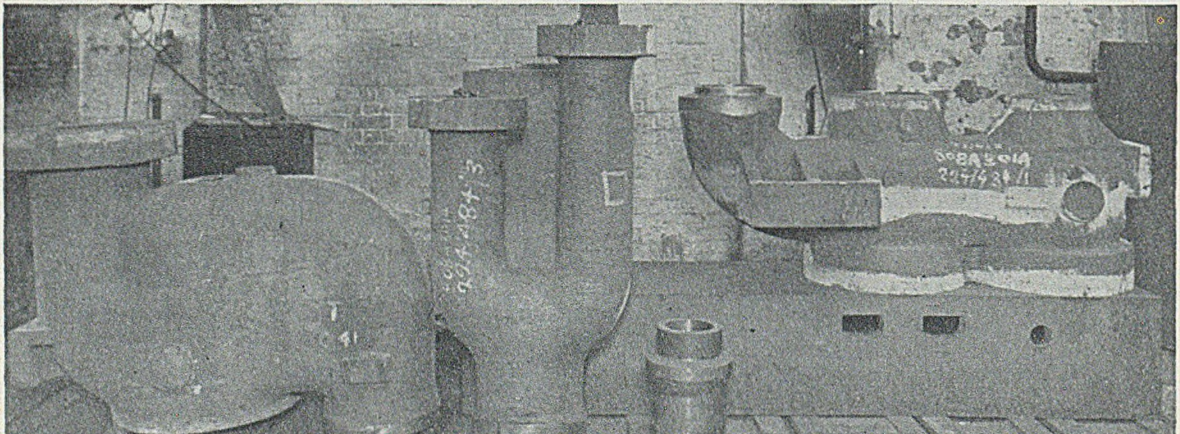

FIG. 16.—*Component Parts of Steam-chest Assembly.*

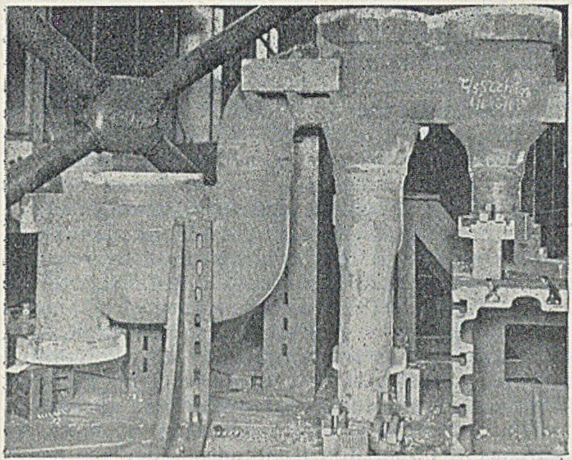

FIG. 17.—*Parts of Composite Steam-chest Welded in Position.*

the experimental mould, these being connected to high-speed electronic recorders. A reasonably accurate picture of the process of solidification can be obtained in this manner, but the time consumption in relation to the experimental evidence produced is very heavy. The most advanced method is the electrical analogue development, which correlates a phenomenon occurring in a different physical field following the same law. In this case the flow of heat by conduction, attendant on the solidification of a mould, is compared with the flow of electrical current in bodies with evenly distributed resistance and capacity following the same natural laws. This method has been developed at Columbia University by Paschkis and a group of co-workers. The results so far obtained have illuminated the part played in the solidification process by variations in casting temperature, the conductivity of the mould material, and the effect of moisture on the sand, as well as by many other factors.

More direct research, dealing with the effect of composition, sand, etc., on the tendency toward hot-tearing and cracking at high temperatures, has been carried out under strictly arbitrary conditions and offers possibilities of early application to practice; and as such is of the utmost importance.

Foundry Acceptance of Difficult Jobs

One criticism that can be levelled at the foundry industry is that far too often a difficult and complicated design is accepted without hesitation. In this respect it would almost appear that a fear exists that rejection of a design on the grounds of complication during the casting process would represent a reflection on the competence of the founder. A brief example will illustrate this point.

The valve-door casting illustrated in Fig. 19 is obviously better from the production point of view as a one-piece casting, but the difficulties of ensuring solidification in the trunnion arms are formidable, whichever method is adopted for casting. There is no fundamental reason why the casting should not be broken-down into three intrinsic castings, the trunnion arms being produced separately and welded into the door, which in turn could be produced separately, without the complications due to sectional variations inherent in the one-piece casting.

On the other hand, there are castings that allow little or no compromise of this nature. Examples of these are the integrally-cast bucket Pelton wheels, shown in Fig. 20, which have become the speciality of certain Continental foundries. The boss part of the casting must of necessity be of heavy section, whereas the individual buckets bear no relation to it in thickness. The surface finish must be as smooth as possible, so as to minimize hand-finishing times, and the junction of the bucket and boss must be free from cracks on account of the heavy and repeated impact stresses sustained in service. These requirements demand specialized techniques, such as the utilization of special collapsible cores between the buckets to allow free contraction of these parts on to the main hub.

Casting Surface

Demands in respect of standards of surface finish are becoming more and more stringent, particularly where the castings are employed in the transfer of fluids. Machining operations on complicated streamlined shapes are of necessity expensive, and involve the application of specialized machine-tools. Hand grinding, again, is extremely time-consuming as regards manhours, and experience has shown that from the point of view of speed of operation

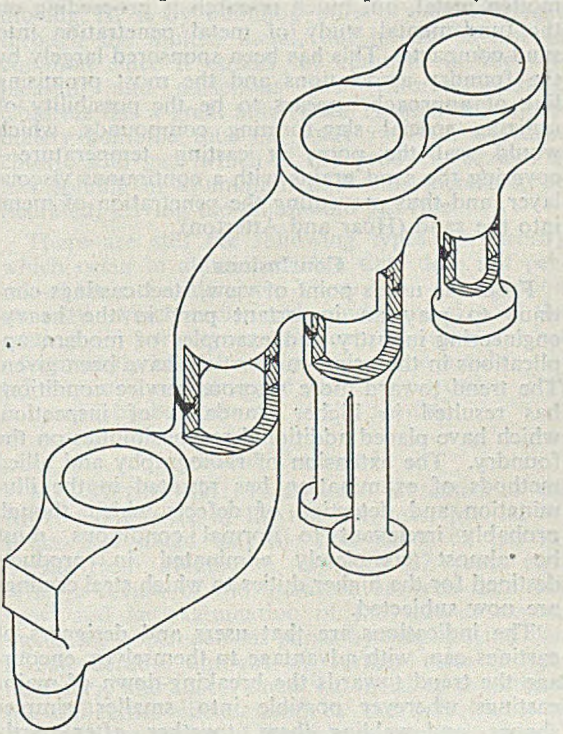

FIG. 18.—*Steam-chest Assembly, Part Sectioned to show Welds.*

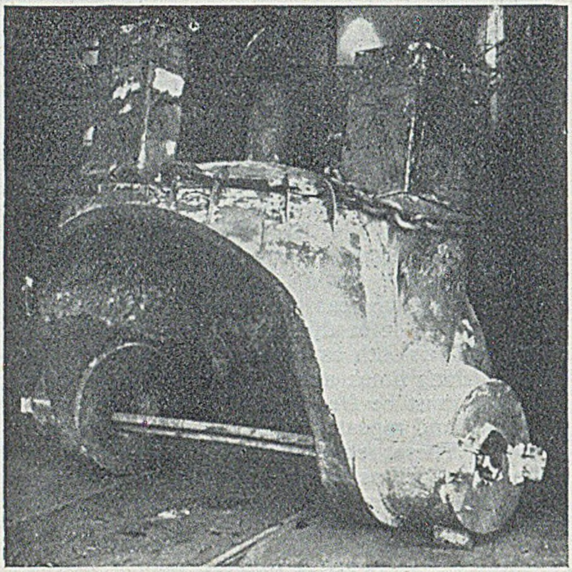

FIG. 19.—*One-piece Valve-door Casting.*

at this stage, the most economical method is to cast as near size as possible and grind away a minimum of material.

This in turn demands a casting skin as smooth as possible, and metal penetration must be at a minimum. The latter is dependent to a large extent on the running system and method of entry of the molten metal, but much research is proceeding on the fundamental study of metal penetration into sand compacts. This has been sponsored largely by the foundry associations and the most promising line of approach appears to be the possibility of utilizing special slag-forming compounds, which would seal the pores at casting temperature—covering the sand grains with a continuous viscous layer, and thus preventing the penetration of metal into the sand (Hoar and Atterton).

Conclusions

From the user's point of view, steel castings continue to play an important part in the heavy-engineering industry and examples of modern applications in the prime-mover field have been given. The trend toward more rigorous service conditions has resulted in higher standards of inspection, which have placed additional responsibilities on the foundry. The extension of radiography and allied methods of examination has resulted in the illumination and detection of defects which, though probably irrelevant to normal conditions, must be almost completely eliminated in products destined for the higher duties to which steel castings are now subjected.

The indications are that users and designers of castings can, with advantage to themselves, encourage the trend towards the breaking-down of major castings wherever possible into smaller simpler shapes and welding these together after partly machining. This not only assists the founder but also increases the potential source of supply. Where no compromise is possible as regards size or shape, the most important factor would appear to be the concentration of production in as few foundries as possible, so as to facilitate the building up of practical experience. On account of the growth and development of alternative methods of fabrication and the impact of these on the foundry industry, it is essential that this movement towards specialization should be actively encouraged.

The positive collective attitude of the majority of steel foundries to the problems covering research and development is a source of satisfaction to the user. Extensive and comprehensive programmes covering the major problems of solidification, sand behaviour at high temperature, hot-tear formation, and many allied phenomena, are receiving the most careful study both in Great Britain and abroad.

The development and application of these researches to production techniques will place heavy responsibilities on the methods departments of steel foundries. The latter sections of the organization are becoming increasingly important, since, in addition to the duties indicated, it is their responsibility to promote and encourage the essential liaison between the designer and foundryman.

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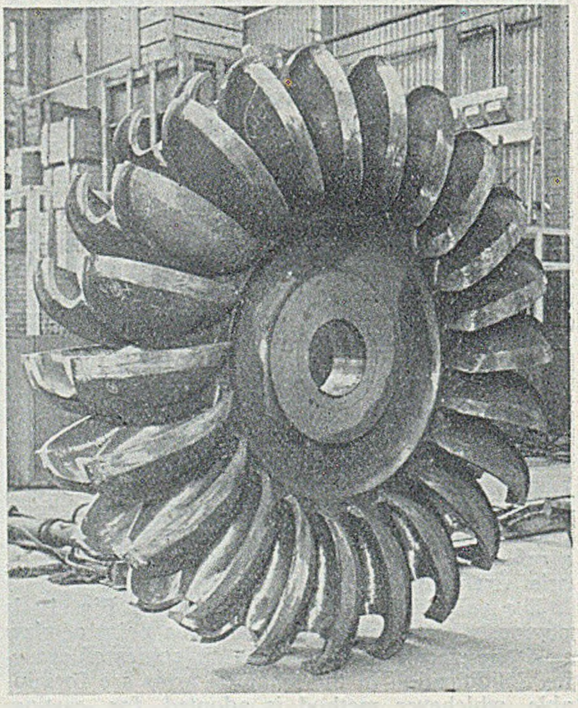

FIG. 20.—*Pelton Wheel with Buckets Cast Integrally.*

Problems Evening

Subjects dealt with in this discussion include methods of avoiding gas porosity in aluminium; possible metallurgical uses of coke breeze in the foundry; ways to avoid the incidence of shrinkage in castings; and the use of exothermic feeding compounds.

The quarterly meeting of the metallurgical section of the South African branch of the Institute of British Foundrymen was held at Barclay's Bank Buildings on November 18, 1952. It took the form of a "Problems Evening," with the president, Mr. H. A. Godwin, in the chair.

MR. J. J. MARAIS introduced the first subject, his remarks on "Gas Porosity in Aluminium" being read by Mr. John Steele, in the unavoidable absence of the Author, and what follows is an abstract.

Gas Porosity in Cast Aluminium

Many foundries have discovered that incorrect identification of defects has resulted in much wasted effort and money being expended on corrective measures which may not be at all related to the defect in question. Although several different types of porosity occur in aluminium, all who are acquainted with the casting of aluminium and its alloys can scarcely mistake the porosity which so often appears in cast aluminium. This porosity is found in the form of small pinholes uniformly distributed through the casting. Most experts agree that this type of porosity is due to dissolved hydrogen in the melt. The H_2 is derived from any source of moisture or hydrocarbons. The moisture reacts with the aluminium as follows:

$$2Al + 3H_2O = Al_2O_3 + 3H_2.$$

At the temperature at which this reaction takes place, it is quite possible that the H_2 may be present in a nascent form. Thus

$$3H_2 \rightarrow 6H.$$

H_2 being far more active in its nascent form, one can, therefore, assume that its solubility will also be far greater. It is established that the solubility of H_2 increases rapidly as the temperature of the molten metal rises. Therefore, one of the most common causes of porous aluminium castings is improper temperature control allowing the aluminium to become too hot.

Secondly, great care should be taken to see that the coke, crucible lining of the furnace, etc., is kept perfectly dry. The air used during melting should be kept as dry as possible by not passing it through wet flues, etc. If oil is used, the products of combustion should also not get into contact with the aluminium. In order to prevent contact of moisture or hydrocarbons with the aluminium during melting a flux should be used. Two types of fluxes are suitable: one melts or sinters at a low temperature and, therefore, forms an impervious cover over the molten aluminium; the other can remain in the form of a powder which gradually liberates chlorine or fluorine gas. Both have a very great affinity for H_2, and immediately combine with any that may be present.

Thirdly, from the standpoint of minimizing H_2 porosity, the combustion gases should be completely neutral, or, better still, slightly oxidizing. If there is insufficient air for complete combustion the presence of unburned hydrocarbons are a source of H_2 which can be dissolved in the aluminium.

