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The Institute's Proceedings

The Proceedings of the Institute of British Foundrymen for 1949 are contained in a volume which is about 14 per cent. larger than the previous one. The great value of this book and those which preceded it is that the bulk of the matter published is of general interest, and unlike some of the transactions of the learned societies which are of very limited appeal. Naturally, the Institute has to cater for the three main branches of foundry practice, and taken over the years it does very well. This year, however, the amount of space devoted to actual steel founding is rather scanty, but there is, of course, a wide volume of information on subjects common to all foundries, such as costing, inspection, sands, and core making. The new volume is particularly strong in really practical Papers. This is a very good feature, because, in the past the practical man was in the main denied the use of photography and normally had to do his best with written description and sketches. This new technique—for the practical man—allows of a critical examination of the craft and makes for a better understanding of underlying principles.

One of the most interesting Papers included is that on "Casting Inspection," by Mr. J. H. Williams, for it discloses, perhaps for the first time, the whole *rationale* of a phase of foundry practice essential for the well-being of the industry. The light-alloy founders held a special session to discuss three Papers. This innovation was obviously a success, and since there is now a general realisation that much good can be derived by practical men talking over their problems with the metallurgist in public, it is to be hoped that such sessions will be regularly held. A feature of the Institute's Proceedings in recent years has been the inclusion of Committee Reports. The two printed in this issue are of basic significance and wide interest; they are: "The Influence of Stripping Temperature on the Properties of Pearlitic Grey Cast Iron," and "Cupola Charge Materials." The latter was adversely and to our mind unjustifiably criticised. Conversations with many foremen have convinced us that it has proved itself to be of the greatest practical value. Another Paper which cut new ground, was Mr. Wizard's Paper on "Art Foundry Practice." Though this branch of foundry work is of ancient origin, it has been neglected by modern technical authors. The two exchange Papers from America and France, the former dealing with "Bronze Foundry Practice," by Dr. A. J. Smith, and the latter on apprenticeship training by Mr. Waeles, well maintained the high level so long established. The American Paper was the 29th of an unbroken series. Surely this must be a record in international co-operation! Moreover, this has not been a one-way traffic, and the members of the Institute have, if we remember rightly, reciprocated year by year since 1922—that is, one year later, when Mr. G. K. Elliott presented the first Paper from the American Foundrymen's Association on electric-furnace practice. Later, other nations emulated this system, and we confidently assert that in no other branch of industry has there been such large-scale technical co-operation.

This is the 48th volume of the Proceedings, and it is truthful to say that anybody so fortunate as to own the complete series, possesses the best compendium of foundry practice available. Such a person, however, could not fail to note the continuous improvement in presentation and the worth of matter published. To the list of editors who have contributed to this meritorious development, we pay our tribute. None, however, has done better than Mr. G. Lambert, who has produced this 1949 edition, and to him we extend our sincere compliments.

Contents

Institute's Buxton Conference (1950) Fund

First List

Mr. C. H. Kain, the honorary treasurer of the fund being raised in connection with the forthcoming conference of the Institute of British Foundrymen, has sent us the first list of subscribers, as follows:—

The Butterley Company, Limited, £50; Ley's Malleable Castings Company, Limited, £50; Constructional Engineering Company, Limited, £26 5s.; Herbert Morris, Limited, £25; S. Russell & Sons, Limited, £15 15s.; Knowsley Cast Metal Company, Limited, £10 10s.; Markham & Company, Limited, £10 10s.; Bradley & Foster, Limited, £10 10s.; Mason & Burns, Limited, £10 10s.; Shotton Bros., Limited, £10 10s.; The Fordath Engineering Company, Limited, £10; Leigh & Sillavan, Limited, £10; George Oxley & Sons, Limited, £5 5s.; Harborough Construction Company, Limited, £5 5s.; Metallurgia, £5 5s.; Lancaster & Tonge, Limited, £5 5s.; Hill Top Foundry Company, Limited, £5 5s.; Mr. A. E. Peace, £5 5s.; W. & J. Lawley, Limited, £5 5s.; British Foundry Units, Limited, £5 5s.; Mr. W. T. Laverton, £5 5s.; Baker's Foundry Company, Limited, £5 5s.; The British Rollmakers' Corporation, Limited, £5 5s.; General Metallurgical & Chemical, Limited, £5 5s.; Mr. G. C. Studley, £5 5s.; Robert Hyde & Son, Limited, £5 5s.; Northampton Foundry Company, Limited, £5; Hunt Bros. (Oldbury), Limited, £5; Richards (Leicester), Limited, £5; Sarginson Bros., Limited, £5; Lee, Howl & Company, Limited, £5; C. & B. Smith, Limited, £5; Sykes & Harrison, Limited, £5; Mr. C. W. Bigg, £5; Harvey & Longstaffe, Limited, £4 4s.; F. Parramore & Sons (1924), Limited, £3 3s.; Foundry & Engineering Company (West Bromwich), Limited, £3 3s.; E. S. Lord, Limited, £3 3s.; Wright's Havelock Foundry Company, £3 3s.; Darby & Company, £3 3s.; Idoson Motor Cylinder Company, Limited, £3 3s.; Thos. Holcroft & Sons, Limited, £3 3s.; Henry Hollingdrake & Son, Limited, £3 3s.; Mr. J. Wallis, £2 2s.; The Brockmoor Foundry Company, Limited, £2 2s.; Taylor & Hubbard, Limited, £2 2s.; Platt Malleable Castings, Limited, £2 2s.; Mr. J. Durrans, £2 2s.; Mr. G. W. Brown, £2 2s.; Mr. J. Roxburgh, £2 2s.; Hopyard Foundries, Limited, £2 2s.; Frodair Iron & Steel Company, Limited, £2 2s.; Mr. W. Taylor, £2 2s.; Thos. Bolton & Sons, Limited, £2 2s.; Mr. Ellis Flower, £2 2s.; Coventry Malleable & Aluminium, Limited, £2 2s.; Daimler Company, Limited, £2 2s.; Chas. B. Pugh (Walsall), Limited, £2 2s.; Walter Button, Limited, £2 2s.; Ferrous Castings, Limited, £2 2s.; Mr. L. C. Griffiths, £2 2s.; Mr. J. Humpston, £2; Mr. Michael M. Hallett, £1 1s.; Henry Robinson (Ironfounders), Limited, £1 1s.; Service (Engineers), Limited, £1 1s.; Mr. W. D. Pugh, £1 1s.; Ferro Enamels, Limited, £1 1s.; Mr. T. J. Wragg, £1 1s.; Mr. C. J. Dadswell, £1 1s.; National Trades Technical Societies, £1 1s.; Wm. Hammond, Blades & Company, £1; Mr. Clifford R. Smith, £1; Mr. A. Bartlett Smith, £1; Mr. J. Carter, 10s. 6d. Total, £434 2s. 6d.

Conference on Isotopes in Industry

The Department of Extra Mural Studies of the University of Birmingham, in conjunction with the Birmingham branch of the Atomic Scientists' Association, is holding a conference on "Isotopes in Industry" from May 19 to 21, at the University, Birmingham. The conference is designed to introduce radioactive isotopes and the associated techniques to industrial scientists and technologists. Further details may be obtained from the Department of Extra Mural Studies, University of Birmingham, Edmund Street, Birmingham, 3.

Forthcoming Events

APRIL 18.

Institute of British Foundrymen.

Coventry Students' Section:—"Permanent Mould Casting in Aluminium and Magnesium Alloys," by A. Robinson, at the Coventry Technical College, at 7.15 p.m.

APRIL 20.

East Anglian Section:—Annual General Meeting, at the Central Hall, Public Library, Ipswich, at 7 p.m.

APRIL 21.

Middlesbrough Branch:—Annual General Meeting, at the Cleveland Scientific and Technical Institute, Corporation Road, Middlesbrough, at 7.30 p.m.

APRIL 22.

Bristol Branch:—Annual General Meeting and Branch Dinner, at the Grand Hotel, Broad Street, Bristol, at 3 p.m.

Film Review

Gating Systems for Metal Casting

Under the joint auspices of the British Steel Founders' Association and the London Branch of the Institute of British Foundrymen last Wednesday week there was presented a coloured film dealing with Foundry Gating Practice. The film, which has been prepared by the United States Naval Research Laboratory, was introduced by Mr. J. F. B. Jackson, B.Sc., the B.S.F.A. director of research. The meeting, which was held at the Waldorf Hotel, was presided over by Mr. F. Arnold Wilson and was particularly well attended. The film was shown in three parts designed to cover gating systems for metal castings; finger gating and step gating. They disclosed the answers to many problems for, proceeding systematically, the results were shown of altering positions, section sizes and forms of ingates. Yet withal, there were but few conclusions that could be drawn and these were not stressed in any summing-up available to the audience. The film recalled to the reviewer the type of American research published about thirty years ago, when, with some brilliant exceptions, the Papers were either all data with no conclusions or statements based on undisclosed experiment. This film falls into the former class. The technical production and photography were alike excellent and the background commentary was entirely adequate. Comparing it with the British film—"Sandstone Secrets"—the reviewer deems the latter to be superior as a documentary film on account of the clear lessons it teaches.

V.C.F.

British Exhibits at Cleveland

Whilst British firms have previously taken space at exhibitions organised by the American Foundrymen's Society, it is, we think, correct to say that the "show" to be held in Cleveland, Ohio, from May 8 to 12 will be the first occasion on which British-made foundry equipment will be shown. Two concerns—British Moulding Machine Company, Limited, of Faversham, Kent, and Foundry Equipment, Limited, of Linslade Works, Leighton Buzzard—have taken space and both will be exhibiting various types of moulding machines. We sincerely hope that the enterprise shown by these two firms will command the success they so well merit. Mr. H. J. Bullock, of British Moulding Machine Company, Limited, is going to America in the Queen Mary which is scheduled to sail to-morrow, April 14, and Mr. V. L. Cashmore, of the same company, leaves in the Mauretania on April 25.

Patternmaking for General Engineering Castings*

By H. S. W. Brittain

Beginning with remarks on the history of founding to show how patternmaking has been developed as a craft, the Author next describes the pattern shop itself, the equipment installed and its capabilities. A comprehensive section on pattern materials is followed by those devoted to metal patterns and core-making—the latter being illustrated by citations from the Author's experience. Thereafter, numerous individual patterns are described as examples which relate to pattern-practice for serving various moulding layouts—in green-sand, dry-sand and loam.

HISTORY records that in all probability copper was the first metal to be smelted and cast into useful articles. This discovery appears to have been quickly followed by the production of bronze. The Bronze Age is variously quoted as being around 1400 B.C.[1] or 1100 B.C.,[2] and its origin in China during the Shan and Chou periods. Early evidence of the art of founding in the period mentioned is proved by the finding of bronze statuettes, some of which can be seen in the British Museum, and others in the Fitzwilliam Museum, Cambridge. These statuettes are said to have been made by what is now known as the " lost-wax " process, or " cire perdue." Since A.D. 1943, this process has become well known, and is being highly developed as a precision-casting method. It is claimed that castings are made to within plus or minus 0.002 in. of the desired dimensions, thus eliminating costly machining operations. Whether, in the early stages of founding by the wax process, a master pattern was first made from wood or some other medium, is not known. It is known, however, that in the early Bronze Age some castings were made in open moulds, fashioned by carving out stone, or cutting the required shape out of clay. The art of making patterns must inevitably have followed the discovery of moulding, for early man would obviously need more production from his newly-found art.

The Bronze Age was followed by the so-called Iron Age. Iron is said to have been used in Greece in 1200 B.C.[3] Odysseus is reputed to have used a spearhead made from iron, although it is thought that it must have been forged and not cast. Dr. H. O'Neill[4] attributed the discovery of cast iron as being around 206 B.C. in China. Then for many centuries the discovery was forgotten or thought of no practical use. He also gives the date of the introduction of iron-founding into this country as around A.D. 1500.

Bronze and iron were the major metals for the making of castings until the advent of steel. In A.D. 1740, Benjamin Huntsman, of Sheffield, invented a crucible capable of withstanding the intense heat required to make cast steel; thus began the age of steel. To complete the picture, then, must be added mention of the light metal aluminium. J. Caven and H. W. Keeble, in their recent Paper, note that this metal has only been in use as a commercial metal since A.D. 1825.

To-day it is very difficult to keep in touch with the various metals and alloys used for making castings. With so many metals at his disposal, the engineer can design machines, or parts thereof, to suit his own particular requirements, and demand exceptionally high physical strengths from castings. Whatever the design of a casting, if it is to be produced by any of the normal moulding processes, then some form of pattern is necessary. The pattern may be of the most simple character; on the other hand, it may be a most complicated array of pattern and core-boxes. Patterns are made from such small articles as boot protectors weighing a fraction of an ounce, to almost any size one can imagine, and by weight up to 200 tons or more. The company with which the Author is connected are believed to have made the heaviest iron casting in this country. During the last war they cast an ingot mould weighing 160 tons—no mean achievement!

Types of Foundries

The manufacture of castings falls into categories such as steel, iron, brass or bronze, aluminium, and light alloys, etc. While there are a great number of specialised foundries, the majority can be termed jobbing foundries. This is a very loose term which is used to describe a foundry tackling a great variety of casting designs, in a wide range of weights, and in many kinds of metals. It is not uncommon for one foundry to manufacture castings by the green-sand, dry-sand and loam-moulding methods. The nomenclature sounds simple enough, yet the processes involved are very complex, so much so that only by many years of contact with them can the patternmaker hope to be in a position to supply the pattern equipment applicable to each process.

Fifty years ago, there was introduced into this country a machine for the mechanical ramming of moulds. To-day, as all foundrymen are machine and mechanisation minded, the engineer is providing the means to speed up the production of castings so sorely needed by the engineering industry. Along with these rapid changes in foundry technique is the demand for greater accuracy in the dimensions of the castings; to a great extent this is the responsibility of the patternmaker. It is not uncommon to hear the remark that " a casting cannot be more accurate than the pattern from which it is made."

Pattern Shop

Any foundry producing a wide range of castings should have its own well-equipped pattern shop. If patterns are to be produced economically and speedily, the shop should be equipped with an adequate supply of machines to eliminate as much as possible both the work normally done with hand tools and the need for skilled men to manipulate them.

* A Paper read before the Birmingham branch of the Institute of British Foundrymen, Mr. H. G. Hall presiding. Later presented to a London branch meeting under the presidency of Mr. F. Arnold Wilson.

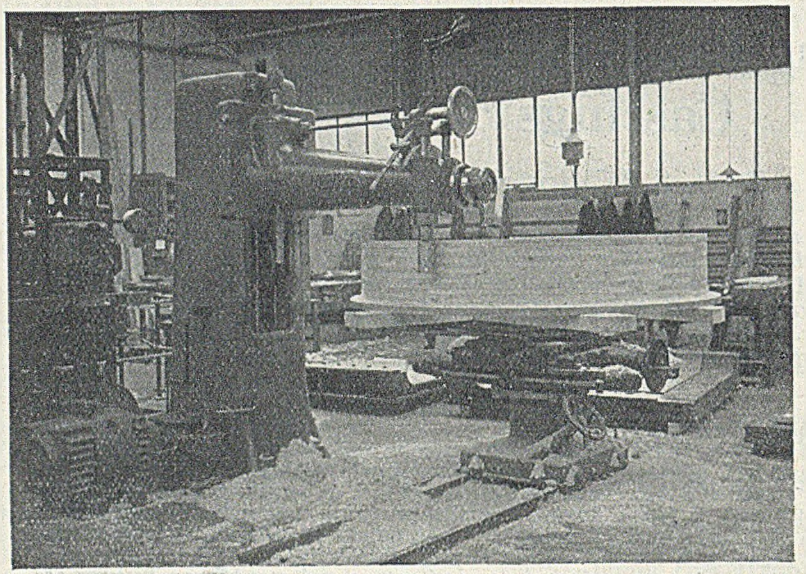


FIG. 1.—WADKIN MILLER WITH 7 FT. 6 IN. DIA. BY 18 IN. RING ON THE TABLE.

Equipment

The large shop usually has a cross-cut saw, circular saw, dimension saw, one or two band saws, disc sanders, bobbing or belt sanders, combined surface and thickness planer, face-plate and centre lathes. A series of 6-in. or 9-in. surface planers at strategic positions adjacent to the work benches and portable drilling machines are also an asset. One of the best general-purpose wood-working machines is represented by the Wadkin range of pattern millers. There is no doubt these machines are used on a considerable number of operations normally performed by the hand of a skilled patternmaker.

Fig. 1 shows the large type of pattern miller with a circular pattern, 7 ft. 6 in. dia. by 1 ft. 6 in. deep, being milled inside and outside. The thickness is ½ in. Normally this would be turned in the face-plate lathe.

Fig. 2 shows a Wadkin tool cupboard, which clearly indicates the range of the cutters and tools for equipping the pattern miller. It is possible to use the machine to clean up and shape aluminium patterns and core boxes or parts used in pattern construction.

Metal Patternmaking

Some patternshops prepare metal patterns, the equipments then includes metal-cutting lathes and millers. In this connection one must mention the profiling machines of the Keller type, used to reproduce metal patterns exactly in accordance with a master pattern. Naturally, all patternshops are not equipped with anything approaching such an array of machines; the general rule is a scarcity of machines even to the point of embarrassment.

Materials

The majority of patterns are made in wood, the choice being yellow or Canadian pine, mahogany, white pine, teak and occasionally other types of either home-grown or imported timber. Usually, the first three find most favour and, when other timbers are used, it is either because of lack of supplies of those preferred or for some special reason—often a personal prejudice.

Canadian Pine

For choice, the Author prefers to use yellow pine; it is easy to work and can be finished with a smooth, silky surface. It is not unkind to machines or hand tools. The supply is quite adequate, and the material can be obtained in boards from one inch to three inches thick, and from four inches to eleven inches wide. The quality varies from "first" to "fifths" or "sixths," the general quality used being "thirds." Timber is not a cheap commodity, for a standard of timber equals 165 cub. ft., or 120 pieces 6 ft. long by 3 in. by 11 in. wide—the cost being in the region of £70 per standard for "third"

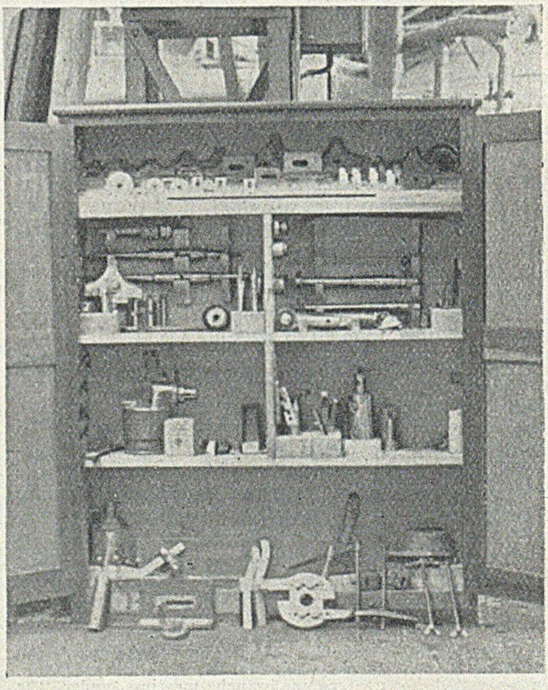


FIG. 2.—WADKIN TOOL-EQUIPMENT CUPBOARD.

quality. It is essential to exercise the greatest care in the use of timber, owing to the economic position of the country; nevertheless the supply position ought not to be embarrassing to users, and delay in delivery should be avoided, or production of patterns and eventually castings will be affected.

White Pine

White pine is an inferior type of pine, grown in the northern part of America, bordering on Canada. Its grain is more open than yellow pine, due to its quicker growth; consequently, it is softer and less durable. The greatest drawback to its general use is its tendency to shrink as much as $\frac{3}{16}$ in. in a width of 12 in.

Mahogany

Mahogany is of great value to the patternmaker and foundrymen, because it has qualities not possessed by any other timber of a commercial use. These qualities are close grain, and consequent hardness, ability to give a smooth surface on face or end grain (provided it has been well "seasoned," *viz.*, dried out), and there is practically no shrinkage after being worked. Care needs to be exercised in the selection of this timber because there are scores of varieties on the market. The true mahogany came originally from Cuba, but this cannot now be bought. The next best is Honduras-grown; mahoganies are also found in far-off Africa, and range in colour from rich red to almost white. These African types are usually inferior in texture and working qualities.

Teak

Teak comes from Burma, India and Ceylon; it can be used to make patterns, but is difficult to work due to its hardness and the presence of a gritty substance in the pores of the timber; often it weighs as much as 70 lb. per cub. ft.

Substitutes

During the last war a great number of substitute timbers were tried out, but probably none has survived the adverse criticism of the patternmaker, and pine and mahogany remain supreme.

Moisture Content

The moisture content of timber is a vital factor governing whether it shrinks or swells. No matter what the moisture content of the atmosphere may be, timber will attempt to adjust itself to that condition. Therefore, if a pattern can be kept at a constant temperature and almost constant humidity, little or no shrinkage or swelling should occur.

A rough check for the moisture content of timber can be made by using the "Speedy" moisture tester as used for foundry sands. This is done by collecting the sawdust from a sample of timber, weighing out the standard amount and proceeding as if testing sand. The variation in moisture content ranges in various samples, from 7 to 22 per cent.

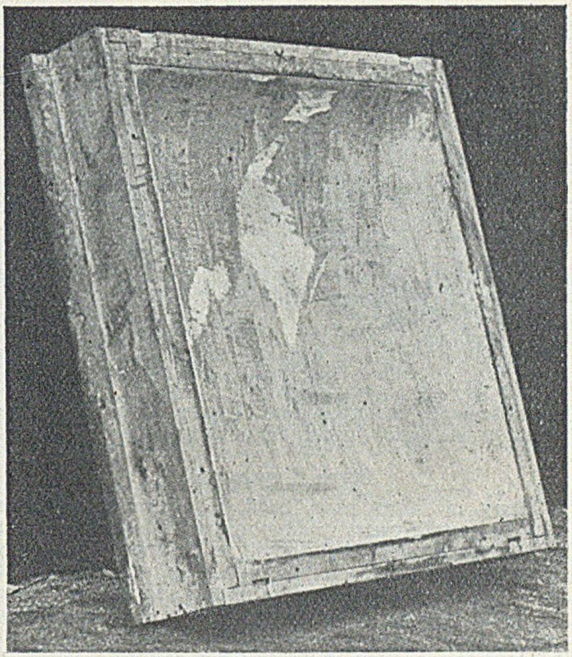


FIG. 3.—PLASTER OF PARIS PRESS BLOCKS (LARGE).

Other Pattern Materials

The failure of timber to withstand the ravages of moulding in sand, when a considerable number of moulds are to be made from one pattern, or where rigidity and resistance to abrasion are important, as required by quantity production from machines, has led to the use of other materials for patterns. Most of these materials come into the sphere of the metal patternmaker. Almost any metal can be used to make patterns.

Plaster Patterns

A further material often used to make patterns or parts thereof is plaster of paris. Whilst, no doubt, it is best used by trained operatives, much can be done by the less skilled, using it for unusual shapes and "one-off" jobs.

Figs. 3 and 4 serve to show that much work was saved in making press blocks. These patterns were made by using a timber framework to give the edge shapes, and were filled in with plaster and strickled where possible. The top-block shape was forked from the bottom plaster block. The thickness of the material to be pressed was first superimposed on the bottom block. A certain amount of hand work was necessary

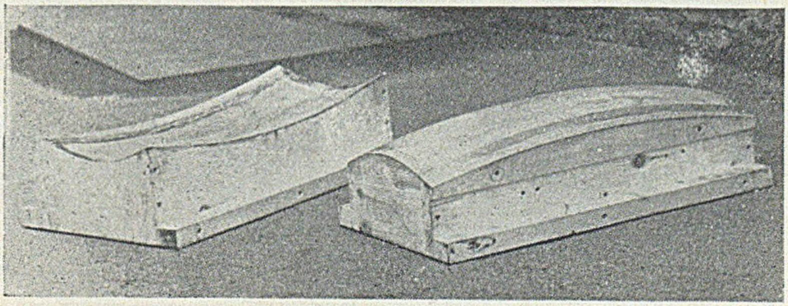


FIG. 4.—PLASTER OF PARIS PRESS BLOCKS (SMALL).