The fourth precaution to take is to attempt to rid the molten aluminium from any H_2 which may have dissolved. This can be done as follows:

(*a*) By leaving the pot of molten aluminium standing, after removal from the furnace, for as long as possible before casting. However, this purging action is not reliable and quite often the casting will still be porous.

(*b*) By bubbling dry nitrogen gas through the molten melt. The action here is purely mechanical. The nitrogen, as it bubbles through, appears to carry the H_2 out of the metal.

(*c*) By using fluxes, chiefly consisting of organic compounds which contain chlorine in the molecule, and decompose to liberate chlorine gas. This method is fairly effective, provided that every precaution is taken to keep the degasser dry and free from moisture.

(*d*) The best and most effective method of removing H_2 is by bubbling pure dry chlorine gas through the molten metal, but its use is not so common since it entails the removal of the unpleasant and poisonous gas (chlorine) fumes. Chlorine has a great affinity for H_2 and will immediately combine thus $Cl + H = HCl$. Hydrochloric acid gas, which is the product formed, is less soluble in aluminium and will, therefore, be liberated, leaving the aluminium gas-free.

There are still the following types of porosity which occur in aluminium, but time does not permit of their consideration. These are:—(*a*) Reaction porosity—which occurs only under the skin of the casting; (*b*) porosity due to steam pressure or what is commonly known as blowing of the mould; and (*c*) entrained or entrapped gas (air) porosity. This is caused by bad venting of the mould.

Added Comment

MR. STEELE said: In a paper presented to the I.B.F. Conference at Buxton last year, Mr. A. W. Brace had stated that the first paper on gas removal from aluminium appeared 27 years ago. After a review of the literature between then and now, and an examination of the various experiments, he concluded his paper by emphasizing that a considerable amount of further research was necessary, and that "there was need to investigate the difficulties encountered by the industrialist in applying the results of the research on the subject." One interesting point of the lecture by Mr. Brace

Problems Evening

was a quotation from a previous lecturer, who stated: "In many alloys the degassed metal (that is, degassed as far as ordinary dissolved gas was concerned) would, upon casting, contain shrinkage cavities large in size or few in number."

A report in the FOUNDRY TRADE JOURNAL, April 3, 1952, recorded a discussion on aluminium, and one of the participants stated that he was not at all sure that a condition of complete freedom from gas was everything a foundryman wanted. Many aluminium die-casters introduced gas agents for the purpose of dispersing local shrinkage, and even in sand casting a complete freedom from gas might give an increase in local shrinkage difficulties.

From the foregoing it would appear that the present discussion could be entitled rather "Production of Aluminium Castings Containing the Minimum of Gas Required to Produce Sound Castings."

Degasification

DR. WEISS said that the contributions so far had dealt with a very wide range of the subjects brought up under the heading of degassing. In Britain, after considerable research on the degasification of aluminium alloys and pure aluminium, there was no doubt that the question had been settled. Methods advocated in Britain were degasification by means of organic methods, nitrogen methods, or chlorine methods. The last of these was very effective, but was neither conventional nor very versatile. The use of dry nitrogen, too, was almost entirely mechanical. The most versatile method was by using hexachlorethane, but care should be taken to ensure that proper amounts were used. Any of the three methods, however, were satisfactory bearing in mind what would be required. There was one complication—if the alloy contained too much magnesium, the treatment should be not only that of degasification, but also of protection for the magnesium, which would readily oxidize. For gravity-die-castings, to get satisfactory results it was desirable to introduce gas. Moisture-laden chemicals were introduced, which, with a certain amount of gas, gave good and sound gravity-die-castings. Care should be taken to avoid the development of "pinhole" faults.

THE PRESIDENT, referring to the production of gas-free aluminium, asked whether the type of melting unit had any effect. In other words, was there any appreciable difference between the use of oil- or coke-fired crucibles?

MR. STEELE said he thought not, but there was a difference if an electric-arc furnace was used.

DR. WEISS said he though there was no real difference. He had found that with the use of induction (not arc) furnaces degassing was necessary, but if melting conditions were carefully controlled and clean, the chances of gas pick-up were very little.

MR. DE KIEWIET asked if there was any difference between gravity-die-casting and sand-casting. In personal experience he had found that gravity-die-casting gave better results, though he never really sought for a reason.

DR. WEISS said the answer there was that a casting solidified very quickly in a die, whereas its slower solidification in sand tended to impart visible pinhole porosity, but the die-casting must be given ample feed.

MR. STEELE asked why certain technicians advocated very slow cooling.

DR. WEISS, in reply, said that this was more a case of pre-solidification. The work was allowed to cool to 600 deg. C., during which time the H_2 escaped. Then it was carefully reheated and this produced sound castings. To-day, however, this method had become obsolete.

MR. DE KIEWIT asked if anyone had any experience of the vacuum melting of aluminium.

DR. WEISS then explained the Pfeiffer method of testing aluminium to ensure it was gas-free.

MR. STEELE said that overseas he had seen a complete charge melted and cast under vacuum. He himself had recently made castings in gas-free moulds, in which the temperature of the mould and the metal had been carefully controlled, and had found that few of the castings showed any signs of shrinkage. Perhaps, however, they had degassed too thoroughly.

DR. WEISS said that many foundries used cast-iron pots rather than steel. Cast iron was not unsatisfactory, provided the coating of the refractory was adequate. However, since it was very simple to make aluminium castings successfully, he posed the very pertinent question at this stage—why complicate the process by all the difficulties that had so far been raised during most of the discussion?

THE PRESIDENT raised the point that, after the war, much aluminium scrap came on to the market which contained too high a proportion of magnesium. Was there any way in which this "magnesium-plus" metal could be used successfully?

DR. WEISS said that to do so one must first remove the magnesium. It might be necessary to remove from 1.0 down to as little as 0.15, and for this the rotary furnace had proved best. As the rotating aluminium made contact with the hot brickwork, the magnesium was oxidized and driven off till the metal contained only about 0.3 per cent. magnesium. By a further and subsequent chemical process the reduction of magnesium was brought down till it was only 0.15 per cent.

THE PRESIDENT expressed his gratitude for the interesting observations that had been put forward, particularly from Dr. Weiss, whom the members were honoured to welcome as a guest.

Metallurgical Uses of Coke Breeze in the Foundry

The next problem was that of the metallurgical uses of coke breeze, and he invited Mr. P. L. Ward to address the meeting.

MR. P. L. WARD said it was always a problem—the use to which foundrymen could put the accumulation of coke breeze which always seemed to pile up in foundries. It could, of course, be burnt, and when he was over in Britain recently he visited foundries where it was bought and used for drying cores and moulds. Speaking from a purely metallurgical point of view, however, he would imagine that the main difficulty in making use of coke breeze was finding a suitable bonding agent for it, so that it could be made into satisfactory briquettes. Even if it could be briquetted, he imagined that its use in cupolas would be limited in that it could only be supplementary to other fuels burned at the time. The point was that in South Africa the coke available had not a very good shatter value, and to the best of his knowledge, most of the coke breeze to-day was simply being dumped. It would be interesting to learn from the meeting if there was actually any metallurgical use for this substance.

MR. STEELE said he had heard of its effective use in brickworks, but agreed that to make bricks of coke breeze could hardly be regarded as a metallurgical outlet for it, from the point of view of foundry practice.

On this point MR. WARD agreed, and said that in Britain coke breeze had a further "specialized" outlet in the building trade, where it had been successfully used for the manufacture of building blocks not strictly brick-like in appearance.

MR. DE KIEWIET pointed out that in certain screw-fed types of mechanical stokers, an addition of coke breeze worked very well indeed.

MR. ALEXANDER asked if it could not be used in units operating on pulverized fuels, in combination with coal?

MR. WARD explained that it had a high abrasive action which, in its resultant wear and tear on the pulverizer, would hardly compensate for the saving on fuel. For most pulverizers, the coke breeze would prove far too abrasive, and in some cases, so much so that he doubted if it could be used in this way.

MR. ALEXANDER said it might be possible to put the coke breeze through a ball-mill type of pulverizer first, to get it down to size, and then into a conventional pulverizer of the hammer-mill type.

THE PRESIDENT thought Mr. Alexander had made a good point. After this, of course, if it could be used as powder or, as Mr. Ward suggested, in the form of briquettes, it should be ready for mixing.

Shrinkage of Castings

THE PRESIDENT then brought up item four into third place on the agenda, and in this connection he referred to a recent paper by Mr. Oliver Smalley on shrinkage. He thought that the metallurgist in South Africa should pay more attention to shrinkage than he did at present, and particularly so when this occurred in the foundry.

MR. PIENAAR, referring to feeding castings, said that at present it was largely a matter of apportioning the responsibility. He asked if it should properly be the responsibility of the foundryman (in the provision of extra feeding), or should the responsibility lie with those in the laboratory (in the provision of metals which would obviate the shrinkage)? It was his experience that the foundryman was always prepared to overcome instances of shrinkage by providing extra feeding, but this was a state of affairs that could have been overcome long before it occurred. By the addition of a number of extra feeders, there was a decrease in the yield, and consequently, also in the output of castings.

THE PRESIDENT said the metallurgist should be consulted at all times, but particularly in the very beginning. After all, he was a man with all the technical knowledge of what happened when metals solidified. Take one example, the addition of silicon. It was dangerous to push up the silicon content to counteract any deficiency in the carbon content of cast iron—for one thing, the fluidity was lost. The metallurgist should also design the runners, and this should not be by any rule-of-thumb technique, but scientifically, right on the drawing board. That he did not was one of the reasons why many of the castings that foundrymen were turning out to-day were unsatisfactory.

MR. STEELE in that connection asked how many metallurgists there were who could even read a drawing? How many were there who knew the difference between a pattern and a core-box? The metallurgist must be taught how to read drawings before he could be entrusted the responsibility for designing runners, etc., necessary to a good casting. However, apprentices should be trained in the laboratory for some time. As far as he knew, they were not given this experience at present. If they were, they would become better journeymen, because of the added knowledge they could pick up from the metallurgists, on the one hand, and the foundrymen on the other.

THE PRESIDENT said everybody would agree with Mr. Steele. It would, incidentally, be a good thing to show a metallurgist what happened in practice when a metal entered a mould. It should then be the laboratory job to compile data for future foundry practice.

MR. ALEXANDER said that analysis was a determining factor in controlling shrinkage and porosity —the only difficult thing was to determine to what extent laboratory control should be adopted.

Copper Additions

MR. DE KIEWIET reported that his foundry had experienced that the first few pots of a melt had a slight tendency to develop a chill, with resultant shrinkage. The addition of 1.0 per cent. of copper to the metal as it flowed out of the spout had eliminated this shrinkage.

MR. PIENAAR reported that he had tried this addition of copper, but that it had made very little difference in white iron castings.

DR. WEISS explained how copper added to the graphitization of the metal, so that shrinkage was eliminated although some chilling occurred. He drew attention to the large number of samples of defective castings which showed signs of shrinkage. As many as eight out of ten defects were due to shrinkage, all of which pointed to a lack of laboratory control. The large variety of metals in use to-day, and the demand for increasing accuracy in castings (to eliminate subsequent processes), were a sore trial to foundrymen. It should be the responsibility of somebody in every foundry to draw up a "riser chart" that would show the types of sizes of risers desirable for all the different types of metals required to be cast.

The purpose of a chill was to get even solidification, therefore there was no need to worry about

Problems Evening

risers. The process of obtaining a chill to-day was still done to much on the "Heath Robinson" technique in many foundries. There was no general answer to any problem of risers and their number.

MR. WARD asked whether it was the responsibility of the metallurgist when a casting ran satisfactorily, but an error occurred in the melt.

THE PRESIDENT said that if the metallurgist was worth his salt, he should specify the exact type of feeder for different carbon-silicon alloys. That was his job, and he alone should sort out the problem.

MR. STEELE said the position was that the metallurgist saw the risers, but the moulder—the man on the floor—did not always know what sort of metal he was using. There should be a daily posting of metal analyses, and, even more desirable, close co-operation, at every stage, between the metallurgist and the moulder.

THE PRESIDENT said the moulder should go to the laboratory every day, since this was the hub of the working of any modern foundry.

MR. ALEXANDER suggested the plotting of cooling curves as a valuable guide to casting characteristics, and particularly to solidification characteristics of metals being cast.

MR. STEELE, agreeing, asked where was one to get an immersion pyrometer that would stand up to such temperatures?

MR. ALEXANDER said that any good platinum-rhodium couple should be the answer, particularly if it were fitted with a detachable silica sheath.

Where and when to use Thermit Heads

THE PRESIDENT explained that the use of thermit heads was a technique which enabled foundrymen to get hot metal where it was needed in a casting—for example, in the feed reservoir.

MR. STEELE said it was a very valuable technique in the hands of the man who understood properly how to use it. He had once used four pounds of thermit powder, and had produced a perfect job in a casting that had been short of 25 lb. of metal.

DR. WEISS said that Mr. Steele's experience was common in the United States, where thermit was added to the surface of the risers. It was the better practice, however, to use different types of thermit, which would make up for metal deficiency at the same time that it provided heat for the casting.

An equally good method, he went on, was to use exothermic feeding pads, which supplied fresh heat from the cooling components to offset that lost by the cooling riser. At the moment there was much argument on this point in foundries, and the question of economics had largely entered into the debate. Fettling, for example, was a big consideration.

MR. STEELE explained another job, in gunmetal, where risers had been cut down to a fantastic degree by using exothermic compounds, with perfect results in the subsequent casting.

DR. WEISS spoke of plaster sleeves on non-ferrous castings in the United States, but said that in Britain they had found plaster and vermiculite sleeves not as good as thermit heads. The difficulty with plaster was that unless it was aerated, it was not a strong enough sleeve. Vermiculite was a good material which, in the initial stages, had been boosted as a miracle product; but it had not been found as satisfactory in actual practice as the claims that had been made for it.

There being no further discussion the President declared the meeting closed, after thanking all who had contributed.