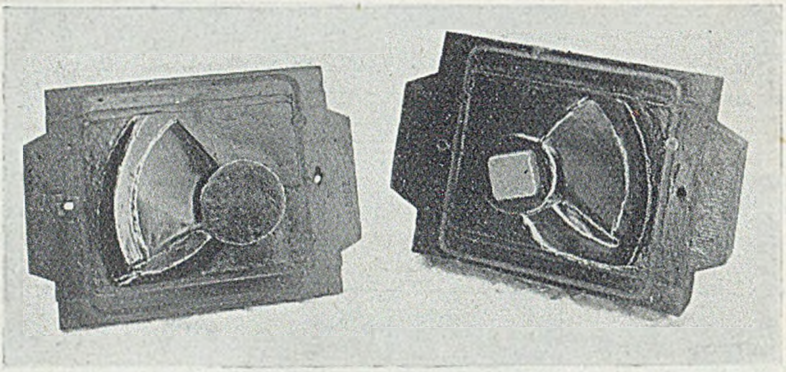


Fig. 5.—Pattern Plate of Stone Compound for a Pug Knife.

to shape the corners. Plaster of paris is not very effective when used for machine-moulding patterns.

Stone Compound

Many mediums have been experimented with for making pattern plates; the best seems to be one or other of the various proprietary "stone" compounds. Very many pattern plates of these materials have been made from time to time with more or less success depending upon the design. The compounds have one fault in common; they are apt to crack quite easily. They can be used as a backing in which to embed metal patterns, and form the irregular joint around those patterns. In the better practice when using "stone compound," a machined cast-iron frame is used to surround the material. When a cast frame is not available, a satisfactory job can be made by using a wooden frame.

An example of a pair of stone-compound pattern plates for pug knives, making use of a wooden frame, is shown in Fig. 5. Many moulds have been made from this simple set-up. Many such examples will present themselves to the foundryman and patternmaker. It should be noted that a master pattern is first made, and a sand mould is made from it in which to pour the compound, thus forming the shape of the required pattern.

Metal Patterns

Cast iron is considered the best medium for the manufacture of metal patterns, either cast integrally with the plate or for loose patterns to be superimposed on a machined plate. The application of metal patterns and pattern plates is most common for machine-moulding purposes, on quantity production lines. Yet it is not uncommon to find metal patterns being used for hand-moulding methods. Quite recently, the Author used a cast-iron pattern for a slag pot weighing almost 4 tons, whilst other examples could be quoted. The disadvantage of cast iron is its weight, and the fact that it quickly goes rusty once the original skin has been disturbed. It is also prone to cracking due to jolting or squeezing on machines, particularly when attempts are made to lighten the pattern. Cast iron is not particularly easy to scrape and file to procure a smooth surface.

Brass and Gunmetal

These metals find much favour because they are easier to work and give a very fine smooth face to the

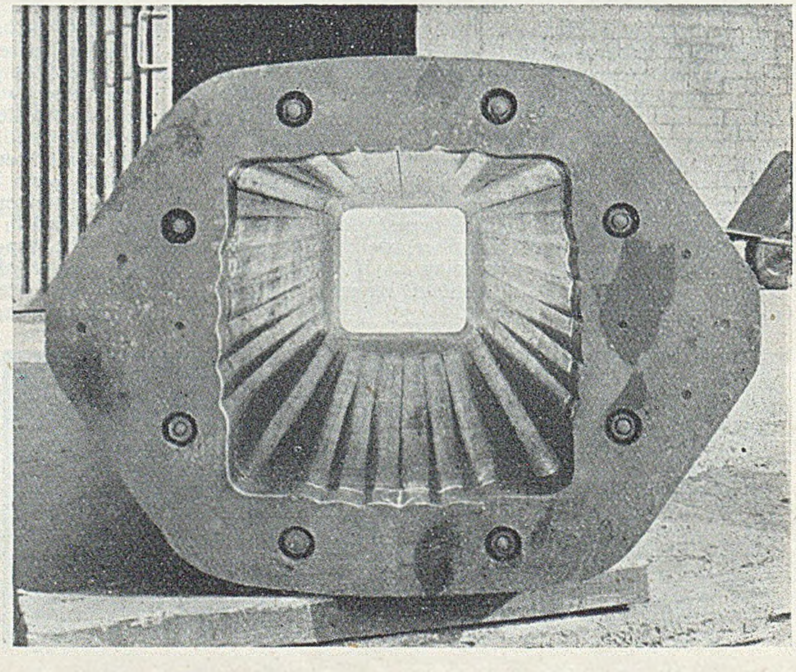


Fig. 6.—Interior of Pattern for an Ingot Mould.

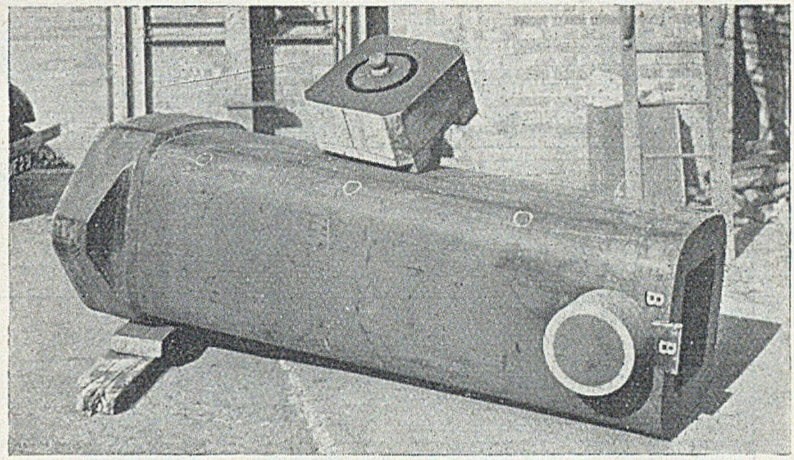


FIG. 7.—EXTERIOR OF PATTERN FOR AN INGOT MOULD.

pattern. Due to their relative softness, they are inclined to wear quickly by the abrasion of sand; furthermore the weight factor must be taken into account, as also must the heavy cost of the metal.

All metal patterns and, in fact, wooden pattern plates, which are very costly to produce, should be stored in a room that is kept at a constant heat and humidity by good ventilation and thermostatic control (65 deg. F. usually being sufficient).

Aluminium and Aluminium Alloys

There are a great number of aluminium and aluminium-alloy specifications, and no doubt at some time or other most of them have been used with some degree of success for metal patterns and plates. Parts of patterns and whole or parts of coreboxes are constantly being made from these light but strong metals. Undoubtedly they are superior from the weight and the east of working viewpoints. Here again, abrasion quickly takes its toll, as does pitting caused by corrosion. As with stone compounds, metal patternmaking usually demands a wooden or plaster master pattern, and this adds to the cost of production.

Plastic Patterns

Finally, on the question of materials, the industry cannot afford to ignore patterns made from plastic materials. The Author has no knowledge of this

CHART OF INFORMATION REQUIRED BY PATTERN SHOP			
1	TYPE OF MOULDING.	A. GREENSAND B. DRYSAND C. LOAM	
2	DIRECTION OF MOULDING.		
3	METHOD OF MOULDING.	A. HAND B. MACHINE	
4	WHICH MACHINE.	A. SANDSLINGER B. JOLTER	
5	TYPE OF PATTERN.	A. WOOD B. METAL C. STONE COMPOUND ETC.	
6	" " CORE(S)	A. GREENSAND B. DRYSAND C. OILSAND	
7	" " COREBOX.	RAMMED ON PLATE OR TURNED OVER ON TO PLATE	
8	CORES MADE IN HALVES OR WHOLE.		
9	ANY SPECIAL COREPRINTS.		
10	" " CONTRACTION.		
11	KIND OF METAL.		
12	SPECIAL M/C ALLOWANCES OR HEAD.		
13	CAMBER, AMOUNT & DIRECTION.		
14	STRIPPING PLATE. IF REQ^{D}?		
15	IF MOULDING-BOX PATTERN REQ^{D}.		
16	SIZE & SHAPE OF BOX.	(DRG. IF SPECIAL)	
17	IF RAMMING OR TURNING OVER BOARD NEEDED.		
18	TYPE OF CORE IRON PATTERN.		
19	N^{o} OF PATTERNS PER BOX.		
20	SHAPE, SIZE & POSITION OF RUNNERS.		
21	" " " " " HEADS.		
22	" " " " " INGATES & DOWNGATES.		
23	" " " " " CHILLS (IF ANY)		
24	FOUNDRY. PLANNED PERIOD.		

FIG. 8.—CHART OF PATTERN-SHOP INFORMATION.

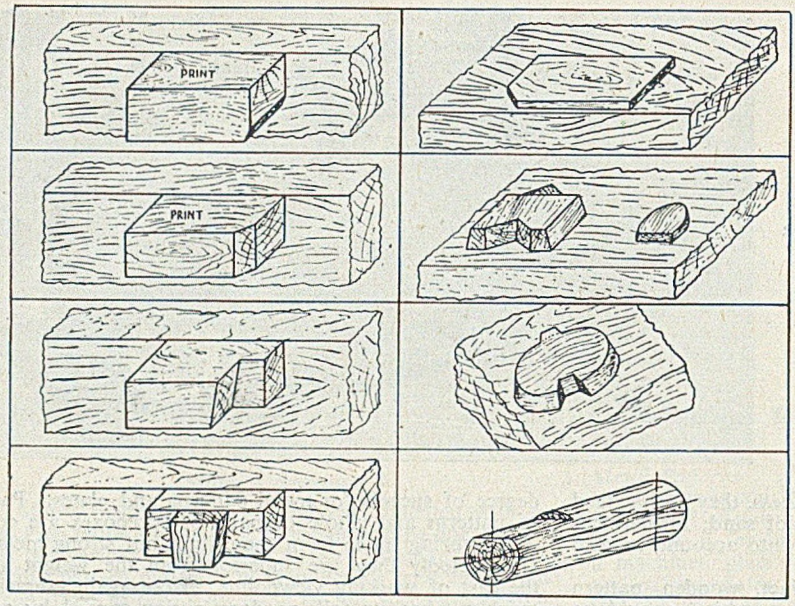


FIG. 9.—EXAMPLES OF "FOOL-PROOFS" USED TO ENSURE CORRECTNESS IN THE PLACING OF CORES.

material being used in this country, but in America it is finding favour for loose patterns, as well as pattern plates. He has, however, a pamphlet from the Plastics Corporation, of Chicago, showing various types of applications. It contains the following claims:—

(1) Good drawing qualities due to a glass-like face.
(2) Thermal action from hot sand is non-existant.
(3) Plastic is a non-conductor of heat, hence there is no condensation on the plate.
(4) Less vibration is required to withdraw the pattern.
(5) Specific gravity is 1.7 ($\frac{1}{4}$ of an ounce per cub. in.).
(6) Will withstand heat up to 340 deg. F. (160 deg. C.).
(7) As with stone compounds, plastic can be drilled, tapped, sanded, milled, etc.
(8) Low shrinkage—given as 0.0025 in. per in.

Other claims are made, but due to the special technique in manufacture, only specialist firms can make these patterns. The materials used are liquid phenolformaldehyde thermo-setting resin, a catalyst to stimulate the exothermic heat reaction, and a filler to add strength.