Welding of Mild Steel to Cast Iron

In the February *Transactions* of the Institute of Welding, Mr. C. C. Bates has described a number of methods of welding mild steel studs to cast iron and concludes with the following statement:—

Arising from this investigation, the following recommendations are given for the welding of mild-steel studs to cast iron, provided the studs are not subject to shock or high dynamic loads. As impact bend and torque properties approaching those of the parent stud have been obtained after welding, it is recommended that studs be welded to grey-iron castings such as machine-tools, frames, etc., by one of the following methods:—

1. To pads of deposited weld metal as described in the article.
2. To mild-steel inserts, such as "chaplets," pre-positioned during the moulding operations. By this means, flush-fitting stud attachments of uniform design can be achieved.

It is possible to weld mild-steel studs to grey cast-iron tunnel members by either the metallic arc welding process or by a combination of the metal arc and gun stud welding processes. For fillet-welded studs, the physical properties, bend and torque strengths vary with the type of electrode used. The most satisfactory and consistent results are obtained with an austenitic steel electrode using a "buttered pad" technique.

The welding of studs to cast iron using a "buttered pad" and a stud-welding gun gives results superior to any of the other procedures adopted. The thickness of the deposited weld-metal pad is of importance—approximately $\frac{3}{16}$ in. is advised. The pad diameter is not critical but it should be large enough to allow a fillet weld to be made on the pad, without fusion with the cast-iron base metal.

The protective paint film sometimes applied by the manufacturers of the castings should be locally removed before welding.

Fuel-saving Equipment Loan Scheme

In reply to a question from MR. GERALD NABARRO (Kidderminster, C.), MR. GEOFFREY LLOYD, Minister of Fuel and Power, gave the following particulars about fuel-saving equipment:—

The Government loan scheme for fuel-saving equipment started on May 29, 1952. The experimental scheme had still two months to run. The following particulars related to the applications so far received: Applications received, 34, amount £249,707; withdrawn, 8 (£35,447); rejected, 11 (£89,973); loans granted, 3 (£25,960).

Recommendation No. 21 of the Report on National Policy for the Use of Fuel and Power Resources was still under consideration.

Removal of Silicon from Pig-iron in the Ladle

French Technique for Oxygen Injection

Silicon removal from molten pig-iron by the injection of oxygen after tapping into the ladle is a method which is receiving considerable attention both in this country and on the Continent. The advantages of silicon control in the basic open-hearth and particularly in the basic-Bessemer converter are well known. The best method of introducing oxygen to the ladle, however, has still to be finally settled. Work on the subject by the French Institut de Recherches de la Sidérurgie (I.R.S.I.D.) has led to some progress in this direction, and already in France a steelworks treats some 900 tons (metric) of hot metal in the ladle daily, the method being resorted to when silicon content exceeds 0.50 per cent. Information on the subject was recently presented to the Société Française de Métallurgie by P. S. Leroy, of I.R.S.I.D.

Injection of oxygen into open-hearth and electric-arc furnaces for carbon removal has been a subject for development in several countries and is fairly well understood. There is, however, a fundamental difference between injecting oxygen for carbon reduction during refining, and treatment in the ladle with oxygen to remove a portion of the silicon. In the steel furnace, the injection is carried out beneath an active blanket of slag. In the pig-iron ladle, desiliconizing is different in that the slag formed is relatively inert. Oxygen injection causes it to foam and expand to about 2½ times its normal volume. Addition of lime, however, reduces the foaming while increasing the efficiency of oxygen injection. Bath area is small relative to depth, and there is no vigorous boil, the reaction products being principally oxides of silicon manganese and iron, all of which enter the slag. In the circumstances, compared with oxygen efficiencies of 80 to 85 per cent. obtained in the open-hearth, those associated with pig-iron silicon reduction in the ladle are low. But in the latter case, oxygen efficiency counts less than saving in furnace time, efficiency being defined by the author as:

$$\frac{\text{Oxygen in } SiO_2 \text{ produced}}{\text{Oxygen supplied}} \times 100$$

Experiments in Desiliconization

The author described experiments in 30-ton (metric) transfer ladles containing molten iron with 0.70 per cent. Si content, using apparatus injecting oxygen at the slag/metal interface. This was first carried out at an angle of 65 deg. with a pressure of 57 lb. per sq. in. and an oxygen flow of 320 cub. ft. per min. through two converging lances, the depth of submersion being 12 in. Temperature measurements showed that when the injected oxygen exceeded 70 cub. ft. per ton of iron the thermal reaction reached to the bottom of the ladle. Up to an injection of 180 cub. ft. per ton, oxygen efficiency was 40 per cent. the author emphasizing that these figures relate to an initial silicon content of 0.70 per cent. and that higher figures would demand more oxygen. The silicon reduction in the present instance was to 0.49 per cent. at two-thirds the ladle depth, and the Mn content had been reduced from 0.33 to 0.27 per cent. Oxygen injected per ton of iron averaged 160 cub. ft. Iron oxidation amounted to about 1 per cent. The metal temperature was increased by an average of 90 deg. C., but there was considerable variation between top and bottom of the ladle.

Further experiments were carried out using a pair of oxygen lances in a vertical position, and while results were slightly better, both slag and metal were ejected by violent agitation and intense vibration when the oxygen injection took place below the slag/metal interface. There was little change in results when the oxygen lances were immersed about 2 in. while the ladle was being filled. Again, use of high-pressure oxygen between 170 and 210 lb. per sq. in. blown vertically on to the surface of the metal through a single lance caused a good deal of slag disturbance and splashing; but oxygen efficiency was 61 per cent. and silicon removal 0.19 per cent. Temperature increase, however, was only 45 deg. C. Using a multiple-hole nozzle with lime addition to encourage oxygen reaction with silicon at the expense of manganese, gave an oxygen efficiency of 53 per cent. with silicon removal of 0.30 per cent., temperature increase being 65 deg. C. Thermal reaction was found to reach the bottom of the ladle with an oxygen flow of 50 cub. ft. per ton of metal.

Leroy considers that (1) treatment during ladle filling and (2) with multiple-hole nozzle directed on to the metal surface, are methods which may be adopted in practice, possibly in conjunction with a device for the recovery of iron oxide dust from the fumes.

Recent Wills

Ralston, John, late Midland representative of Colvilles, Limited	£12,458
Baker, S. A., governing director of S. A. Baker (Engineers), Limited, Salford	£31,320
Dyson, John, a director of Frederick Dyson & Sons, Limited, ironfounders, of Leeds	£14,786
Nickels, G. C., late chairman of Chaseside Engineering Company, Limited, and Chaseside Motor Company, Limited	£519,590
Croft, Frank, former chairman and managing director of Crofts (Engineers), Limited, Thornbury, Bradford	£120,440
Goddard, J. T., solicitor, of Theodore Goddard & Company, who was chairman of Blaw-Knox, Limited, steelworks and furnace equipment makers, of London, S.W.3	£97,643
Brodrick, Harry, head of Brodrick & Wright, consulting engineers, of Hull, and a founder member of the Society of Consulting Marine Engineers and Ship Surveyors	£64,140
Johnson, Dr. Fred, formerly for 35 years head of the Department of Metallurgy at Birmingham Technical College, and an original member of the Institute of Metals	£10,242
Ffiske, W. H., a former director of Boulton & Paul, Limited, structural engineers, of Norwich, who had been Assistant Director of Aeronautical Products at the Air Ministry	£14,265
Good, A. P., formerly chairman of Associated British Engineering, Limited, Associated British Oil Engines, Limited, and a number of other companies, deputy chairman and managing director of Brush Electrical Engineering Company, Limited, and a director of many other concerns	£515,457

Importance of Materials Handling for Improved Production

Improvements in productivity in British industry depend upon a proper appreciation of materials handling and materials processing by management, foremen and operators; more importance being attached to planning, organization and designing for production; more qualified engineers being employed on the production side; and upon production research being given the same status as product research.

These conclusions were reached in a paper read yesterday by Mr. L. Landon Goodman, B.SC., A.M.I.MECH.E., A.M.I.E.E., of the British Electrical Development Association, at a meeting of the Royal Society of Arts, entitled "Materials Handling and Processing, Past and Present."

Mr. Goodman said that all major industrial operations could be divided into two fields—materials handling and materials processing. Materials handling he defined as the technology embracing the movement and storage of everything within an industrial establishment, improved materials handling resulting in increased productivity and better utilization of premises, upgrading of labour, reduction in accidents to personnel and products, and a consistent level of production.

Materials processing he defined as the technology covering those operations through which material passes during the course of manufacture and which change its form or composition. Blending of handling and processing led to uniform flow, improved process loading, reduction to a minimum of inter-process stores, elimination of bottlenecks, and better utilization of labour, while the overall pulse of an organization beats more quickly and more regularly.

After tracing the origins of mechanization or mechanical handling, Mr. Goodman gave an account of the various handling devices used at the present time, which, he said, could, with advantage, be used in greater numbers. These devices included cranes of various kinds, lifts, roller chain and belt conveyors, elevators and battery-electric trucks.

Junior Engineers' Meeting

A meeting of junior engineers, organized by the Iron & Steel Institute, will be held at Ashorne Hill, Leamington Spa, from May 11 to 14, 1953; Mr. C. H. T. Williams, chairman of the Iron and Steel Engineers' Group of the Institute, will preside. The object of the meeting is to provide an opportunity for the younger engineers and operators in the iron and steel and associated industries to discuss engineering problems of interest, and any members of these industries will be welcome at the meeting provided they are below the age of 35, whether or not they are members of the Iron and Steel Institute. Details of the programme (which includes works visits) as well as application forms, may be obtained from the secretary, Iron and Steel Institute, 4, Grosvenor Gardens, London, S.W.1. A conference fee of £2 will be charged to cover the cost of transport and other external expenses.

According to Liberia's Consul General, Mr. S. Edward Peal, there are openings there for British manufacturers in the fields of preparatory machinery for ground clearance, agricultural equipment, public works machinery and construction equipment, building plant, equipment for recreation, and a wide range of consumer goods.

Railways' Coronation Speed-up

British Railways are to make a big summer speed-up for Coronation year. Many main-line trains will be accelerated, thus benefiting business travellers and holidaymakers. These accelerations are due to main-line track improvements, with a smaller number of speed restrictions on many routes. In addition to the improved condition of track, the progressive introduction of B.R.'s new standard locomotives is helping towards better schedules. The summer services this year will operate from June 8 to September 20 inclusive.

Among the highlights of the speed-up is the principal day service between King's Cross and Edinburgh (Waverley)—to run from June 29 and to be named "The Elizabethan"—which will cover the 392¾ miles in each direction non-stop in 6¾ hours, 22 minutes faster than last summer. The Royal Scot will leave both Euston and Glasgow (Central) at 10 a.m. as now, but will be due at either terminus at 5.30 p.m.—an acceleration of 30 minutes over last summer. Between London (Euston) and Birmingham, five trains in each direction are being accelerated to perform the journey of 112¾ miles in 2 hours, with one intermediate stop. The express service between Euston, Birmingham, and Wolverhampton will be further improved by restoring the 10.55 a.m. train from Wolverhampton and running the 8.20 a.m. from Euston daily instead of on Mondays only as at present. Over the Cheshire lines between Manchester (Central) and Liverpool (Central), the hourly-interval express service will be accelerated from 50 minutes' overall running time to 45 minutes, retaining existing stops. On the West of England and South Wales routes to and from Paddington there will also be accelerations.

One Hundred Years of Patents

The British Patent Office celebrates its 100th birthday this year. To those interested in the rise and progress of industry—and particularly of the application of inventive genius thereto—some sections of its century of records are worthy of scrutiny. Prior to the setting up of the Great Seal Patent Office (as the department was originally named), the law relating to patents had been built up on the basis of the Statute of Monopolies, 1624, by successive judges and law officers. Then, in 1852, came the Patent Law Amendment Act, which called, for the first time, for the establishment of registers and the printing and publishing of specifications and indexes, so that we find that within a year or two no fewer than 15,000 specifications, new and old, had been so published.

In 1883 came yet another Act, and here the immediate effect was to transfer responsibility for patents to the Board of Trade—from which arose the Patent Office as it is known to-day. By the turn of the century, 375,000 patent records had been summarized in 1,168 volumes containing 200,000 pages, 610,000 abridgements, and 475,000 illustrations. At one time the work of the Office fell sadly into arrear, largely through wartime difficulties, but with a present-day staff of 1,000 these arrears have now been almost wiped off.

While the Government's diagnosis of the coal position was that supplies for industry should be adequate in the coming months, firms would be well advised to accept all coal being offered to them now, it was stated at a meeting of the London and South Eastern Regional Board for Industry on April 1.

Casting Aluminium Bronze

By Ben Shaw

There seems to be a growing appreciation of the many useful characteristics of cast alloys in the aluminium-bronze range. In some measure this may be due to the need to conserve certain alloys that are in shorter supply, but it is certain that the advantage this range of alloys offers will enable many new applications to become permanently established.

Aluminium-bronzes are alloys of copper, containing from 5 to 15 per cent. of aluminium. Within this range are moderately strong alloys having high ductility as well as high strength, alloys possessing fair ductility; some of these latter alloys compare in strength with mild steel and they can be heat-treated in a manner similar to that used for steel. In addition to aluminium, the alloys may or may not contain iron, manganese, silicon, nickel, and minor percentages of other elements may be present.

The combination of useful properties possessed by the aluminium bronzes, and increasing knowledge of their potentialities, has led to their greater use in industry. Among the copper-base alloys they are pre-eminent in their resistance to oxidation and scaling at elevated temperatures. They have good corrosion resistance against many media, they are resistant to abrasion and have low coefficients of friction in contact with other metals. They are also non-magnetic, and it is probably this property, coupled with those already mentioned, that has caused the Admiralty to make increasing use of these alloys in marine applications.