Composite Patterns for Ingot Moulds

For various reasons it is not always possible to construct a pattern from either all wood or all metal, yet by a combination of metal and wood a satisfactory pattern can be constructed. The Author prefers to call these composite patterns. Figs. 6 and 7 illus-

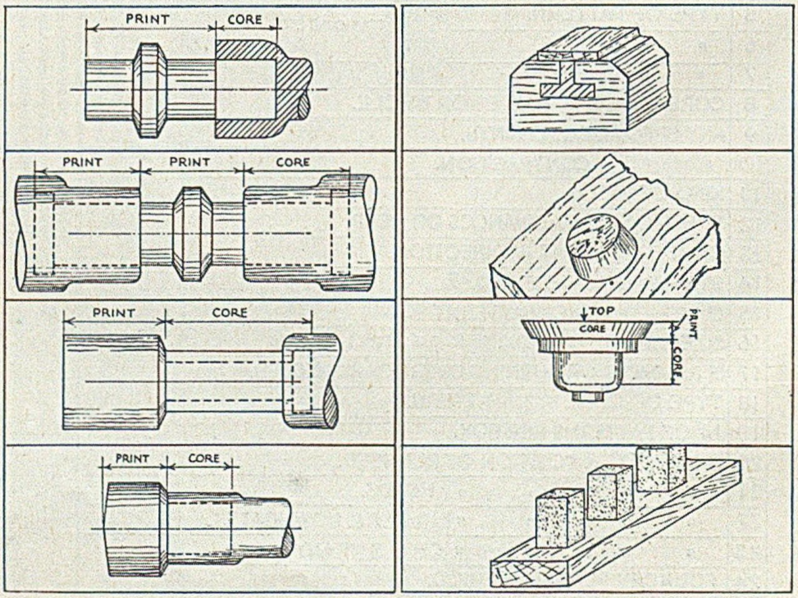


FIG. 10.—BALANCED CORES.

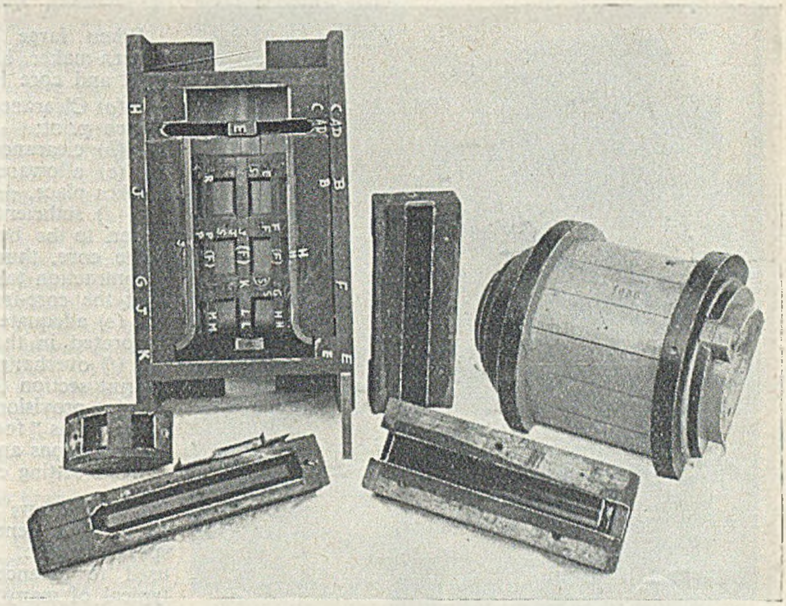


FIG. 11.—PATTERN EQUIPMENT FOR A ROLLING MILL, BOTTOM CHOCK.

trate how a combination of cast iron and mahogany can be made into a pattern of an ingot moulds.

Throughout the years, various methods have been used in the manufacture of these moulds and to-day mechanised methods are being developed. All-wooden patterns have been used, but after a time they become damaged and distorted. Up to a certain weight, all-metal patterns are used, which may be lightened out by internal coring. Gradually, experience has shown that the weight would have to be reduced even more and the outcome was the composite pattern as illustrated. The body portion is made from mahogany, the ends being iron castings protecting the timber and providing rigidity for the whole pattern.

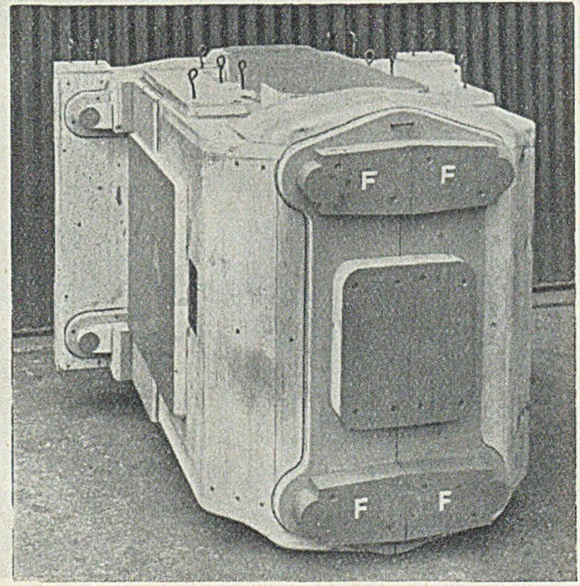


FIG. 13.—ROLL-HOUSING PATTERN.

Construction

Two master patterns are made of the ends; these are of three-sided-box sections, so that the wooden ends are encased in metal for a matter of 3 in. down the body. The end castings are machined on the outer face and on the inside so as to ensure a perfect touch between wood and metal; counterbored holes are provided to receive the bolts and nuts. The wooden portion is so constructed to permit cavities from end to end and side to side to allow for the passage of bolts to tie the whole structure. This wooden section is assembled temporarily for marking out. It is then dismantled and the internal flutes are worked to shape by hand. The ends of this portion are cut to fit the cast-iron ends. The whole of the wooden section is then assembled, glued and screwed together. The outside shape is planed to size, the cast-iron ends are fitted, and the tapered-end portion is fitted and worked to size. Bolts are passed from end to end and finally tightened with box spanners. The side bolts are also fitted and tightened. Dovetails are fitted into the dovetail slots; there are to carry the trunnion core blocks. The side projections on two sides of the metal base are filled with wood; over this and screwed to it is the portion forming the plinth. The cast-iron ends are finally ground to the outside and inside shape of the wooden portion. This pattern is used for machine moulding, a stripping plate being used in stripping the mould.

Patternshop Information

Although it would take a considerable space to discuss every detail connected with the production of patterns, patternmakers can be reminded that before embarking upon the production of any pattern, consideration has to be given to a number of vital points. These can be most easily compressed by reference to the chart shown in Fig. 8.

It is not suggested that every point noted is involved in all pattern layouts, but at some time or other these questions arise either singly or collectively. Their importance is obvious, as most will agree; nevertheless, one meets with patterns which have not been given the

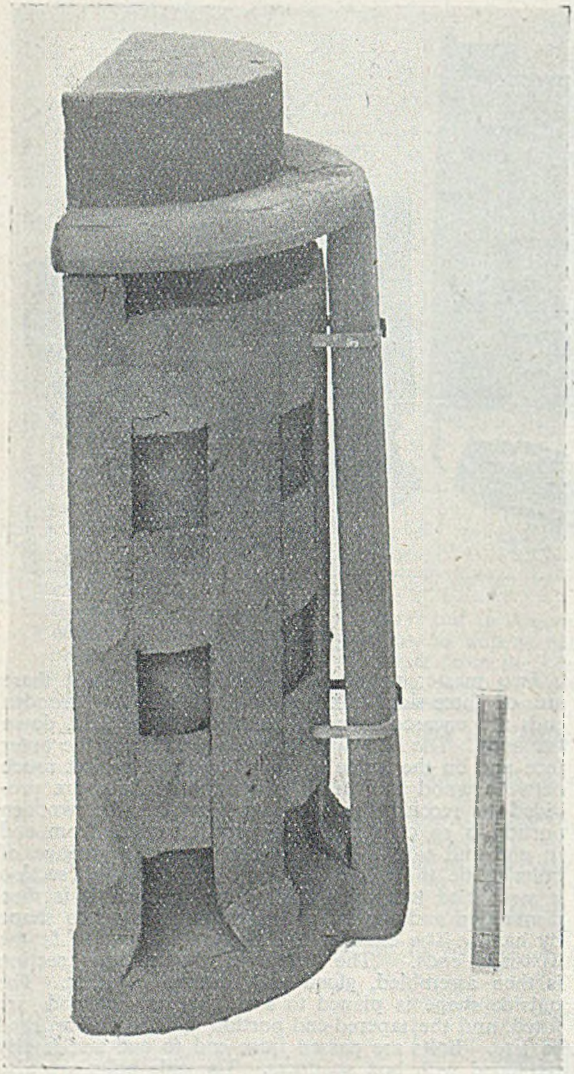


FIG. 12.—ROLLING MILL, CORE FOR THE BOTTOM CHOCK.

Patterns from other Sources

necessary consideration, thus very often causing drastic and expensive modifications at a later stage.

When a foundry makes castings from patterns supplied by its own pattern shop, the information required can be obtained and applied. Despite the advantages of having patterns made in the pattern shop attached to the manufacturing foundry, many concerns requiring castings send along their own patterns either previously used or new. This procedure often entails expensive moulding methods or costly pattern modifications. Occasionally, this remark does not apply, but, in general, founding technique varies so much it is seldom that "outside" patterns conform to requirements. As a personal statement it might be said that patterns generally come in for a considerable amount of unfavourabe comment from foundrymen, despite gigantic efforts on the part of patternmakers to give the best they can under difficult conditions. Generally it is the core boxes which cause most trouble, the reasons being legion.

Cores

When large cores are needed in a mould, the pattern-maker has to make some allowance on the print and core box. These are enumerated as:—

(*a*) Clearance on print ends, as much as $\frac{1}{8}$ in. on each print;

(*b*) clearance allowance on print sides;

(*c*) allowance for core expansion when drying takes place, $\frac{1}{16}$ in. per foot being a usual allowance;

(*d*) sufficient depth of print to allow the core-iron to be bedded largely in the print portion of the core, thus often preventing cracking caused by contraction taking place directly on the main frame of the core-iron;

(*e*) adequate lead or taper on prints, incorporated in the core if possible;

(*f*) overhanging cores to have more weight in the print section than the overhanging portion; and

(*g*) provision of core sets, more commonly known as "foolproofs." These need to be of ample proportions and in a position that is easy to observe when setting cores.

Fig. 9 shows examples of various types of "foolproofs" in general use. There may be others of a special nature. Fig. 10 shows a series of methods used to balance cores; here again these are only typical of many that come into use.

Method of Moulding

The design of some castings is such that the method of moulding is governed by the necessity for cores and the disposition of their prints. In other cases, the method is governed by the need to have the outside portion of the casting without blemish caused either by casting or fettling.

Fig. 11, which shows a rolling-mill housing (bottom chock), was moulded with the flat face uppermost, and extra machining allowance was made to take care of any dirt that might settle in the top edges. The main core carries a series of "V" grooves to key the

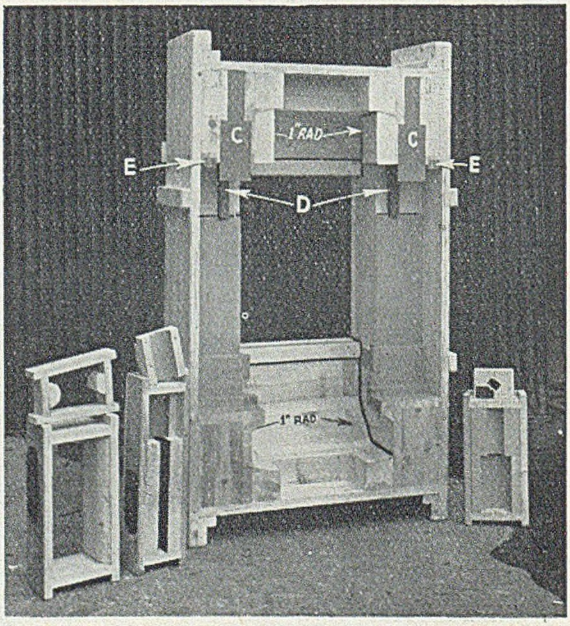


FIG. 14.—ROLL-HOUSING CORE-BOXES.

"Babbit" metal. The whole core-box assembly is arranged to be movable from the outer framework, thus avoiding undue damage when extracting the core from the box. At each end of the main core box is a core print marked "E," this is to receive the ends of an oval core which passes down the back of the main core but is only attached by the two print sections. Fig. 12 shows the bottom chock core. Here the complete assembly is made as one unit, ready for insertion into the mould. The total number of cores in one assembly is 24.