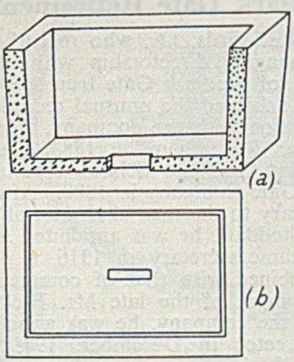

FIG. 1.—*(a) Sectional Sketch and (b) Plan View of a Core for Forming the Feeding Head when Casting Aluminium-bronze.*

Improved Casting Methods

The wider acceptance of the aluminium-bronzes in the form of castings is due, in no small measure, to improvements in casting methods. The making of sound castings has always been an outstanding requisite whatever the metal, but casting the aluminium bronzes to ensure soundness is among the most difficult foundry operations. They have a very narrow freezing-range and a high shrinkage; they readily absorb gas in the molten condition, and the low freezing-range reduces the possibility of such absorbed gases being given off in the mould.

As a general rule, the casting alloys have a minimum aluminium content of 9 per cent. Below this content, it is usually understood that a single-phase alloy will be formed because, under conditions of equilibrium, 9.8 per cent. of aluminium is soluble in copper. Beyond this two-phase alloys are formed, but the change from single to two-phase alloys is very gradual and it is probable that, under normal conditions, alloys containing 9 per cent. aluminium will have a two-phase structure.

The production of satisfactory castings depends largely on the melting procedure adopted, the manner in which the moulds are filled and the use of large risers. Chills are also a useful aid. In melting, it is important to make full use of the oxide film and to reduce stirring of the charge as much as possible, gas absorption can thus be minimized. In filling the moulds, for the same reason, the metal should enter from the bottom. From normal swan-neck gates the molten metal enters the mould in the form of a miniature fountain, the height depending upon the head of metal in the pouring basin. This action should be avoided if at all possible because of the disturbance, which it is advisable to guard against. The turbulence would continue until sufficient metal had entered the mould to counteract it, when a steady body of metal would rise in the mould, carrying an unbroken skin of oxide. However, a certain amount of damage is done initially, as the metal enters the mould in this way and to minimize the effect it is frequently possible to use a core to take the impact from the swan-neck gate and carry two or more sprues to allow the metal to enter the mould more gently.

Risers

Rather large risers are necessary with all aluminium-bronze castings, and too many are better than too few. The great difficulty with many large risers is the time and expense of removing them from the cool casting. A useful method to overcome this difficulty without reducing the efficiency of the riser is to make the riser-cup in the form of a core, for which a corresponding print is arranged on the pattern. It will be noted from the sketch, Fig. 1, that the contact between the riser head and the casting proper is comparatively small, but in practice the metal it contains remains hot and performs its function admirably. This type of head has the advantage of being easily broken off when the metal has set. The actual size and shape of the head may vary with the work in hand, and be circular or rectangular, but the basic idea can be usefully applied to many designs of castings.

MILLSPAUGH, LIMITED, Alsing Road, Sheffield, formerly a subsidiary of Hadfields, Limited, are spending £200,000 in the conversion of the former Hadfield forge at their Alsing Lane Works into one of the most modern centrifugal foundries in the world, and capable of building the largest sizes of rollers for paper-making plant. At present, Millspaugh have to do their foundry work in part of the Hadfield works and by running a night shift they can produce 150 tons of castings a month. The new foundry will treble that production rate, without using a night shift and with no extra workers.

Institution of Mechanical Engineers

New President

Mr. Alfred Roebuck, M.I.MECH.E., the new president of the Institution of Mechanical Engineers, acquired his technical training mainly at the Applied Science Department of Sheffield University. He began his working career in the employ of Hadfields, Limited, steel makers and engineers, Sheffield, and since then has always been associated with that company.

After serving an apprenticeship in the workshops he was an engineering draughtsman for three years. In 1914 he was appointed assistant chief engineer, and in 1924 was promoted to chief engineer. He became one of the first local directors of the Company in 1929, and works director in 1931. He held the latter office for fourteen years, and from 1945 he acted as director with special duties until he resigned from the Board in 1950. He is still retained by the Company as consultant.

Mr. Roebuck was also appointed a director of John Baker & Bessemer, Limited, in 1945, and a director of Millspaugh, Limited (paper machinery manufacturers) in 1946, but relinquished these appointments when he retired from the board of directors of Hadfields, Limited.

From 1939 to 1943 he was engineering director in charge of construction and production at the Ministry of Aircraft Production Factory, Swinton. In 1947 he was elected a member of the American Society of Mechanical Engineers, and in the autumn of 1949 Mr. Roebuck was nominated by the Institution to join a team of specialists to tour the United States of America to investigate materials handling in industry, and was elected leader. During 1949-50 he was president of the Junior Institution of Engineers, and in June, 1952, was appointed by the Minister of Labour and National Service to be a member of the panel to represent employers on the Industrial Disputes Tribunal.

Mr. Roebuck was elected a member of the Institution in 1929, and after serving on the Yorkshire branch committee for a few years he was appointed chairman for the years 1937 and 1938. He has served as a member of Council since 1937 with the exception of the years 1943 and 1944, and for the past five years has held the office of vice-president. He has served on many committees, taking a special interest in the membership committee, of which he was chairman for a number of years.

He has represented the Institution on the Court of Governors of the Sheffield University for many years, and is now chairman of the University Engineering and Metallurgical Committee. He is the author of many papers, and particularly during the past three years he has given many lectures both in this country and abroad on the subject of materials handling.

Mr. Roebuck is a member of the Institute of British Foundrymen, and of the Iron and Steel Institute. He has always associated himself with local activities in Sheffield and is a past-president and trustee of the Sheffield Society of Engineers and Metallurgists, a past-president of the Sheffield Metallurgical Association, and past vice-president of the Sheffield and District Engineering Trades Employers' Association. He is a Freeman of the Company of Cutlers of Hallamshire. He holds the rank of Serving Brother of the Venerable Order of the Hospital of St. John of Jerusalem and is chairman of the Sheffield branch of the St. John's Ambulance Association.

Changes at I.C.I. Metals Division

Mr. H. E. Jackson who relinquished the chairmanship of the metals division of Imperial Chemical Industries, Limited, on March 31, is retiring from the metals division at the end of June, at the termination of his present year of office as president of the British Non-Ferrous Metals Federation. He joined the I.C.I. organization at the time of the merger in 1926, after 14 years' association with three firms concerned in the merger. Since then he has been occupied principally with the technical and commercial aspects of shotgun and metallic ammunition manufacture, joining the board of the division in 1933 and becoming chairman in 1944. He is a member of the Federation of British Industries' regional council, was president of the Aluminium Development Association, 1948-49, and chairman of the Aluminium Industry Council, 1948-49 and 1951-52.

His successor, Mr. C. E. Prosser, was appointed to the board of I.C.I. metals division in 1936. He has throughout his career played a prominent part in the counsels of the non-ferrous metal industry. A former chairman of the Brass Wire Association and the Copper Tube Association, he headed the panel which, during the second world war, was responsible to H.M. Government for output of non-ferrous tube and tube products. His official appointments include chairmanship of the International Relations Sub-committee of the British Non-Ferrous Metals Federation, the Non-Ferrous Wrought Metals Export Group, and the Condenser Plate Association.

Mr. Prosser joined Elliott's Metal Company, Limited, in 1910 and on this firm's incorporation in I.C.I. was appointed metal sales manager. He was appointed commercial managing director of the metals division in 1944.

Park Gate Retirement

Mr. T. W. Edwards, J.P., who recently retired from the joint managing directorship with Mr. C. H. T. Williams, J.P., of the Park Gate Iron & Steel Company, Limited, had achieved the unusual record of 54 yrs. of active association with the company. He was born at Parkgate, near Rotherham, in 1883, and educated at the Rotherham Grammar School, entering the service of the Park Gate Company in 1898. After a period as private secretary to the then chairman of the company, Sir Charles Stoddart, he was appointed assistant secretary and became secretary in 1916, a position which he later combined with that of commercial manager. On the retirement of the late Mr. Fred Clements as chairman of the company, he was appointed assistant managing director in December, 1945, and became appointed to the joint managing directorship in March, 1948.

Mr. Edwards continues his association with the company as a special director and consultant, and also retains his seat on the Board of the British Basic Slag, Limited, of which he is deputy chairman. It is interesting to recall that Mr. Edwards' family has had a continuous association with the Park Gate Company of over 100 yrs.

I.N.C. Conference in Scarborough.—The director of the Ironfounders' National Confederation, Mr. R. Forbes Baird (117, Church Lane, Handsworth Wood, Birmingham, 20), wishes members to make early reservation for hotel accommodation for the first annual conference, which is to be held in Scarborough from April 30 to May 3. An excellent social and technological programme has been arranged.

Personal

Mr. E. H. Salinger has changed his address to 18, Welbeck House, Welbeck Street, London, W.1.

Mr. G. P. Clay has been appointed chief engineer of the metals division of Imperial Chemical Industries, Limited.

Mr. J. W. Rodger, managing director of Bruce Peebles & Company, Limited, Edinburgh, returned by air from Uganda on March 28, after a six months' world tour.

Prof. J. F. Baker, head of the Department of Engineering at Cambridge University, is to receive the honorary degree of Doctor of Science from the University of Leeds next month.

Sir William Wallace, chairman and managing director of Brown Bros. & Company, Limited, Edinburgh, has been re-elected president of the Institution of Engineers & Shipbuilders in Scotland as from October 1.

Mr. George H. Davison, secretary of the research and development department of the United Steel Companies, Limited, Sheffield, has been elected chairman of the reference and special libraries section of the Library Association's Yorkshire group.

Mr. R. W. Casasola, organizer for the Amalgamated Union of Foundry Workers, appears on the short list drawn up by the Sunderland Labour Party from which a candidate will be selected to contest the Parliamentary by-election at Sunderland South. He is 59.

Mr. R. Stewartson, M.A., A.M.I.MECH.E., has been elected to the Council of the Institution of Mechanical Engineers. He is head of the metal-forming section of the Research and Development Department of the United Steel Companies, Limited, in their Swinden Laboratories, Rotherham.

Mr. F. Guy Dawson, formerly group sales manager of the finished products division of Qualcast Limited, Derby, has resigned his appointment with Qualcast, Limited, also his directorship of Follows & Bate, Limited, Manchester, an associated company, to take up a new appointment in London.

Mr. C. R. Sankey, head of Joseph Sankey & Sons, Limited, Bilston, sailed for New York in the Queen Mary on April 7. During his three-week tour, Mr. Sankey is to visit the firm's new plant at Smith Falls, between Toronto and Ottawa, and later is to spend some time with business colleagues in New York.

To mark the completion of 10 years' chairmanship of the joint works council of the David Brown Foundries Company, Penistone (Yorks), Mr. G. L. Hancock, a director and general manager of the David Brown Foundry group, was recently presented with a cigar box by employee representatives on the council.

Dr. Denis Rebbeck, a director for several years of Harland & Wolff, shipbuilders, engineers and founders, has been appointed deputy managing director of the company. Mr. H. C. MacEwan, electrical manager of the company, and Mr. W. H. Park, shipyard manager and head of the steel constructional department, have been appointed directors.

After 23 years as secretary to the Staveley Iron & Chemical Company, Limited, near Chesterfield, Mr. James Carmichael has retired. He joined the company in 1926 as assistant secretary, and four years later became secretary. He is succeeded by Mr. Arthur Edward Biggs, who has been with the company for more than 40 years, since 1927 as chief cost accountant.

Sir Philip Johnson is relinquishing his position as managing director of the St. Peter's Engine Works of R. & W. Hawthorn, Leslie & Company, Limited, Newcastle-on-Tyne, as from April 30, but will retain the deputy-chairmanship of the company. He will be succeeded as managing director by Mr. John Bulman; Mr. D. G. Ogilvie, works manager, will become general manager.

Mr. C. H. Rowley has been appointed deputy general manager of the service department of the Austin Motor Company, Limited. Mr. Rowley has been with the company for 44 years, and after training in the factory, went to the service department in 1912. Before his new appointment, he was technical service manager. Mr. D. H. Warren now becomes technical service manager.

Mr. John D. Lloyd has been appointed a director of Mavor & Coulson, Limited, engineers, of Glasgow and Sheffield. Mr. Lloyd was recalled from the Army in 1942 to supervise installation and servicing in Sheffield of American mining equipment. In 1949 he was transferred to Glasgow. In 1946 he became a director of a subsidiary, Mavor & Coulson (South Africa), Limited, and later was made managing director.

Five new appointments have been made by Henry Meadows, Limited, Diesel-engine and gearbox manufacturers, of Wolverhampton, following the policy of reorganization and expansion announced last September. Mr. E. H. L. Cooper becomes general works manager; Mr. J. R. Threlfall, production manager; Mr. G. Metcalfe, production controller; Mr. D. E. Mallet, chief inspector; and Mr. H. D. Prescott, assistant chief inspector.

Obituary

The death has occurred of Mr. M. S. D. Day, who was a member of the London committee of High Speed Steel Alloys, Limited, Widnes (Lancs).

Mr. James Denny Inglis, who has died at the age of 82, was for many years a director of A. & J. Inglis, Limited, shipbuilders, of Glasgow.

Mr. Henry Humphreys, senior partner of J. H. Humphreys & Sons, manufacturers of magnetic chucks and demagnetizers, of Werneth, Oldham, died on March 31.

Mr. W. McDowell, a member of the Scottish mining staff of Mavor & Coulson, Limited, makers of coal cutters, conveyors, etc., of Bridgeton, Glasgow, which he joined 21 years ago, died on April 1, at the age of 60.

Mr. John Douglas has died at the age of 66. He served for many years as an executive of P. &. W. MacLellan, Limited, iron and steel merchants, and shipbreakers, of Glasgow, and was appointed a director in 1939, a year after he had been elected president of the National Federation of Scrap Iron, Steel and Metal Merchants. He had also been president of the Scottish section of the federation, and president of the Iron, Steel and Ironmongery Benevolent Association. Mr. Douglas's principal concern in his firm was with the scrap and shipbreaking branch.