The roll housing, shown in Fig. 13, is of a design which lends itself to moulding in a two-part moulding box; from the moulding joint, it is symmetrical on each half. Where the necessary boxes are available and a Sandslinger exists, the design is ideal. There are core openings on all six sides; because of this, it was decided to make the main body-core in halves (core "A"). A small point to notice on the pattern is the method of attaching the loose pieces by means of the hooked metal skewers. The core marked "F" is a filling-in core and provides a print for another round core inserted in "A."

Fig. 14 shows the core boxes for this housing. The two small coreprints, marked "D" in the main core, carry the core shaped from "D" to circular. This core has to be attached to the large core before insertion into the mould. These two projecting cores eventually seat into the half-round core prints under core "F" on pattern. The purpose of core "C" is obvious; the oblong core on extreme left is used to core-out the base. It will be noted that considerable taper is allowed on print "A" to act as a leading print, because it is closed "blind." A clearance of $\frac{1}{4}$ in. is allowed on the end of the side prints to avoid crushing or rubbing.

Fig. 15 shows the fret-cutting machine base. Fragile patterns such as this, which have to withstand quantity-production conditions, need to be carefully constructed to outlast handling in the foundry, and to leave a mould which requires the minimum of finishing. The pattern conforms exactly to the shape of the required casting, and no cores are used, except for casting on a name. Mahogany was used throughout in the construction. The bottom frame was made thick enough to allow a large radius being worked out of the solid. Every corner fillet was built in and cut from solid timber; wherever a joint was made, special precautions were taken to ensure it being tied to its counterpieces. A Wadkin miller was not available, thus every corner had to be worked by hand tools. Finally the pattern was finished with two coats of pattern enamel.

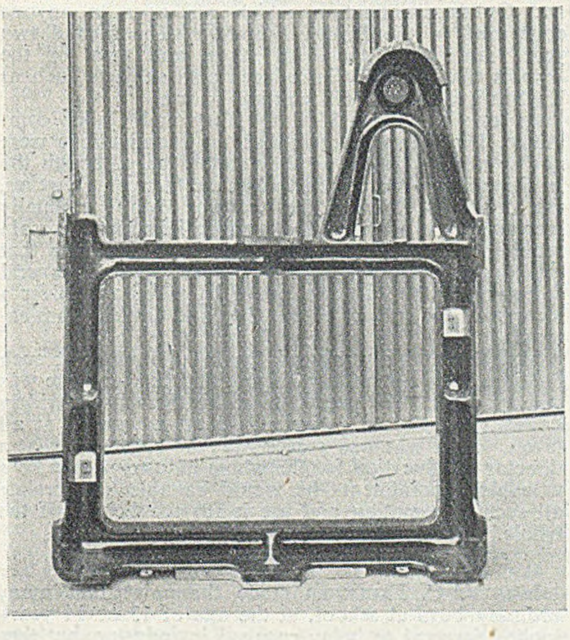


FIG. 15.—FRET-CUTTING MACHINE BASE PATTERN.

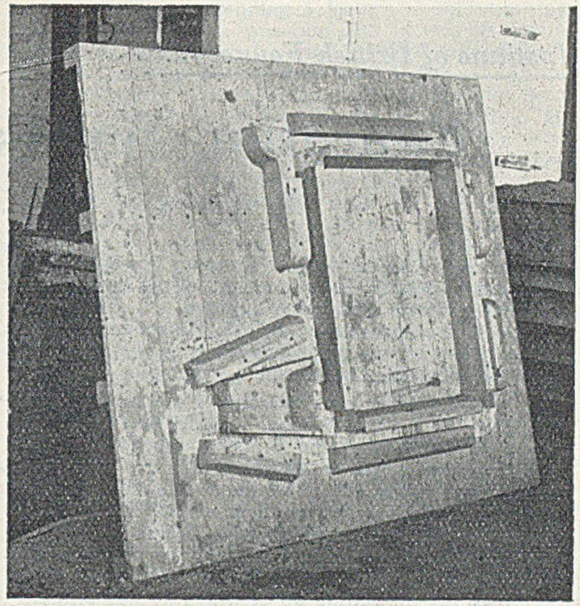


FIG. 16.—RAMMING BOARD FOR THE FRET-CUTTING MACHINE BASE PATTERN.

A ramming board is shown in Fig. 16. In an endeavour to give rigidity to the pattern, and to form the various mould joints, this strong ramming and joint board was constructed. The castings have been made by both green-sand and dry-sand moulding methods. Incidentally, some foundry opinions accept the ramming board as a mixed blessing, bedding-in being preferred.

(To be concluded)

The Works Lorry

Mr. A. H. Wild, a well-known solicitor, speaking at a recent meeting at Cambridge, organised by the Eastern sub-area of the Traders' Road Transport Association, the national organisation for "C" licence operators said that it had been calculated that there were some 2,000 potential offences every time a van or lorry was taken on the road. The point was, how could a trader find out what did affect him? He could, of course, purchase a set of regulations dealing with the subject—that cost about £65. He could consult a solicitor, and unless the point raised was one of every-day occurrence, it was possible that he would not have the answer at hand. The third possible action he could take was to join an association such as the Traders' Road Transport Association, where the officials were dealing all the time with problems affecting traders and were abreast topically with the various complex legal requirements.

Institute of British Foundrymen *London Branch*

Education for Foundry Personnel

Discussion of Mr. W. F. Seivewright's Paper

A Paper on "Education for Foundry Personnel" was presented by Mr. W. F. Seivewright, of the International Meehanite Metal Company, Limited, to the London Branch of the Institute of British Foundrymen, in the course of which he made reference to the Meehanite apprenticeship training scheme.

Before the Paper was presented, the branch president, Mr. F. Arnold Wilson, introduced the Author, who is a member of the branch council. He was trained originally as a mining engineer, and subsequently had begun his career in the foundry industry with Cameron & Robertson, Limited, of Kirkintilloch. He had served the International Meehanite Metal Company, Limited, as sales and commercial manager, and had taken very great interest in the foundry school of the group, for the setting up of which he was primarily responsible. He was also a schools governor for the London County Council.

Following the reading of the Paper (printed in our last week's issue), Mr. Seivewright presented a cinematograph film in colour to illustrate a valuable method of presenting a highly-complicated and technical subject for educational purposes. It told in a simple manner the story of the fundamental atomic structure of plastics, which have combinations of properties not possessed by any other materials.

DISCUSSION

MR. J. F. KAYSER (past branch president), who said he had been most impressed by the Paper, first expressed his full agreement with the Author concerning the value of instructors in industry; indeed, he could not imagine that there were any people in industry who were more useful and important than instructors, and he added that he hoped they were paid accordingly.

Commenting on the references in the Paper to interest in one's work, prestige and income, he said he was fortunate in that he was extremely interested in his work, though admittedly he was even more interested in the income it produced. Unfortunately, however, the majority of workers were not interested in their work, but they were interested in their incomes. He asked if it would be agreed that, if a man made the effort to educate himself, thereby becoming more useful to industry and to the community at large, he should gain a larger reward by way of income than was received by others who had not made that effort.

(This aspect of the matter was not discussed at length, it being felt that it was not within the ambit of the Institute.)

MR. V. C. FAULKNER (past president of the Institute and of the branch) drew attention to the reference in the Paper to the raising of the school-leaving age from 14 to 16 years, in an endeavour to give better teaching to a wider selection of the population, and asked for the Author's further comments.

MR. SEIVEWRIGHT said the education of young people up to the age of 14 years was elementary education; beyond that age, in quite a number of cases, development began. The moment one began to educate young people, in the scholastic sense, beyond the age of 14 years there was a definite widening of the basis of their education. The point he had tried to emphasise was that, up to the age of 14 years, education was purely preparatory; after that came real education, and in the great majority of cases the young people could then definitely begin to learn. Therefore, by raising the school-leaving age we were in the educative sense very definitely reaching a far wider section of the population than formerly.

Influence of School-leaving Age

MR. G. D. LAWRENCE said that at the moment the statutory school-leaving age was 15 years in respect of primary schools, and secondary education went on after that. The Institute, he continued, had quite a big interest in the courses for pattern makers and foundry workers throughout the country, and in the examinations of the City and Guilds of London Institute. Quite a large number of apprentices nowadays were attending part-time day classes, attending for one full day or two half days per week, often attending, also, a class in the evening. His impression was that those students had a full day's instruction each week on practical foundry subjects, including mathematics, and so on—mainly calculations, following on the instruction given in the primary schools—technical drawing, and science as applied in the industry. The training covered a period of four years. During the first two they took the intermediate course for the City and Guilds examination, which was open to anyone concerned in the British Empire. The second two years represented the final stage, and most of the schools that he knew introduced also subjects such as English and others of a cultural nature.

As one who served on the City and Guilds committee, Mr. Lawrence felt that the examinations were not so widely known as they should be, although the Institute had done a lot to advertise them. However, the numbers taking the courses were gradually increasing. In his view the examinations met the main requirements of the trade in general. He suggested that much good might follow if Mr. Makemson, the general secretary of the Institute, could be asked to deliver a lecture on the subject of the City and Guilds examination.

MR. SEIVEWRIGHT agreed that at the moment such facilities were not widely known, and the response was still sporadic. We needed to make them more widely known, in order to derive maximum advantage at all levels. That was one reason why he suggested that a director of education for the whole industry would be a valuable appointment—he would be able to correlate all such information and use it for the benefit of the whole.

Vocational Suitability Tests

MR. V. C. FAULKNER made the point that many ordinary boys at school, at the age of 13 or 14 years, looked forward to being engaged in industry, but they were kept at school for another two years and they were bored. He asked if Mr. Seivewright considered it right to keep that type of boy at school. He also asked for comments with regard to the estimation of vocational suitability in schools, for it seemed to be entering more and more into the new educational system. Many parents were incensed about it, and he had received many complaints from parents about the nonsense that was talked in that connection.

Incidentally, he related a story concerning a large international organisation some of whose plants were doing badly, and who had asked their star manager to go to one of their factories. There he had found himself interviewed by a vocational suitability expert, who put before him some crossword puzzles, coloured balls, and so on. The manager had at once decided that, if he were to become general manager of that factory, out must go the expert.

MR. SEIVEWRIGHT pointed out, in order to avoid misunderstanding, that he had used the term "vocational" entirely in relation to instructors; the sense of vocation applied to a very limited number of people. He did not know the views of the educationalists with regard to it, but he was very much against the application of so-called vocational guidance to very young people, for in the majority of cases they were not sufficiently developed to enable a fair estimate to be made. At a later stage guidance might assist in making a choice in the right direction.

There was a type of man who "possessed a pair of hands," and a type who had brains but no talent in his hands. The same education was obviously not suitable for both types. Talent in a man's hands showed up at an early stage, and if a boy so equipped were kept at school until he was 15 years old, and ultimately until he was 16 years old, he would be wasting his time during those two years; until he could start to use his hands he could not develop very far mentally. One of many criticisms was that it had a narrowing effect upon him, and such a boy should be released from school at an earlier stage so that his other talents could be developed along with those of his hands.

Education and Recruitment

MR. A. R. WIZARD, after complimenting the Author on the wide range of educational problems covered in the Paper, said one realised that boys of ages ranging from 14 to 18 years were a very peculiar group of people. However much was talked about vocational training, and so on, the main difficulty of the industry was to get youths into the foundries. From the statistics given in the Paper concerning the Meehanite apprenticeship training scheme, it was amazing to find that, since its commencement in 1945, only 100 boys had pased through to date, of which only 5 had received Diplomas. If in a large organisation such as the Meehanite group, with its vast resources, only 100 boys attended a specific training centre in the course of 4 years—an average of 25 per year—the solution of the problem seemed to involve grave difficulty, and he shuddered to think of the difficulties involved in trying to solve the problem in the foundry industry generally.