News in Brief

THE ANNUAL CONFERENCE of the Combustion Engineering Association will be held on May 7 and 8, at the Palace Hotel, Buxton.

A SOCIAL CLUB and recreation centre will soon be opened by the Butterley Company, Limited, for their employees in Ripley and district.

IT IS ANNOUNCED from the headquarters of the Paris International Foundry Congress, that 70 technical papers have been offered, about half coming from abroad.

SIXTEEN EMPLOYEES of Hale & Hale (Tipton), Limited, ironfounders, have been presented with gold watches to mark their completion of 25 years' service with the firm.

THE HEAD OFFICES of the P.D.N. Castle Engineering Company, Limited, have been transferred to Yeovil Works, Lea Road, Waltham Abbey, Essex (telephone: Waltham Cross 4311).

DURING MARCH, 20,082 cars, commercial vehicles, and tractors were produced at the Dagenham (Essex) works of the Ford Motor Company, Limited—a record in the history of the company.

"TRAINING SCHEMES IN INDUSTRY" was the title of an address given to Kilmarnock Rotarians on April 9 by Mr. Douglas S. Gardner, works manager of Glenfield & Kennedy, Limited, Kilmarnock.

INSTITUTE OF PERSONNEL MANAGEMENT of Management House, 8, Hill Street, London, W.1, are organizing a third overseas conference to be held at St. Catharine's College, Cambridge, from June 30 to July 3.

VALVES, 48 IN. DIAMETER, and weighing almost six tons each, have been manufactured by Glenfield & Kennedy, Limited, Kilmarnock, for insertion in the new east and west mains at the Milngavie waterworks, of Glasgow Corporation.

MAJOR E. C. PECKHAM is resigning his position as managing director of Metalock (Britain), Limited, to develop an International Metalock Association. His place is being taken by MR. H. A. PAGET, formerly sales director of the British company.

THE LEEDS OFFICE of the Riley Stoker Company, Limited, combustion engineers, of London, W.C.1, moved on April 1 from London Assurance House, Bond Place, Leeds, to new premises at National Employers House, Quebec Street, Leeds, 1 (Telephone: Leeds 33274).

THE BUSINESS of George Dyke & Son, Limited, doorbolt manufacturers and drop forgers, of Willenhall (Staffs), has been acquired by H. & J. Hill (Willenhall), Limited. Mr. Harry S. Dyke, grandson of the founder of George Dyke & Son, is to carry on for a time as managing director.

INDUSTRIAL SUNDAY will be observed on April 26. On that day services in many cathedrals and churches will be devoted to prayer and thought for all engaged in industry. The Industrial Christian Fellowship (with the commendation of the Archbishops and Bishops) is responsible for the observance.

THE BOARD OF DIRECTORS of Allied Ironfounders, Limited, Falkirk, entertained a company of 450 at their fifth annual dinner and dance in the Town Hall, Grangemouth. Mr. W. H. Smith, deputy managing director of Allied Ironfounders, Limited, and chairman of the Scottish group of companies, presided at the dinner and welcomed the guests and members of the staff.

LONG SERVICE is to have a Coronation reward for the employees of the Triplex organization who have served with the company for more than 21 years. They will watch the Coronation procession from the windows of the firm's head office in Piccadilly. In the firm's Willesden and King's Norton factories there are 157 employees who qualify for this invitation from the directors.

THE DIRECTORS of the Engineering Centre, Limited, 351, Sauchiehall Street, Glasgow, C.2, have resolved to close the Centre on September 30, 1953. They explain that certain industries, trade associations and large manufacturers have shown preference for arranging their own exhibition of their products and the tendency is for these organizations to select areas of their own choice for such exhibitions.

BRITISH INSULATED CALLENDER'S CABLES, LIMITED, announce that their Overseas Reception Office has been transferred to 11, Bedford Square, London, W.C.1 (Tel.: Museum 1600). The Overseas Reception Office was formed in 1949, for the benefit of overseas visitors, as a place where they can obtain information of any kind, office facilities, and assistance in securing accommodation, travel and recreational facilities.

JOSEPH GILLOTT & SONS, Albert Terrace Road, Sheffield, makers of special steels since 1868, have been acquired by Rubery Owen & Company, Limited, in conjunction with the Coventry Gauge & Tool Company, Limited, and the Brook Tool Manufacturing Company, Limited. Mr. Alfred Owen, chairman and joint managing director of Rubery Owen and Company, Limited, will be chairman of the steel firm's board of directors.

ENGLISH STEEL CORPORATION, LIMITED, Sheffield, have successfully cast the first ingot from which one-piece boiler drum forgings, 42 ft. long and 6 ft. across, will be made for the British Electricity Authority. The ingot, 26 ft. long and more than 10 ft. thick, weighs 270 tons, and is the largest ever cast in the Commonwealth, and may equal any cast in a metal mould anywhere in the world. A replica in lighter material will be on show at the B.I.F.

TWENTY-FOUR EMPLOYEES of Tonks (Birmingham), Limited, founders, were overcome by fumes from coal gas on April 8, and ten were taken to hospital. The 24 men were working in the tube mill near to an annealing furnace. It is thought that there was a gas escape from the annealing furnace which was being started up after the Easter holiday, but the management is awaiting the reports of experts who have conducted an investigation at the factory.

THE RAILWAY EXECUTIVE has placed an order with the North British Locomotive Company, Limited, Glasgow, for three 200 h.p. Diesel-mechanical shunting locomotives for use in the North Eastern Region. These engines will be of the 0-4-0 type with a total weight of 32 tons and length over buffers of 22 ft. 11½ in. They will incorporate the Voith-North British system of hydraulic transmission which avoids the use of a gearbox. This order is part of British Railways' plan for providing 573 Diesel shunting engines during the next five years.

APPRENTICES from Birmid Industries, Limited, entered for the first course in safety organized by the newly-opened Birmingham and District Industrial Safety Group training centre at the Birmingham Museum of Science and Industry. The course began on April 9, under the direction of Mr. H. N. Jones, H.M. Inspector of Factories. The instructors included Mr. D. J. Jeary, safety officer G. E. C. Witton; Dr. J. G. Billington, chief medical officer, G. E. C. Witton; Mr. A. J. H. Wood, H.M. Inspector of Factories; Mr. D. Murtha, of T. Broughton & Sons; and Mr. E. E. Jelliffe, of Fisher & Ludlow, Limited.


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Raw Material Markets

Iron and Steel

The blast furnaces are favourably placed to produce the extra tonnage now required of them. Engagement of maximum capacity is made possible by the provision of adequate, though not excessive, supplies of coke, ore, and limestone, and the advance in pig-iron prices covers the recent rise in fuel and transport costs. The bulk of the iron produced is going into direct consumption in the steel furnaces and there are no surpluses of either basic or hematite iron to build up reserve stocks. Indeed, stocks of hematite are being raided to meet urgent and immediate needs. High-phosphorus iron is not so difficult, but there is keen competition for the limited supplies of low- and medium-phosphorus grades.

The expansion of steel ingot production in the past three months has not been marked by any corresponding increase in the deliveries of home-produced billets, blooms, slabs, and sheet bars. Makers seem to be restricting supplies to their quota tonnages and re-rollers of small rounds, squares, and flats have re-emphasized the difficulties arising from the prevailing scarcity of small billets. The position in regard to sheet bars is a little easier.

The outlook for the rollers of steel products of all descriptions may be described as "set fair." The volume of orders in hand enables operators to arrange their programmes without frequent changes of the rolls and this, of course, exercises a favourable influence on output. As the spring advances, more export inquiries are circulating, of which the spate of offers of orders for sheets from the United States and Canada is a notable example. Possibly the interest of oversea buyers has been inspired to some extent by the rise in prices in the European Coal and Steel Pool area and the impending control upon steel sales which the High Authority has announced its intention of imposing on May 1. At the moment, however, the dominant factor in the steel trade is the pressing home demand. A speed-up of deliveries has become a vital necessity to many important branches of industry, with the greatest emphasis upon the output of the plate and sheet mills.

Non-ferrous Metals

All the metal markets were weak during last week's trading, the fall in tin amounting to a collapse. The turnover was not large, but buyers were conspicuous by their absence and values moved accordingly. Stocks in London Metal Exchange warehouses have continued to decline. Large as the fall has been, it must be remembered that the pre-Korean price of tin was around £350. Lead declined by from 30s. to 35s. for the respective months, but there was a good deal of fluctuation in values during the week. Zinc lost £2 10s. for April and £2 5s. for July, but showed signs of resistance below £75.

This week, tin prices have again fallen substantially, cash on Monday dropping by no less than £90. After a small increase on the following day, yesterday (Wednesday) the official quotation fell by as much as £50. Both lead and zinc have also lost ground again this week.

In the United States, the quotation was unchanged at 11 cents, but the lead price fell by ½ cent to 3 cents. In copper one of the chief Custom smelters reduced from 33 to 32 cents at the end of the week, while the primary producers remained at 30 cents, so that the range is now closer than it was. On the export side the Belgians were reported as having sold at 32 cents, but it would seem that the f.a.s. average price of the E. & M.J. is still over 34 cents.

On this side of the Atlantic there is daily expectation of an announcement by the Ministry of Materials that the six months' notice of termination has been reduced to three, and from that point it is expected that the actual announcement that bulk buying is to end will not be long delayed. In the meanwhile, the news from the copperbelt is not very encouraging, for once again there is an acute shortage of coal and operations have been seriously curtailed.

Scrap business is very restricted and copper scrap prices, which, together with secondary refined copper, are now free from control, were marked down, the value of No. 2 copper wire scrap, for example, being reported at around £190. Heavy copper scrap is also cheap. Brass scrap is not in good demand and 70/30 shell cases are probably obtainable at £180 or even less.

The following official tin quotations were recorded:—

Cash—April 9, £825 to £835; April 10, £820 to £825; April 13, £730 to £735; April 14, £735 to £740; April 15, £685 to £690.

Three Months—April 9, £802 10s. to £807 10s.; April 10, £790 to £795; April 13, £730 to £735; April 14, £727 10s. to £730; April 15, £670 to £680.

Official zinc quotations were as follow:—

April—April 9, £75 to £75 5s.; April 10, £74 12s. 6d. to £74 15s.; April 13, £74 10s. to £74 15s.; April 14, £73 10s. to £73 15s.; April 15, £70 15s. to £71.

July—April 9, £75 15s. to £76; April 10, £75 7s. 6d. to £75 10s.; April 13, £75 to £75 5s.; April 14, £74 5s. to £74 10s.; April 15, £71 10s. to £71 15s.

Official prices of refined pig-lead were:—

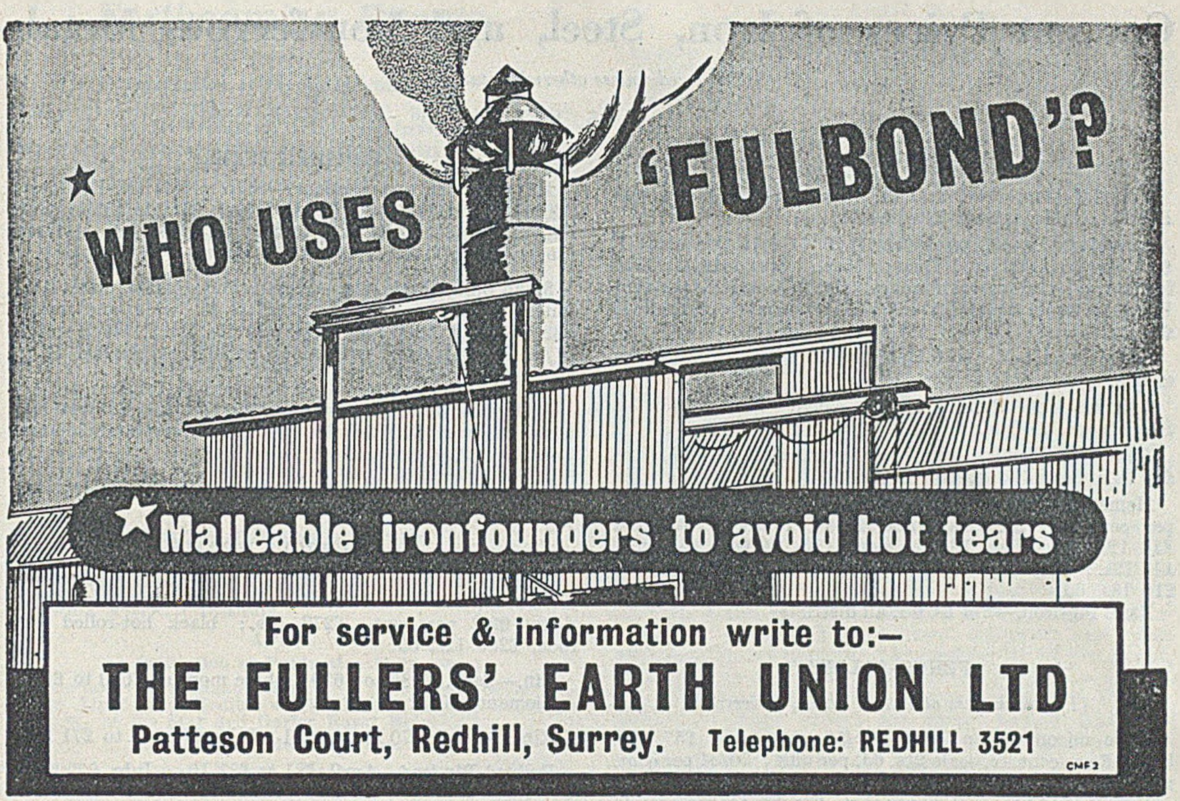
April—April 9, £85 10s. to £85 15s.; April 10, £85 10s to £85 15s.; April 13, £85 to £85 10s.; April 14, £84 to £84 5s.; April 15, £81 to £81 10s.