With regard to instructors, he said that for some considerable time the Borough Polytechnic in London had been advertising for a foundry trade instructor to take classes; he did not know whether or not they had yet found the right man. But he would like to know what was the difficulty, whether the right man was not available or whether it was a question of money. Thirdly, discussing the psychological aspect of training, he recalled that among the photographs shown by the Author to demonstrate the operation of the Meehanite school there was one showing the boys attending a lecture at mid-morning, and he believed there was one also in mid-afternoon. He did not know what period of time was devoted to each lecture, but he had noted that the boys, sitting comfortably in a room with the lecturer, were wearing overalls, which presumably were dirty. He contended that the boys should have had their overalls off, so that they would be still more comfortable and could make notes more conveniently.

MR. SEIVEWRIGHT, replying, said that 106 boys had attended the Meehanite school to date, 25 of them had completed the whole of their training, and five of them had earned the Diploma. He agreed that the number would seem to be small; but the scheme was run by only 12 firms in the group, and not by the Meehanite group as a whole. Of those 12 firms, one was so small that its intake of apprentices was only two per annum, and the largest of the 12 firms had an intake of 12 apprentices per annum. Not all the boys had been through the school yet, and it was still in some degree experimental. Those who were responsible were not by any means sure that they had yet obtained all the right answers to the problems involved, but they had some of those answers and he believed they were on the right road. There was one instructor, and eight boys attended for a month at a time; as mentioned in the Paper this was deliberate policy to ensure the maximum individual instruction. For two months of the year the instructor was not teaching at the school, but visited the various foundries from which the boys came, amplifying their training in collaboration with the local instructors, and finding out how the boys were getting on before returning to school.

Once the organisers of the scheme were sure that they had found all the answers to their problems, they would develop it on a larger scale and would have more boys going through. He knew of two attempts to put in similar schemes, but those schemes were not yet established. That suggested that the caution exercised in developing the Meehanite scheme was wise.

With regard to the criticism that the boys were wearing overalls whilst attending a lecture, he said there were two views on the matter. One was to allow them to change before going into the lecture room, taking half an hour or so to do it; the other was to treat them in the same way as when attending practical classes towards the end of their school careers, when overalls were worn on the occasion of visits to particular types of shops, the boys then going on to classes whilst still wearing overalls. Either system could be adopted; but he thanked Mr. Wizard for having raised the matter and said it would be considered again.

Craftsmen Wanted

MR. G. C. PIERCE (past branch president) said he had thoroughly enjoyed the lecture, as, indeed, he always enjoyed lectures on education as applied to the foundry industry. But one basic consideration which was always in his mind was how far such educational schemes served to bring more craftsmen into the industry, men who would be prepared to work with their tools. In his opinion, the scheme which the Author had outlined would appear, as did many others, to be training young people for the technical or the higher administrative jobs in the industry. Perhaps other people would not think so, but when lads were asked what was their object in undertaking their studies it became quite obvious that they wanted to be something better than journeymen moulders. That was a matter about which he was very much concerned, in the interests of the industry, and he had yet to find the answer. He believed he could point to one important feature, but

Education for Foundry Personnel

that was taboo; perhaps on some future occasion he would be permitted to talk "off the record."

MR. SEIVEWRIGHT replied that the organisers of the training scheme had set out to produce craftsmen. Of the five boys who had obtained the Diploma—which was awarded to the outstanding boys—two were working on the floor and showed every sign of remaining there; the other three were showing signs of moving away. The other boys who had completed their training were quite happy about working on the floor. He offered to Mr. Pierce the facility to visit the organisation, with freedom to talk to any of the boys in order to learn their views.

MR. PIERCE said he would very much like to take advantage of that opportunity.

Vote of Thanks

MR. L. G. BERESFORD (vice-president of the branch), proposing the thanks of the meeting to Mr. Seivewright for his Paper, said he had been very interested in it, for he had spent many years in the educational service. He always felt that most people made the great mistake of thinking that boys, and particularly the younger boys, wanted to learn. In his experience, only a very small minority wanted to learn, and the remainder had to be forced to learn.

Admittedly, the Meehanite scheme as outlined in the Paper was a very good one and had very great possibilities; but the Author had not said whether or not it served to attract boys to the foundry, whether it rendered any easier of solution the problem of getting foundry apprentices. That should be the first aim of any foundry training scheme.

MR. MORT, who seconded, thanked the Author for his account of the results of a very keen investigation of a difficult problem. He had emphasised education on the one hand and training on the other, and had made it quite clear how complementary the two were.

The vote of thanks was warmly accorded.

MR. SEIVEWRIGHT, in a brief response, said his organisation was getting the apprentices, but his Paper was concerned only with education—recruitment needed a special study—and he hoped his Paper had stimulated constructive thought.

Engineering Industry's Exports

Over the past six months there has been a considerable improvement in the ability of European countries to export engineering products. According to a United Nations Economic Commission for Europe preliminary report, new orders can either be filled from current production or within maximum periods up to six months. Much longer delivery delays were reported last year. This new post-war situation applies to such products as road-transport and small electric equipment, to timber and roadworking equipment, tractors and farm machinery, machine tools, and metal-forming machinery.

There are a few exceptions peculiar to some countries, heavy machinery and equipment with specifications to order, such as rail-transport equipment, normally taking longer to manufacture, having longer delivery dates. A few items such as boilers and turbines remain in short supply in Europe, according to the E.C.E. analysis.

Board Changes

REVO ELECTRIC COMPANY, LIMITED, Tipton (Staffs)—Mr. P. Tonks and Mr. F. W. Norris have been appointed additional directors.

VENT-AXIA, LIMITED, ventilation specialists, of Putney, London, S.W.15—Mr. J. R. Andrew has been appointed to the board.

BRITISH FURNACES, LIMITED, Chesterfield—Mr. G. Clark, who has been managing director of the company since its formation in 1921 and chairman since 1938, has resigned from both these offices, but he is retaining his seat on the board and will act in a consultative capacity. He is succeeded as chairman by Mr. D. M. Henshaw, who is chairman of B.H.D. Engineers, Limited, a holding company, who thus becomes chairman of all the companies within the group. Mr. P. Hopkinson, who has been manager of British Furnaces since 1922 and a director since 1941, has been appointed managing director. Mr. Hopkinson sailed for the United States last week-end to visit the Surface Combustion Corporation, of Toledo, Ohio, which is an associated company of British Furnaces. He also intends to visit other works in the U.S.A.

HENRY MEADOWS, LIMITED, manufacturers of petrol and Diesel engines, etc., of Wolverhampton—Major-Gen. W. S. Tope, who has been appointed to the board as chairman, has recently retired as chief of R.E.M.E. During the last war he saw active service in the Middle East as Deputy Director of Supplies and Transport, and on the formation of R.E.M.E. in 1942, he became D.D.M.E. and then Director of Mechanical Engineering. He was transferred to General Eisenhower's staff in Algiers and Italy. When the war ended he returned to the Middle East as Director of Mechanical Engineers. Since January, 1947, he has been at the War Office as head of R.E.M.E. Gen. Tope is a Council member of the Institution of Mechanical Engineers and a member of the Institution of Electrical Engineers.

Pilferage of Goods in Transit

As part of a campaign by British Railways and trading associations to reduce the pilferage of goods in transit, the Railway Executive has decided, in order to expedite investigations, to revert to the statutory time limits for lodging complaints and claims in respect of partial loss, damage, deviation, misdelivery, delay or detention of traffic consigned on or after June 1 next. Complaints should be advised in writing to British Railways within three days of termination of transit, and a written submission of claim must be made within seven days after termination of transit.

During the war, to meet postal and staff difficulties, these statutory periods were extended to seven days and 28 days respectively. For the present, no change is being made in the extended periods applicable to non-delivery of the whole of the consignment or of a separate package forming part of the consignment.

Royal Institute of Technology Proposed

The establishment of a Royal Institute of Technology, authorised to award qualifications in technology equivalent to degrees, is urged by the Yorkshire Council for Further Education, which is to recommend the National Advisory Council on Education for Industry and Commerce to press the proposal. It is suggested that colleges running approved courses should receive financial aid on the same scale as universities, from a body standing in the same relationship to the Treasury as the University Grants Committee.

Production Casting of 30-ton Engine Bases*

By C. W. Gilchrist

The breaking down of moulding operations for a large casting reduced the total time of two weeks for a sample casting to two days for the same casting made on a production basis. The crane-lifting capacity required was also a factor which influenced the choice of method. Procedures for making both sample and production casting are fully described.

One of the largest production castings jobs ever undertaken by the Cooper-Bessemer Corporation is the 30-ton engine-block casting. This block is for a large gas Diesel engine developed by Cooper-Bessemer for pumping natural gas through the large pipelines connecting the natural gas fields of the south-west of the United States to the heavy industries of the middle west and east. The engine was designed when the company anticipated a need for a very large engine with greater horsepower per sq. ft. of floor space, making for economy of installation and building space. The only limiting factor was facilities for shipping, so engineers at Cooper-Bessemer designed an engine for the maximum capacity of the largest railway flatcar available.

The foundry was faced with the problem of casting the engine base and frame. Casting in a pit would require a great amount of labour for digging out, as the completed casting would be too heavy to pull loose with overhead cranes. Calculation of the mould and pattern weight at first gave the foundry organisation the impression that box moulding was an impossibility. It was clear that production demands for this casting would also require developments of mould drying and handling methods that were both foolproof and efficient.

It was decided to make a semi-production pattern, even though the first casting was to be for an experimental engine only. Experience had shown that a pattern should never be made for running less than 50 pieces, since the difference in cost between a single-casting pattern and a "50-casting" pattern was not high enough to effect any great saving. Also, it appeared that the engine would ultimately be built on a production basis.

* An abridged version of an article printed in the *Iron Age*. The Author is foundry superintendent of the Cooper-Bessemer Corporation.

Moulding Method for the Prototype

The cost of box parts was prohibitive unless the engine actually sold in quantity, so pit moulding was the method selected for the experimental model. Two 17-in. I-beams were fabricated into lifting beams and set into the bottom of the 10 by 12 by 28 ft. pit, as shown in Fig. 1. After ramming and levelling, steel rails were set on the lifting beams and again air-rammed and levelled. Ram-up cores and the patterns were then set. The pit was rammed by use of an overhead crane, grab bucket and air rammer. This was a time-consuming operation requiring much skill and care by the moulder. After about six days, it was possible to make a parting at the top of the pit and set the cope. Another day was required to ram the cope and finish the mould.

The mould was dried for five days, using an improvised burner made by sawing slots in a pair of 2-in. pipes and hanging them close to the bottom of the mould, covering the mould with corrugated sheets. The cope was set on a rack and dried, using another set of burners and pipes made for the purpose. This process took more than two weeks.

Next, the 9-ton body cores that form the bearings, ribs, oil pan and cylinder holding-down bosses were placed. The total weight of cores used in the mould was approximately 100 tons. The variations in wall sections ranged from $\frac{5}{8}$ to $4\frac{1}{2}$ in.

The cope was set in place and the casting was poured. Approximately a ton of iron was flowed off after the mould was full to ensure a solid oil pan, which was cast in the cope. Pouring weight was about 32 tons. The base was poured from Mechanite process iron with an analysis of TC 3.5; Si 2.0; Mn 0.75; P 0.20 and S 0.10 per cent. The shrinkage predicted was $\frac{5}{32}$ in. per ft., which is less than normal for this material. The calculation was made on the basis of

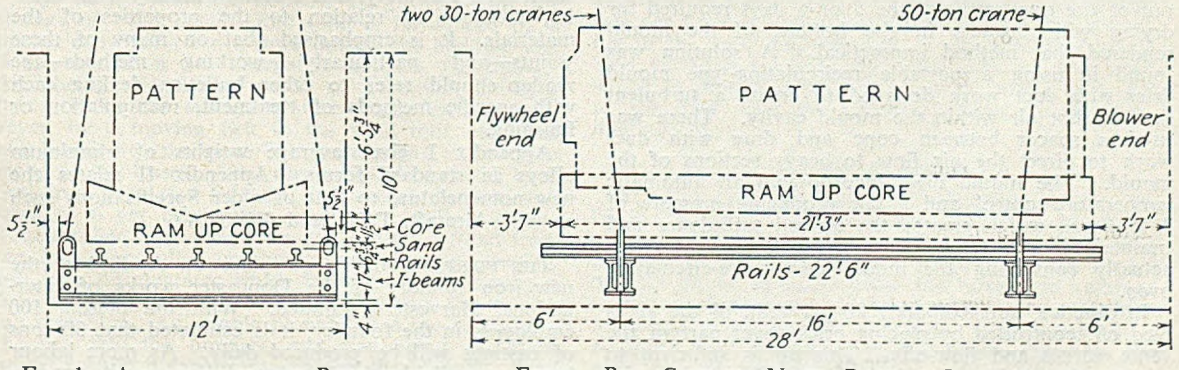


FIG. 1.—ARRANGEMENT FOR PIT-MOULDING THE ENGINE BASE CASTING. NOTE: PAIRS OF I-BEAMS, ASSEMBLED TO FORM LIFTING BEAMS.

Casting of 30-ton Engine Bases

past experience, as large masses of core seem to affect the solid shrinkage of Meehanite in similar designs.

Cooling Temperature Record

Chromel-Alumel thermocouples were placed in silica tubes and put in representative sections such as a 4½-in. bearing section, 4-in. cylinder holding-down boss section, and various thin-walled portions. Thermocouple lead wires were carried out through prints in the cope. Cooling curves were recorded on all these sections, on the basis of which some slight modifications in design were made in areas where stress concentrations were set up, possibly due to differences in cooling rates.

Production Basis

The experimental engine proved successful and it became necessary to go into production on these large castings. If the cycle on a pit was to be 24 to 28 days, production of 6 to 8 bases per month would obviously require converting too much of the foundry floor area into pits, and the engine frames were only a portion of the total production required. The pattern was therefore split in such a way as to allow the boxes to be made in three pieces, consisting of a bottom drag, a cheek and a cope. The cope was matched to fit the same pattern plate as the drag. The cheek was arranged for dowelling to the bottom drag pattern after the drag was rolled over, as the maximum load that could be handled by the foundry's 75-ton crane was calculated to be a 60-in. drag section. The bottom drag was set on the pattern plate and the Sandslinger was used for ramming, thus eliminating 32 hr. of core-making time. This section was slung up, and bottom boards were bolted into position. This half of the drag was picked up, set on a roll-over chain and dumped on a sand pile, and then set into a pit with a levelled bottom; the pattern plate was removed, and the cheek pattern and cheek flask were set in position. The drag was then rammed up to the joint.

The pattern plate thus becomes available for ramming the cope by the middle of the day, so the job that had taken seven or eight days in the pit with air rammers and crane-grab bucket is accomplished in a single day. The Sandslinger makes possible the very small sand wall between the core prints and flask.

Drying

The next problem was that of reducing the 5- to 6-day drying cycle. At this stage, the mould exceeded the crane capacity, so drying in an oven was out of the question, and the 5 or 6 days required for drying with burners in the bottom of the mould rendered that method impractical. A solution was found in using a portable recirculating-type mould drier with duct work designed to create a turbulent flow of hot air within the mould cavity. There was used a spacer between cope and drag with duct work to direct the air flow to heavy sections of the mould. The mould drier incorporated an automatic temperature-control and a fan producing pressure of 3 to 4 oz., which created the desired turbulence and maintained the temperature at 600 deg. F., thus actually converting the mould into a re-circulating oven.

In practice, approximately 20 per cent. of the air is bled off, controlled by placing bricks over part of the vents, sprues and flow-offs. This air is sufficient to remove the moisture, and the re-circulated air maintains the high temperature necessary for drying the pitch compound sand. The drier capacity is one million B.T.U. per hr. It was found that from 24 to 36 hr. are adequate to dry the 80 tons of sand in the mould. Another production mould with over half this volume of sand is dried overnight in the same manner, and has a skin dry of 8 in. minimum depth. Since it takes only two days to core-up, the 8-in. skin dry is entirely satisfactory.

On the production basis, the mould is cored-up and poured in much the same manner as the experimental model. The shake-out procedure is greatly simplified in that the casting does not have to be dug out of a pit. The cope is first removed, then the cheek; this exposes the heavy outer bolt holes in the cope side of the casting. The casting is simply lifted out of the mould at this juncture. The remainder of the flask is raised from the core-up pit and unbolted, and sand is removed with a clam shell bucket. Hard, unburned core prints are removed from the casting with a "core buster" and by washing with a Hydro-Blast.

With the addition of a Sandslinger, the use of flasks in place of pits, and the portable mould drier, the 32-ton casting can, if necessary, be rammed in one day and dried in two nights and a day, thus completing in two days the work that had required two weeks by methods used in casting the experimental model.

Publication Received

The Properties of Aluminium and its Alloys. Published by the Aluminium Development Association, 33, Grosvenor Street, London, W.1, as Bulletin No. 2.

Of course aluminium alloys are well established, but they are still under constant revision and it is this fact which adds so much value to this new 60-page publication. It contains specified compositions and minimum mechanical properties of aluminium and aluminium alloys, together with other data. There has been a very thorough revision of the initial publication (produced by the Wrought Light Alloys Development Association and dealing only with the wrought materials). It now includes most of the new series of British Standard Specifications for aluminium and aluminium alloys in both the cast and the wrought forms. By permission of the B.S.I., quotations from these specifications (BS. 1470-7 and 1490) are made; some of the data are subject to amendment where they are quoted from specifications not yet published.

In addition to the tables of mechanical properties there are notes on characteristics affecting design, a section on durability, and a section dealing with working methods in relation to the properties of the materials. It is emphasised that on many of these points—and particularly working methods—the reader should refer to other bulletins dealing each with specific methods of treatment, manipulation or finishing.

Appendix I gives average weights of aluminium alloys in standard forms. Appendix II relates the new nomenclature to that of older Specifications such as BS. Aircraft, DTD and BS/STA7.

THE FIRST "POUR" took place on April 4 at the new iron foundry of the Doncaster works of International Harvesters, Limited. With the present 100 employees in the foundry, it is estimated that 30 tons of castings will be produced daily. As more labour becomes available, the foundry will increase its production rate.

Cast-iron Components for Gas Cookers

By A. Graham Thomson

GAS STOVES are the principal products of R. & A. Main, Limited, whose Gothic Works at Edmonton, London, is a self-contained factory capable of producing practically all the components required for the manufacture of high-quality enamelled cookers. The factory was erected on the present site in 1899, and for nearly half a century the firm has specialised in the manufacture of gas cookers. During the recent war, commercial production was suspended, however, the works being engaged almost entirely on the manufacture of hand grenades, shells, mine-sinker components and ploughshares. Several bombs fell on the factory during 1940 without any serious interruption to production. In January, 1945, however, extensive damage was caused by a V2 which landed just outside the foundry, blasting off the entire roof and holding up production for about a fortnight. Despite this set-back the company has made considerable progress with its post-war plans, one of the most notable developments being the erection of a large mechanised foundry, which came into production in March, 1947.

The mechanised plant handles most of the quantity production involving long runs, particularly where little coring is required. The production units consist of eight pairs of machines, each pair capable of producing 60 moulds per hour, providing that the operators can keep them working at full capacity. The actual moulding figures are 50 moulds per hour.

The plant was supplied and erected by the Paterson Hughes Engineering Company, Limited, and comprises two completely identical sections laid out in parallel, a gangway of adequate width being available between the two separate pouring tracks. Each section is fed independently from its own sand storage hoppers, so that one section can be completely shut down without loss of production from the other. At present, only one section is in operation, but certain reorganisation work now approaching completion in other departments will shortly enable the second section to resume production. Meanwhile, advantage is being taken of the duplicate sand plant to use each section on alternate weeks, thus facilitating maintenance.

Sand Plant

Two large cylindrical hoppers are provided for the storage of black sand. Red sand is introduced by a bucket conveyor from a store outside the building and is also stored in two alternative hoppers, the change-over being effected by means of a rubber conveyor belt. From the storage hoppers black sand is conveyed by a moving belt to the sand mill, red sand being added to the same belt twice a day in order to make up for losses. Coal dust is supplied to the sand mill in a regulated flow to give a coal dust to sand ratio of 6 per cent. The continuous mill is of the double-roller type with a revolving drum. Sand from the mill is supplied continuously by a short moving belt to a disintegrator which feeds the main conveyor belt supplying the hoppers situated above the moulding machines. Adjustable ploughs feed the sand from the belt into the hoppers, one man being employed on the overhead gangway to control the ploughs. Sand is delivered to the hoppers at the rate of 30 tons an hour in each section.

Moulding Operations

The moulding machines are B.I.C. electric type fitted with down-sand frames and operated by push-button control. Each pair of machines is operated by a four-man team, one machine making the drags while the other is engaged on copes. Sand is obtained from the hopper by pulling a lever located directly above the operator's head. No jolting or hand ramming is done; there is only the flat squeeze, the pattern being pushed through the down-sand frame.

Spillage of sand from the moulding machines is delivered back to the main storage hoppers by a moving belt conveyor passing directly under a grating alongside the machines. The moulding boxes are rolled steel with 1-in. dia. loose pins, oval at one end and round at the other, the drag and cope boxes being identical. Clamping is done by means of hooks.

One of the most interesting features of the plant is the handling of the boxes by a pneumatic hoist, which lifts them from the box-return roller track and drops them on to the machines. On completion of the moulding operations a second pneumatic hoist lifts the half moulds from the machine and lowers them on to a roller conveyor located between each pair of machines, the cope being lowered directly on to the drag by the same hoist. From the roller conveyor, the closed boxes are pushed on to a continuous plate-type mould conveyor capable of delivering 240 moulds per hour to the pouring station, the speed being variable to synchronise with the requirements of a balanced output. Pouring is done from hand ladles by four men continuously casting from a platform on the same level as the plate mould conveyor track. The metal is obtained from two cupolas worked on alternate days, a complete 5-cwt. charge from the cupolas being run into a bogie which travels by an overhead runway to and from the casting platform.

Melting Details

The inside diameter of the cupolas is 27 in. The cupolas are each equipped with six tuyeres, blast being supplied by a Crompton Parkinson fan. They are mechanically charged by a skip hoist that takes alternate loads of coke, limestone, pig iron and scrap and delivers them direct into the cupola. The melting rate per hour is controlled by the furnacemen according to the daily requirements of the moulding teams. This variation tends to upset the coke to iron ratio, which at present is in the vicinity of only 8 to 1, due to the fact that the chargings have to be semi-intermittent.

Knock-out Station

After pouring, the plate mould-conveyor carries the boxes through a cooling tunnel to the knock-out station, where the moulds are ejected on to the knock-out grid by pneumatic rams. The castings are loaded directly on to stillages, while the boxes are returned to the machine operators by a roller conveyor which feeds the whole line of machines. The knock-out is equipped with a heavy vibrator which separates the castings and runners from the sand. The scrap is placed on barrows and returned to the cupolas for remelting. It consists mainly of runners and risers,

Cast-Iron Components for Gas Cookers

etc. Casting scrap is at present averaging about 10 per cent. The knocked-out sand falls on to a moving-belt conveyor which feeds it back into the storage hopper. Before reaching the hopper, it passes under a magnetic belt which picks out any particles of scrap metal and is sifted by a vibratory screen. It is then transported by bucket elevator to a rotary screen.

Particular attention is devoted to sand control. On one section of the main distribution belt feeding the hoppers, continuous supplies of Albond clay and coal-dust are added, giving the bond for a semi-synthetic sand. Red sand is added only to make up losses. While the sand is being discharged from the storage hoppers into the sand mill, it is sprayed with a controlled spray to maintain constantly a moisture content of 5·5 to 6 per cent. The green strength is usually about 12 lb. per sq. in. in compression and permeability about 30. Samples are taken four times a day and tested for permeability, green strength and moisture content, these tests being undertaken in a section divided off from the pattern shop. Analyses of the iron are also taken every day from both the mechanised and floor foundries.

Floor Foundry

The cast-iron components of gas stoves range from cooker fronts to burners, and some of the jobs do not lend themselves readily to mechanical methods of production. A floor foundry has the advantage of flexibility, since jobs can be changed over without delay and either short or long runs can be handled with equal facility. Moreover, castings involving deep lifts or intricate coring, or requiring particular attention at any point, can be better taken care of when entrusted to an individual moulder than to a team in a mechanised foundry. For these reasons, the company find that there are definite advantages in having both a mechanical plant and a floor foundry for production.