July—April 9, £82 10s. to £82 15s.; April 10, £83 to £83 5s.; April 13, £82 15s. to £83; April 14, £81 15s. to £82; April 15, £79 5s. to £79 10s.

Universities and Industry Co-operation

Appeals to industries to release outstanding workers for a course in management education at universities were made at the annual conference in Gleneagles Hotel last Saturday of the British Institute of Management. Dr. D. S. Anderson, director of the Royal Technical College, Glasgow, said industries must be willing to lend their staffs as lecturers on management courses, and be prepared to release men to attend university courses. Dr. Anderson warned that if university courses were confined to potential managers, the job was only half done. The training of operators' representatives was an essential part of any scheme for education in management.

Earlier, the conference was addressed by Mr. F. G. Woollard, director of Birmingham Aluminium Casting Company, who visualized the introduction of "push-button" factories. He told how one machine replaced 16 that needed 13 men to produce 750 gear-boxes in a 44-hr. week. Now four men produce 1,600 gear-boxes in the same time. Mr. Woollard said that, because of increased demands for maintenance, push-button devices were not the threat to employment which they were sometimes represented to be. He quoted an American example where a plant employing 700 operators and 300 maintenance men, after change to completely-automatic production, needed 550 operators and 450 maintenance men.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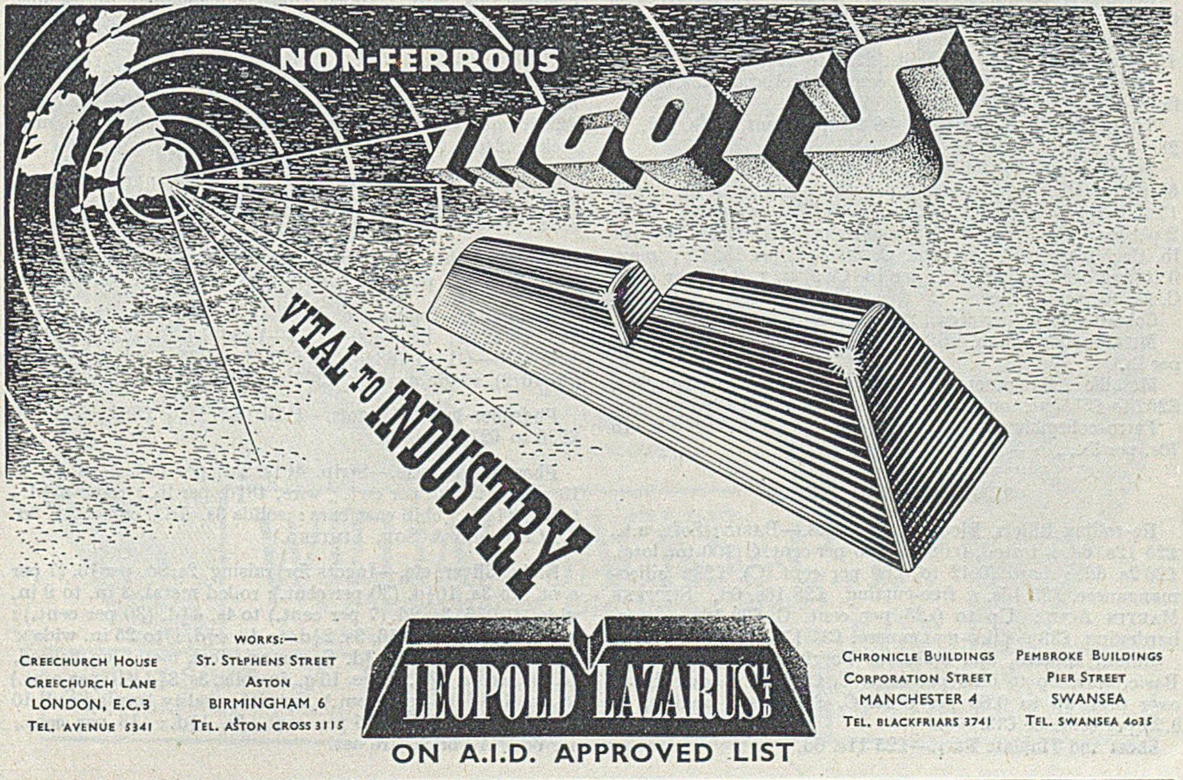
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Current Prices of Iron, Steel, and Non-ferrous Metals

(Delivered unless otherwise stated)

April 15, 1953

PIG-IRON

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

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

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

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

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

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

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

FERRO-ALLOYS

(Per ton unless otherwise stated, delivered).

Ferro-silicon (6-ton lots).—40/55 per cent., £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.

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

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

SEMI-FINISHED STEEL

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

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

Sheet and Tinplate Bars.—£25 11s. 6d.

FINISHED STEEL

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

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., untested, £32 4s. 6d.; flats, 5 in. wide and under, £32 4s. 6d.; hoop and strip, £32 19s. 6d.; black sheets, 17/20 g., £41 6s.; galvanized corrugated sheets, 24 g., £51 7s. 6d.

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

Tinplates.—57s. 10d. per basis box.

NON-FERROUS METALS

Copper.—Electrolytic, £280; high-grade fire-refined, £279 10s.; fire-refined of not less than 99.7 per cent., £279; ditto, 99.2 per cent., £278 10s.; black hot-rolled wire rods, £289 12s. 6d.

Tin.—Cash, £685 to £690; three months, £670 to £680; settlement, £685.

Zinc.—April, £70 15s. to £71; July, £71 10s. to £71 15s.

Refined Pig-lead—April, £81 to £81 10s.; July, £79 5s. to £79 10s.

Zinc Sheets, etc.—Sheets, 15 g. and thicker, all English destinations, £101; rolled zinc (boiler plates), all English destinations, £99; zinc oxide (Red Seal), d/d buyers' premises, £110.

Other Metals.—Aluminium, ingots, £161; 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, 25¼d. per lb.; rods, drawn, 33½d.; sheets to 10 w.g., 275s. 6d. per cwt.; wire, 31⅝d.; rolled metal, 262s. 3d. per cwt.

Copper Tubes, etc.—Solid-drawn tubes, 31⅞d. per lb.; wire, 312s. 3d. per cwt. basis; 20 s.w.g., 340s. 9d. per cwt.

Gunmetal.—Ingots to BS. 1400—LG2—1 (85/5/5/5), £190 to £218; BS. 1400—LG3—1 (86/7/5/2), £200 to £238; BS. 1400—G1—1 (88/10/2), £307 to £375; Admiralty GM (88/10/2), virgin quality, £307 to £380 per ton, delivered.

Phosphor-bronze Ingots.—P.Bl, £318 to £385; L.P.Bl, £236 to £275 per ton.

Phosphor Bronze.—Strip, 401s. 2d. per cwt.; sheets to 10 w.g. 422s. 3d. per cwt.; wire, 48⅜d. per lb.; rods, 43½d., tubes, 41⅞d.; chill cast bars: solids 3s. 7d., cored 3s. 8d. (C. CLIFFORD & SON, LIMITED.)

Nickel Silver, etc.—Ingots for raising 2s. 8d. per lb. (7 per cent.) to 3s. 10½d. (30 per cent.); rolled metal, 3 in. to 9 in. wide × .056, 3s. 2d. (7 per cent.) to 4s. 4½d. (30 per cent.); to 12 in. wide × .056, 3s. 2¼d. to 4s. 4¾d.; to 25 in. wide × .056, 3s. 4¼d. to 4s. 6¾d. Spoon and fork metal, unsheared, 2s. 11d. to 4s. 1½d. Wire, 10 g., in coils, 3s. 8¾d. (10 per cent.) to 4s. 10½d. (30 per cent.). Special quality turning rod, 10 per cent., 3s. 7¾d.; 15 per cent., 4s. 1½d.; 18 per cent., 4s. 6d. All prices are net.

Forthcoming Events

APRIL 20

Institution of Production Engineers

Derby section:—"Textile Engineering," by C. E. Roper, 7 p.m., at the College of Art, Green Lane.

Manchester section:—"Machine-tool Industry," by W. J. Morgan, 7.15 p.m., at the Reynolds Hall, The College of Technology, Sackville Street.

North-eastern section:—Annual general meeting, followed by inspection of the new engineering and laboratory wing, 7 p.m., at the Technical College, Enfield Durham Road, Gateshead-upon-Tyne.

APRIL 21

Institute of British Foundrymen

East Anglian section:—Annual general meeting, 7 p.m., at Central Hall, Public Library, Ipswich.

Sheffield Metallurgical Association

"Modern Rapid Methods of Fuel Analysis," by Dr. R. A. Mott, 7 p.m., in the Grand Hotel.

Institution of Production Engineers

Stoke-on-Trent sub-section:—"Mechanical-handling Techniques," by J. Bain, 7.30 p.m., in the Blue Room, Mechanics Institution, Crewe.

APRIL 22

Institute of British Foundrymen

Birmingham branch:—Annual general meeting, followed by "Production of Match-plates by the Aluminium Pressure-cast Method," by D. H. Potts, 7.15 p.m., at the James Watt Memorial Institute.

APRIL 23

Institution of Production Engineers

Wolverhampton graduate section.—"Mechanized Production of Light- and Medium-weight Moulds," by J. Hill, 7.30 p.m., at the Star and Garter Royal Hotel.

Institute of Industrial Supervisors

Glasgow section:—"Modern Measuring Instruments," by G. L. Robertson, 7.30 p.m., in the Engineering Centre.

APRIL 24

Institution of Mechanical Engineers

"Problem of Fuel-oil Ash Deposition in Open-cycle Gas Turbines," by A. T. Bowden, Ph.D., B.Sc., P. Draper, and H. Rowling, B.Sc., 5.30 p.m., at Storey's Gate, St. James's Park, London, S.W.1.

APRIL 25

Institute of British Foundrymen

West Riding of Yorkshire branch:—Annual general meeting, followed by a short paper by W. L. Bolton, 6.30 p.m., at the Technical College, Bradford.

ABOUT 80 OUTDOOR SEATS, made of wood, cast-iron, steel or concrete, will be shown on May 5 to 16 inclusive in an open-air exhibition which the Council of Industrial Design and the Corporation of Birmingham are arranging in Victoria Embankment Gardens, Westminster, S.W.1.

THE INFORMATION DIVISION of the Mutual Security Agency Mission to the United Kingdom, 1, Grosvenor Square, London, W.1, has issued a list of licensing proposals by 30 American firms for foreign manufacture of their products. Firms wishing to take up new lines or extend existing ones are advised to write for a copy of the proposals available.

THE FEDERATION OF BRITISH INDUSTRIES has agreed to act as the British clearing house for enquiries concerning packaging materials for U.S. defence orders being placed in Western European countries. The U.K. clearing house will be concerned with information required in Western Europe about standards and specifications, quality-control, "know-how" and the supply of packaging materials made to Anglo-American standards, which are not at the moment available in Europe. Enquiries about orders for these service packaging materials should be addressed to the Overseas Directorate of the F.B.I., 41, Buckingham Palace Road, London, S.W.1.

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

FOUNDRY MANAGER. non-ferrous foundries, with first class record, seeks progressive situation; sound practical and technical experience of all phases of hand and mechanised production of heavy and light castings to withstand high pressures; accustomed to complete control.—Box 3398, FOUNDRY TRADE JOURNAL.

NON-FERROUS FOUNDRY MANAGER seeks a position offering scope for initiative in the H.P. Cock and Valve Industry. Accustomed to full control of all branches of the trade, utilizing modern methods of production and control. Excellent references. Midlands area. Own house. A.M.I.B.F.—Box 3406, FOUNDRY TRADE JOURNAL.

FOUNDRY TECHNICIAN/METALLURGIST, young, desires progressive position; able to take charge laboratory, high duty iron, sand and cupola control, mechanisation, jobbing; production minded; Final C. & G. Foundry Practice; A.I.B.F.; Birmingham / Wolverhampton area; no housing required.—Box 3409, FOUNDRY TRADE JOURNAL.

FOUNDRY MANAGER, 45, M.I.B.F., A.M.I.P.E., Grey Iron, Malleable, High Duty, Non-ferrous, Commercial Sales, Costs. Practical man all departments, up to date in really modern methods economic production. Specialist repetition. Accustomed take full responsibility; desires join Midland foundry; guarantee get results, can influence business; excellent records and references; salary/results basis.—Box 3380, FOUNDRY TRADE JOURNAL.

FOUNDRY ENGINEER, age 26, requires responsible position with opportunity to widen experience; anywhere in Great Britain. Engineering apprenticeship; practical foundry experience; National Certificate Mechanical; A.M.I.B.F.; 5 years Iron Foundry Development, jobbing and mechanised, ozs. to 3 tons.—Box 3412, FOUNDRY TRADE JOURNAL.

EXPERIENCED FOUNDRYMAN, 33, resident Midlands, car owner, wishes to represent full time foundry of repute. Steel, malleable, grey iron, non-ferrous. Salary/commission/expenses basis. — Box 3413, 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.

EXPERIENCED man required to take charge of small non-ferrous foundry; able to introduce business an advantage. This is an excellent progressive position for a capable man. Commencing salary up to £750 p.a. with high prospects. Wolverhampton district. — Box 3390, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT—*Contd.*

NON-FERROUS CASTINGS: Well-known Lancs. foundry require well connected representative. Very good remuneration and prospects for successful applicant. Fullest particulars to Box 3415, FOUNDRY TRADE JOURNAL.

REPRESENTATIVE required for Non-ferrous foundry, London Area, Machine and Loose Pattern Moulding. First class castings to any specification and test. Commission basis only.—Apply Box 3414, FOUNDRY TRADE JOURNAL.

AUSTRALIA: Foundry Manager wanted for progressive Company handling high speed, stainless and heat resisting steels. An emigrant of high technical ability is sought who can contribute to development and in addition select and train local talent. Age up to 40. Please reply in confidence to PATON LAWRENCE AND COMPANY, Management Consultants, Royal Mail House, 76, Cross Street, Manchester, 2.

GENERAL WORKS MANAGER required to take full charge of a very large Foundry in South Wales. Age 35/45 years. Applicants must have good technical Foundry background and first rate administrative experience and ability. The position is superannuated. State full details of experience, qualifications, and age, and indication of required salary to Box 3399, FOUNDRY TRADE JOURNAL.

FOUNDRY FOREMAN: Practical, Technical. Experience essential. Grey Iron up to 20 tons per week. Applications in writing only; two references.—SLOUGH FOUNDRIES, LTD., Trading Estate, Slough.

FOUNDRY MANAGER required by an old established Company for a large grey-iron Foundry nearing completion North-west Birmingham. The Foundry has been specially planned to utilize the best modern machinery and equipment obtainable and to promote excellent working conditions. Moulds will be made in green sand using Sandslingers, one of which will be a Locomotive Sandslinger. The position, which carries a salary of £1,500 per annum, demands a production-minded man of proved ability, capable of getting maximum output from the facilities provided. Applications are invited from men under 45-years of age with appropriate qualifications and experience and should be addressed to Box 3402, FOUNDRY TRADE JOURNAL.

CORE MAKER: Working Charge Hand, able to control labour, for small Iron Foundry in Oxfordshire; permanent position. Give details of experience and wages required. Box 3397, FOUNDRY TRADE JOURNAL.

FOUNDRY FOREMAN for Light Engineering Foundry in Glasgow, West, producing high grade intricate castings up to 5 cwts. in gun metal, bronze, aluminium and cast iron to Government Specifications. Must be first class practical moulder used to small quantity production of considerable variety. State age, salary required and full particulars of experience to Box 3400, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT—*Contd.*

FOUNDRY FOREMAN: Young man with practical Foundry Training and some knowledge of Metallurgy to act as Foreman under the supervision of Foundry Manager and take charge during his absence. Applicants should preferably have served an apprenticeship in a Modern Foundry and be about 30 years of age. The post is a permanent one and pension scheme is in operation.—Apply, The Secretary, W. S. BARRON & SON, LTD., Gloucester.

DEVELOPMENT METALLURGIST required by Non-ferrous Refining Company in Birmingham area. Applicants should preferably possess a degree in Metallurgy or Chemical Engineering and some experience in this or related industry. Full details of age, experience, salary required, etc., to Box 3401, FOUNDRY TRADE JOURNAL.

METALLURGIST OR CHEMIST with experience in the refining of Lead and Alloys required for production control and development (Birmingham District). Preference given to applicants possessing a degree in Metallurgy or similar and/or experience in other Metallurgical refining processes. Applicants should state, in confidence, when available, salary required, age and full details of experience—marking letters: "Lead—Private—For the attention of Personnel Manager.—Box 3396, FOUNDRY TRADE JOURNAL.

THE MANUFACTURERS of a well known range of Core Binders require a Technical Representative for the sale of their products in the West Riding of Yorkshire and some adjacent territory Remuneration by salary and commission. —Applications to Box 3404, FOUNDRY TRADE JOURNAL.

ENAMELLING SUPERINTENDENT required for large Cooker and Holloware Manufacturers, Australia. Excellent salary and prospects for right man. First-class passages applicant and family.—Apply giving full details of experience to Box 3405, FOUNDRY TRADE JOURNAL.

APPLICATIONS invited by well-known metallurgical company, for position as Technical Representative covering Yorkshire and particularly the Sheffield area. Essential qualifications: enthusiasm and initiative and liking for hard work. Applicants should be between 25/40 and preferably have some steel foundry and/or steel making experience, coupled with a metallurgical background. Interviews will be given in the appropriate area. Reply giving personal history and as much basic information as possible. Say whether any previous selling experience.—Box 3407, FOUNDRY TRADE JOURNAL.

EDUCATIONAL

UNIVERSITY OF BIRMINGHAM: Graduate Courses in (1) Mechanical Engineering; (2) Chemical Engineering; (3) Metallurgy will be given in the Faculty of Science during the session 1953-54. Courses will be open to graduates with industrial experience and will last one year (October—July). Applications and enquiries to The Registrar, THE UNIVERSITY, Edgbaston, Birmingham, 15.

SITUATIONS VACANT—*Contd.*

FOUNDRY TECHNICIAN (age 28 to to 35) required by progressive Company in North-West England, to assist in Sales Technical Service covering supply to Foundries of Crucibles and Fluxes. Give details of experience, qualification, salary required. All applications treated in strictest confidence.—Box 3410, FOUNDRY TRADE JOURNAL.

METALLURGIST required for Steel Foundry and Engineering Works.—Apply, stating qualifications, experience, and salary, to the SECRETARY, Brown, Lenox & Co., Ltd., Pontypridd, Glamorgan.

COMMISSION SALESMAN wanted for low cost Paints, preferably already with foundry connection for other goods. Big sales possibilities.—Box 3367, FOUNDRY TRADE JOURNAL.

WELL-KNOWN Group of Midland Ironfounders require First-class Technical and Sales Representative for the Greater London Area. Only applications of proved experience in the sales of all types of Grey Iron Castings will be considered. The position is a permanent one and is subject to the Company's Contributory Pension Scheme.—Box 3388, FOUNDRY TRADE JOURNAL.

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.

DRAUGHTSMAN DESIGNER AND ESTIMATOR required to take charge of Drawing Office for Foundry and Machine Tool Makers in Wolverhampton area.—Reply giving full details of experience and salary required.—Box 3385, FOUNDRY TRADE JOURNAL.

WORKS CHIEF ENGINEER required to take charge of development installation and maintenance of plant and equipment of modern engineering works in Cheshire comprising heavy cast iron and steel foundry, machine shops and service department. Equipment includes furnaces, boilers, foundry plant, machine tools, overhead cranes, etc. Good mechanical and some electrical experience necessary. Age 35-45. Commencing salary about £1,000.—Apply giving full particulars, including past experience and qualifications, in confidence to Box 3395, FOUNDRY TRADE JOURNAL.

EXCEPTIONAL opportunity offered to FOREMAN in the 30's, to take charge of modern progressive, well established, Non-ferrous Foundry in Leicestershire. Only persons capable of taking full control and with thorough practical experience of running such foundry will be considered. The foundry has a reputation for good quality work in aluminium alloys, bronzes, etc. It is fully equipped and operates under ideal conditions. Applicants should state when available, and give full details of experience, age, and present position held, together with salary required, which will be treated with the strictest confidence.—Box 3368, FOUNDRY TRADE JOURNAL.

AGENCY

ALUMINIUM GRAVITY DIE CASTINGS. Lancashire Foundry requires agents in Scotland, Midlands, North East Coast. Every support given and good commission paid. Full particulars to Box 3387, FOUNDRY TRADE JOURNAL.

TRADE MARKS

THE Trade Marks Nos. 291010-11 and 622435, consisting of the letters "G.F." and registered in respect of tube fittings and iron castings, were assigned on the 13th January, 1953, by Britannia Iron & Steel Works, Ltd., of Britannia Iron Works, Kempston Road, Bedford, to George Fischer, Ltd., of Schaffhausen, Switzerland, without the goodwill of the business in which they were then in use.

FINANCIAL

FOUNDRY in the South of England, present turnover £12,000 per month, manufacturing iron and non-ferrous castings, patternmaking (wood and metal), wishes to join up with another Company, or would consider Partnership.—Box 3352, FOUNDRY TRADE JOURNAL.

MACHINERY WANTED

CRUCIBLE FURNACE; 600 lb. Capacity; Oil Fired; Lip Axis Tilting Type. Hydraulically Operated preferred, but would accept Manually Operated. Must be in good condition. Send price and particulars to Box 3389, FOUNDRY TRADE JOURNAL.

URGENTLY required, two 1,000 cu. ft., or one 2,000 cu. ft., Electric Driven Air Compressors. 150 lbs. w.p. suitable any A.C. voltage.—Box 3384, FOUNDRY TRADE JOURNAL.

WANTED: 7 ft. Sand Mill, self discharging door; also Parker Portable Belt Loader.—JOSEPH HARPER (GORNAL) LTD., Nr. Dudley.

NEW or second-hand gas fired tilting type furnace, capable of melting 1 cwt. of aluminium for use in pattern making.—THE DAVIS GAS STOVE CO., LTD., Diamond Foundry, Luton.

MACHINERY FOR SALE

4 300-lb. Aluminium Bale Out Furnaces, gas fired. Complete with burners and blower to each pair.—ALUMINIUM DIE CASTINGS (BIRMINGHAM), LTD., Invicta Foundry, Charlotte Street, Birmingham, 3.

MACHINERY FOR SALE—*Contd*

2 British Rema "No. 2A" Pulverizer Coal Firing Units, with spare Motor and sundry spare parts. Can be inspected in working order.—Box 3376, FOUNDRY TRADE JOURNAL.

MORGAN Crucible Tilting Furnace, 250 lb. cap., gas, oil, with fan.
Polishing Barrel, 36 in. by 24 in. a/flats, belt driven.
Adaptable Moulding Machine with turnover attachment for 14 in. by 14 in. boxes.
Taylors £74 Belt Driven Medium Double Headed Brassfinishers Milling Machine with rapid dividing capstan.
Brassfinishers Lathes, 7 in., 4 ft. 6 in. beds, complete with 2-jaw chucks.—NICHOLSON & WEST LTD., Gaol Lane, Halifax. Tel.: 3224.

MACHINERY FOR SALE—*Contd.*

OFFERS invited. Tilghman 5 ft. by 2 ft. 9 in. Shot Blast Chamber Plant complete with Dust Arrestor.—Box 3403, FOUNDRY TRADE JOURNAL.

MORRIS Screenarator Sand Conditioner.—Box 3411, FOUNDRY TRADE JOURNAL.

FOR SALE.—One 20-in. dia. Cupola, complete with motor control gear and blower, spare set of bricks for lining, together with charging platform size 20 ft. by 12 ft. approx., gantry and electric hoist block and bucket, etc. A complete installation, in first-class condition.—Apply H. & E. LINTOTT, LTD., Horsham, Sussex.

SAND MIXERS and DISINTEGRATORS for Foundry and Quarry; capacities from 10 cwts. to 10 tons per hr.—W. & A. E. BREALEY (MACHINERY), LTD., Station Works, Ecclesfield, Sheffield.

FOR SALE.

NO. 16 ATRITOR CRUSHER by Alfred Herbert, complete with Feed Hopper overhauled and with a quantity of spares. Also a No. 12 Atritor by Alfred Herbert, for which we have available about 6 tons of spares. Both these machines are offered at extremely low prices for quick clearance.

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MACHINERY FOR SALE—*Contd.*

TWO B.M.M. Jolt-Squeeze Pin Lift Moulding Machines, Type HPL.1, purchased new 1949. Price: £125 each or £230 the two.—RICHARDS (LEICESTER), LTD., Phoenix Iron Works, Leicester.

B. T.H. very powerful Dust Extractor Blowers. Motorised units (unused). £15 each. One-third to-day's cost.—BELLANGER'S, 306, Holloway Road, London, N.7. North 4117.

WELL - KNOWN Yorkshire Ironfounders having closed Manhole Cover Shop is willing to dispose of the Iron Patterns for same on a tonnage basis.—Box 3408, FOUNDRY TRADE JOURNAL.

McNAB Shockless Jolt Ram Rollover Moulding Machine; 30 in. by 40 in. Table with air operated clamps; almost new.—FRANK SALT & Co., LTD., Station Road, Blackheath, Staffs.

CAPACITY AVAILABLE

CAPACITY for Grey Iron Castings; 10 cwt. maximum; Patternmaking facilities, wood and metal; prompt deliveries. — GOWER FOUNDRIES LTD., Bridgend Trading Estate, Bridgend, S. Wales.

NON-FERROUS FOUNDRY: Castings in Gun Metal, Phosphor Bronze, Brass and Aluminium. Patterns and Finishing included.—HALIDOM PRODUCTS LTD., Gaol Lane, Halifax. Tel.: 66513.

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CASTINGS.—We can save your porous castings, ferrous or non-ferrous, by an approved Impregnation Process; sample castings treated.—RECUPERO, LTD., 66, South Harrow Viaduct, Harrow, Middx. 'Phone: Byron 1178.

NON-FERROUS FOUNDRY. — First-class quality castings in Aluminium, Bronze, Gunmetals, etc., at competitive prices, including patterns if required.—BEESTON LEE & Co., LTD., 33, Swindon Road, Stratton St. Margaret, Wilts.

HAYWOOD BROS., Littleborough, Lancs., invite enquiries for all types of Patterns and Scale Models. Highly finished, accurate work of any size. Tel. 8543.

MIDLANDS.—R. J. Harris & Son, Ltd., Rugeley, Staffs., have for many years produced First Class Grey Iron Castings for Machine Tools, Jigs and Fixtures and General Work, and have now additional capacity available for castings from ½ lb. to 5 cwts., in small or large quantities.

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CAPACITY available for Light Castings weighing from 1lb. to 5 cwts., including Castings for Vitreous Enamelling.—WESTERN LIGHT CASTINGS FOUNDRIES, LTD., Fairwood Foundry, Gowerton, near Swansea, manufacturers of malleable iron castings.

MECHANISED FOUNDRY.—Malleable and Grey Iron Castings offers 20 tons per week free capacity at early date. Preference for boxes up to 28 in. by 16 in. by 5 in. by 5 in. Snap Flasks up to 14 in. by 14 in. by 3 in. Hand moulding capacity also available. Cast Iron Pipes flanged and specials. Patternmaking facilities if required.—E. J. WALLACE, 39, Constitution Street, Dundee.

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CAPACITY AVAILABLE—*Contd.*

CAPACITY available for castings weighing from 1 lb. to 15 tons, including Quasi-Bessermised ingot moulds up to 10,000 tons per annum.—THE CROSS FOUNDRY & ENGINEERING CO., LTD., Gorseinon, near Swansea.

GEORGE DENHAM, LTD., Low Mill Foundry, Darlington, have capacity available for Aluminium, Phos. Bronze and Gunmetal Castings from ½-lb. to 3-cwts., at competitive prices, including patterns if required. 'Phone Darlington 5017.

TIVIDALE FOUNDRY, LTD., Local Board Road, Watford. (Tel. 3743.) Non-ferrous Sand Castings, 2 cwt. maximum. Prompt quotations and deliveries.

MISCELLANEOUS

HAVE your Furnaces repaired or rebuilt by a man with 25 years' experience. Annealing, muffle, refinery, and rev. furnaces, and furnaces of all types.—B. RICHARDSON, 49, Milton Avenue, East Ham, E.6. Tel. No. GRAngewood 0619.

SEA SAND for Castings, any quantity, by road or rail.—JOHN LIVESEY, LTD., Leamington Road, Ainsdale, Southport.

REFRACTORY MATERIALS.—Moulding Sand, Ganister, Limestone, Core Gum; competitive prices quoted.—HENSALL SAND CO., LTD., Silver Street, Halifax.

MISCELLANEOUS—*Contd.*

THE "SERVICE" Sandblaster's Protective Suit, manufactured by MESSRS. THOMAS BUTCHER & SONS, estab. 1876, 237/9, Stamford Street, Ashton-under-Lyne, 'Phone ASH. 1063.

FIREWOOD for Cupolas. Sleepers and Sleeper Wood in wagon loads.—TILLEY'S (WOLVERTON), LTD., Wolverton Bucks.

PATTERNS for all branches of Engineering for Hand and Machine Moulding.—FURMSTON AND LAWLOR, LTD., Letchworth.

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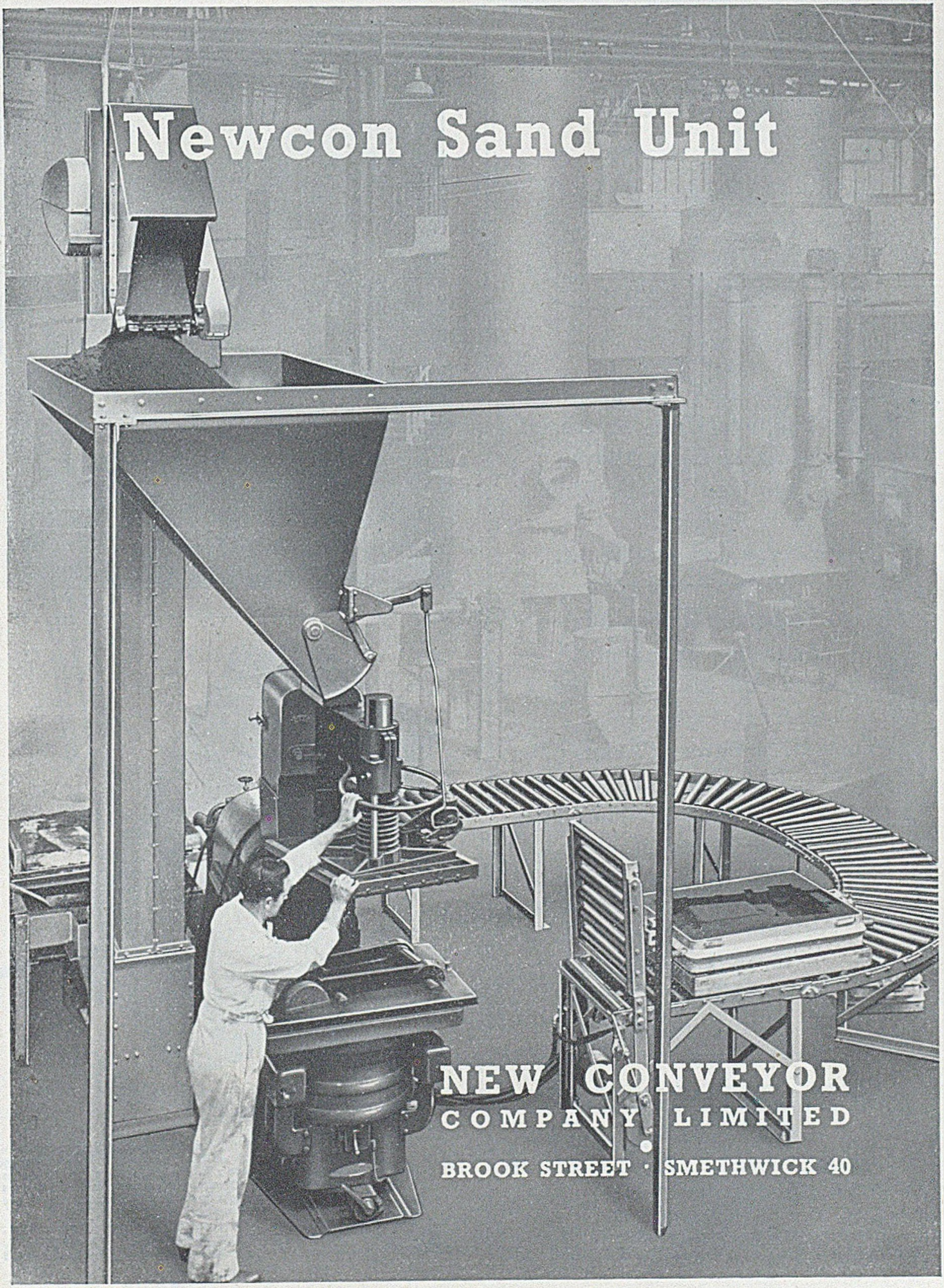
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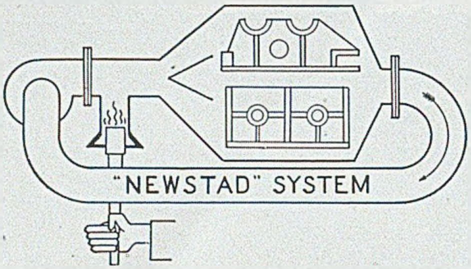

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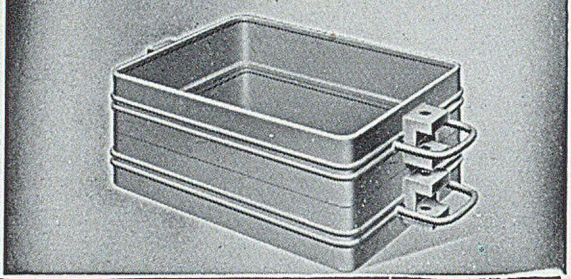

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These patented copper-zinc alloy welding rods make highly successful welds at remarkably low temperatures yet produce a join with a tensile strength of as high as 28 to 40 tons per sq. inch, and at the same time overcome the problem of distortion and the necessity of pre-heating.

* *"Sif-Tips", welding quarterly magazine. Free on request:*

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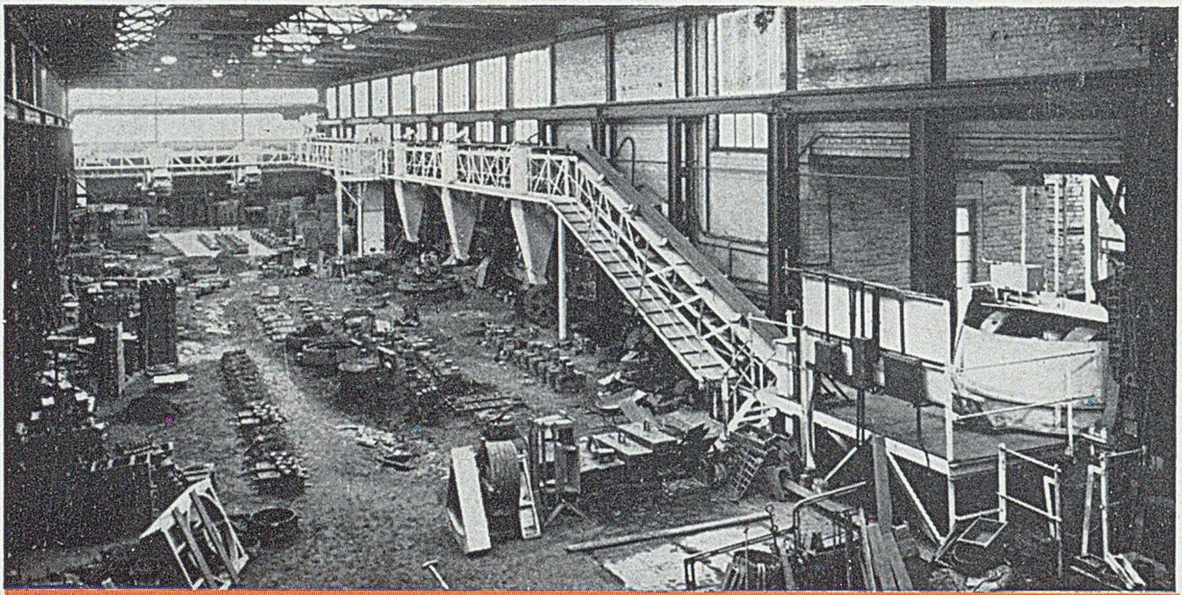

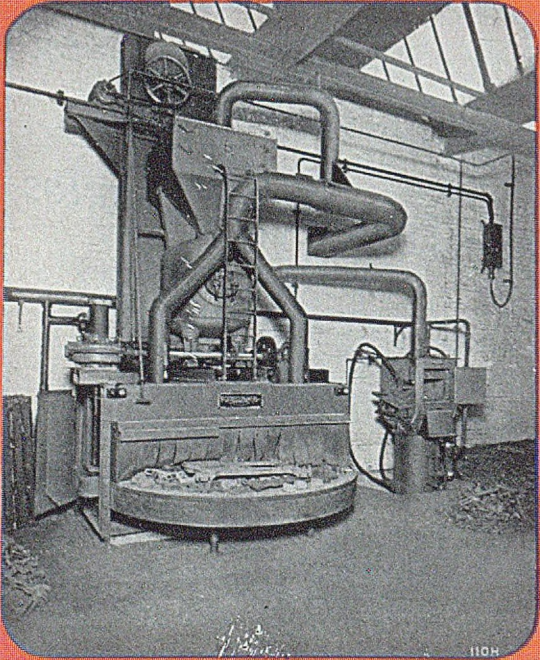


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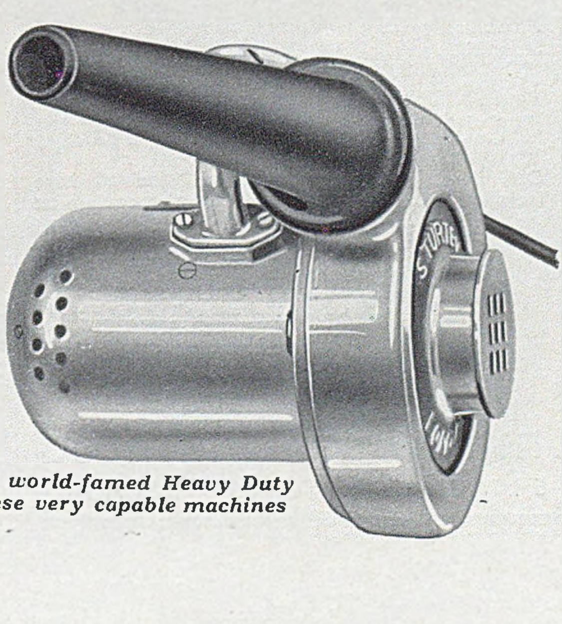

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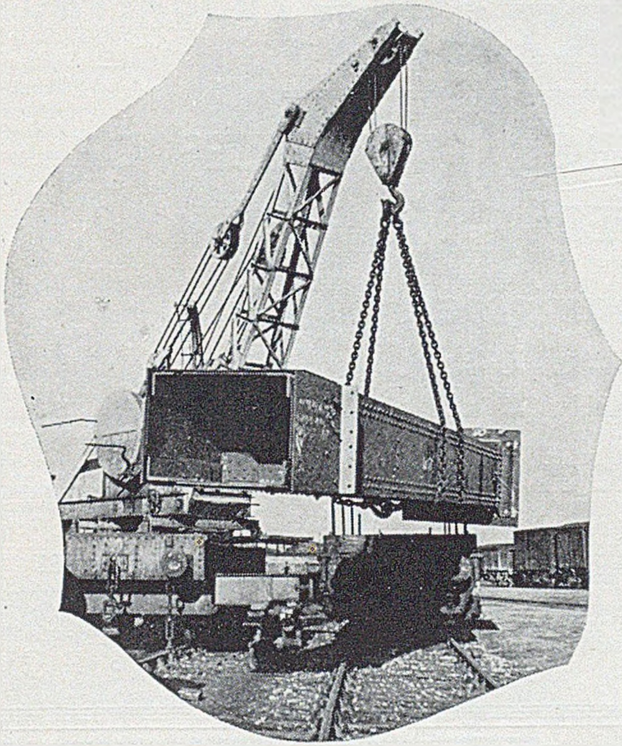

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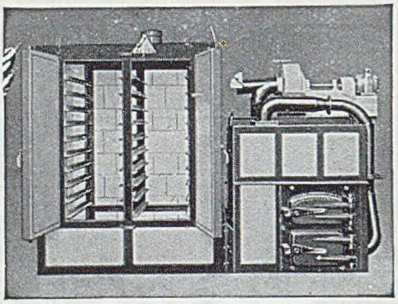

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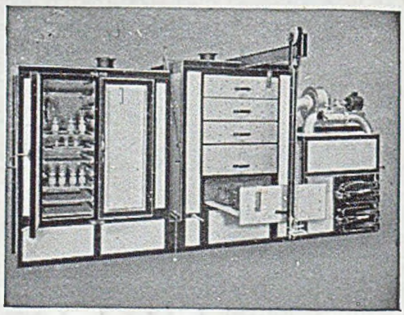

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