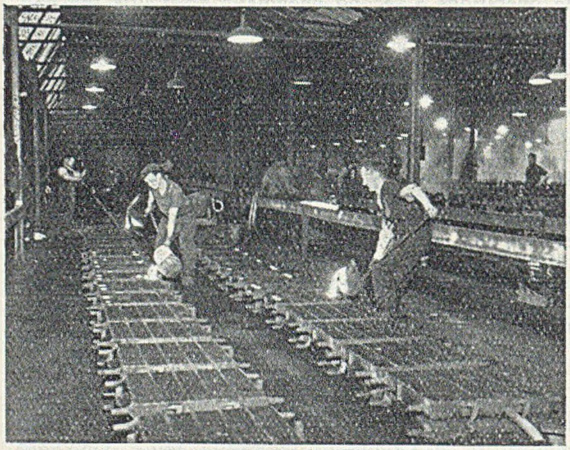


Fig. 1.—View of the Floor Foundry at R. & A. Main, Limited, showing Casting in Progress.

Sixty moulders are employed in the floor foundry. The castings produced range in weight from ½ lb. to 20 lb. Moulding is from pattern plates, but is undertaken on the floor without the assistance of either machines or sand-treatment plant other than a sand mill for facing sand. The boxes vary in size from 24 by 20 in. to 32 by 28 in., with an average depth of 4 in. Moulders average 20 to 30 boxes a day, depending on the size of the box. The boxes have Vee-pins with hook clamping on the sides. The moulder rams up the drag and rolls it over on to a prepared bed on the floor. He then rams up his cope, withdraws his half box from the plate, draws the plate, cores up and closes the mould, leaving the box on the same site for pouring which he does in due course.

Method of Operation

The whole of the foundry floor (Fig. 1) is laid out in double rows and the moulders work in pairs, so that they can help each other with lifts. Each pair of moulders starts at one end of the row and finishes at the other. The advantage of this method is that the moulder has a continuous heap of sand waiting for him as he moves along. Sand is left in the same position and reconditioned on the spot. Two central gangways at right angles to one another enable metal from the cupolas to be delivered in four directions. Each gangway is laid with grooved rails to provide a smooth runways along which 5-cwt. bogies of metal can be transported to the moulders without risk of spilling. Metal is delivered to the end of every row, and each moulder casts his own work by hand ladle. Before clocking out at night, the moulder knocks out the moulds himself, mixes his sand, and stacks the boxes in the same positions that they occupied the night before. The castings are collected in wheeled stillages by separate labour and taken to the dressing shop.

The melting plant for the floor foundry consists of two hand-charged cupolas of 4 ft. 6 in. and 3 ft. 6 in. inside dia., respectively, which are worked on alternate days. One small section of this foundry is devoted to jobbing work, on which six moulders are usually employed. The shop is well lighted by northern-type roof lighting, so that as a rule no artificial illumination is required. Warmth is provided by fan heaters, the heat being supplied by steam coils.

Dressing Shop

Castings from both foundries are conveyed to the dressing shop in stillages drawn either by hand or by Lister trucks. They are rumbled, ground and hand finished in the usual manner and are then sorted into categories, any scrap being removed. The fettling shop is served by an efficient dust-extraction plant.

Core Shop

Six coremakers supply an average of 20,000 cores a week, most of these being cores for cooker burners. This huge output serves both sections of the foundry and is achieved with minimum labour by the effective used of mechanical methods of handling and drying. All cores are made by hand, the sand used being Erith silica sand dried in a gas-fired rotary dryer and mixed in a Fordath rotary mill of 400 lb. capacity. The finished cores are placed in metal shells and transported by pendulum tray conveyors on a monorail to a Bagshawe continuous core stove. The oven operator controls the progress of the conveyors and places the shells in trays, which enter the gas-fired oven in stacks five deep. The oven is fully automatic and is thermostatically controlled to maintain a constant temperature of 250 to 260 deg. C. On completion of the drying cycle of 1 hr. 20 min., the oven is automatically emptied by continuous chain conveyors, the trays being discharged on to a roller conveyor and taken to the core dressers, who remove the cores from the metal drying shells. The shells are then returned to the coremakers, while a gravity roller conveyor carries the trays back to the oven operator. A single operator is able to control both the loading and unloading of the oven.

The finished cores are stacked in racks and are supplied to the moulders at definite times each morning through a window hatch leading into the foundry. The total number of operators in the core ship, including dressing, sand mixing, sand drying and core making, is only twelve. Plans for additional roller conveyors to feed the shells back to the coremakers are now under consideration. This improvement should enable a further increase in output to be effected.

Pattern Shop

In accordance with the progressive policy of the firm, a development department is constantly engaged in investigating new or improved products. This department supplies the pattern shop with drawings for the numerous iron components required. Loose patterns are made and sample castings are submitted. The development department then makes any modifications which are considered necessary and submits finished drawings from which the production patterns are made. These, for both the mechanised and floor foundries, are generally made in cast iron, but, for exceptionally heavy jobs in the floor foundry, aluminium pattern plates are sometimes used. Racks for the storage of pattern plates are provided in a store adjoining the pattern shop. Two pattern moulders are constantly employed in the production of plates for both sections of the foundry.

New Catalogues

Nickel Alloy Spring Materials. A new publication issued by Henry Wiggin & Company, Limited, Wiggin Street, Birmingham, describes in some detail the properties which have led to the wide use of their high-nickel alloys as springs operating under unusual and exacting service conditions. A particularly interesting section indicates the possible applications of the Nimonic series of alloys for springs operating in high temperatures. Other materials covered in this twenty-eight page booklet include Nickel, Monel, K-Monel, Inconel and Ni-Span C.

Polishing Media. Griffin & Tatlock, Limited, of Kemble Street, London, W.C.2, and elsewhere, have just released an interesting four-page pamphlet which fully describes the potentialities of "Microid" polishing aluminas—a range of polishing powders specially prepared for use in the polishing of ferrous and non-ferrous metals for micro-examination. The leaflet is essentially dignified and leaves the reader with the conviction of the reliability of the issuing house and its products.

Safety Boots. From Sound Boots, Limited, of Morley Road, Soundwell, Bristol, we have received a folder which describes and illustrates a range of safety boots. The details of a £50 guarantee scheme are given, and accompanying the folder were details of the first claim—the loss of half a toe instead of half a foot. The construction of the boot has every appearance of giving protection from crushes and with slight modification could be made to give protection from burns.

Time-Temperature Control. A leaflet received from the Wheelco Instruments Company, 847, W. Harrison Street, Chicago, Ill., U.S.A., describes and illustrates an automatic time-temperature programme controller known as the Cronotrol; this instrument is used in the industrial processing of metals, where the particular application requires a predetermined heating and cooling cycle to measure product uniformity and minimise rejects.

Book Reviews

Methods of Increasing Output. (Mimeographed.) By O. W. Roskell. Published by O. W. Roskell & Company (Reports), Limited, 14, Great College Street, London, S.W.1. Price 21s.

In this book, which runs to nearly 100 foolscap-size pages, no aspect of means of increasing production has been omitted. All such matters as noise, lighting and welfare have been included. On the physical side, such as the choice and installation of conveyors, layout, handling plant, and the like, the information given is somewhat scanty. Thus the main value of the book is in the realm of industrial psychology. The reviewer found the earlier part of major interest, such as, for instance, the contribution to the problem of allowing over-generous pathways and space between the various machines. Again, too, the reference to the absence of a finished pile of work through rapid removal by conveyor and its influence on the operative is psychologically interesting. Since the war there has been a plethora of information telling manufacturers and their managers how to run the businesses. There is, or should be, a recognition that labour conditions have changed. Yet the constant reiterations of approaches to these problems makes one wish there was just one good book on the subject and then a prolonged holiday from further discussions. This one at least forms the basis of such a work, and as such can be recommended.

Large-scale Organisation. Edited by G. E. Milward and published for the Institute of Public Administration by MacDonald and Evans, 8, John Street, Bedford Row, London, W.C.1. Price 16s.

If the reader fondly imagines that by reading this book, he will discover some common-to-all basic principles which can be applied, he will be disappointed. It is apparent that Government departments, banks, insurance offices and large-scale industrial concerns such as Lever Brothers have each evolved quite satisfactory yet differing systems. Some allow much individual action to be taken, while others attune everything to the over-riding headquarters' policy in order that no mistakes can occur. An interesting contribution from the foundry angle is an article on the British Iron and Steel Federation by Mr. R. M. Shone, C.B.E. The various articles on the Government departments are really interesting. They show clearly how much that the layman would call extravagant red-tapism is essential in order that no person can involve the department in unpleasant controversial matters. Looked at as a statement of what is done by these large undertakings and not as a text book for learning basic principles, this book has much to commend it.

V. C. F.

Titanium. Report of a Symposium on Titanium, sponsored and published by the Office of Naval Research and sold by the U.S. Government Printing Office, Washington, 25, D.C. Price 25 cents.

This Report includes no fewer than 17 Papers, together with the discussions on each. The initial Paper by Mr. N. E. Promisel states very clearly the potentialities of this metal in many fields. There is no reference to the application of titanic oxide in ceramics, as the field explored was predominantly metallurgical. There is much of interest for both ferrous and non-ferrous metallurgists as there are constant references to both branches of the science. The reviewer esteems this Report so highly that he confidently recommends its purchase by all research organisations.

V. C. F.

Profits Tax Exemption

Relief from liability to profits tax was claimed by representatives of nationalised industries at the last session on March 30 of the Tucker Committee, the committee appointed by the Chancellor of the Exchequer to make a detailed technical investigation of the methods of computing trading profits.

It was emphasised by the various spokesmen that the consumer had to foot the bill for profits tax, which kept prices above the level they otherwise would be, and as the State-managed industries did not set out to make profits in the ordinary commercial and industrial sense, they should not be taxed. Principal complaint was that State monopolies were liable to profits tax, whereas their predecessor companies, except for coal mining, were exempt as statutory undertakings. Large amounts of interest were now paid on the fixed-interest bearing capital, but only a portion was allowed to be deducted when computing profits tax liability.

The Committee, which since its formation on January 16 has heard evidence from leading industrial and trade experts, will now meet in private to reach decisions and prepare its report, which it is hoped will be presented to the Chancellor this year.

German Steel Output

The application of the West German Government for permission to produce more than the 11.1 million metric tons of crude steel a year fixed by the Allies as the maximum has been rejected. This was implied in a letter from the Allied High Commission to the Federal Chancellor, Dr. Adenauer, which reminded him that the Commission's responsibility was based, not only on the Washington Agreement of the Western Powers made in April, 1949, regarding prohibited or restricted German industries, but also on the Occupation Statute made to prevent any Germany industry from developing a war potential. The Federal Chancellor has also been informed that the Allied High Commission is preparing a law to form the general legislative framework for the actions of the Military Security Board and that the Commission has decided to require the licensing of blast furnaces and of equipment for the production of crude steel and for primary processing of special importance.

Dr. Adenauer told a Press conference recently that a higher steel quota would be applied for by his Government only if such a request could be based on better grounds than a temporary surplus demand for steel.

Adjustable Ladle Bogie

The illustration shows a new ladle-carrying bogie which has been designed and placed upon the market by the Railway & General Engineering Company, Limited, of Midland Works, Meadow Lane, Nottingham. The actual ladle shown is one well established in foundries. It has a capacity of 10 to 12 cwts.; is handled by the overhead crane and has been subject to no modifications whatsoever. Thus it can be transported by an ordinary hoist or chain block and lowered straight on to the trunnions of the bogie. The main feature of this bogie is that the trunnions which carry the ladle can be raised or lowered during the pouring operation, thus enabling, with a minimum of effort, the pouring lip of the ladle to be maintained at the desired height from the time teeming begins to the completion of the operation. The contraption obviously gives stability in comparison to overhead suspension, yet it can be easily manœuvred by using the hand wheel as a pushing handle. It has every appearance of being of robust construction, the moving parts are all totally enclosed, whilst the wheels are mounted on roller bearings.

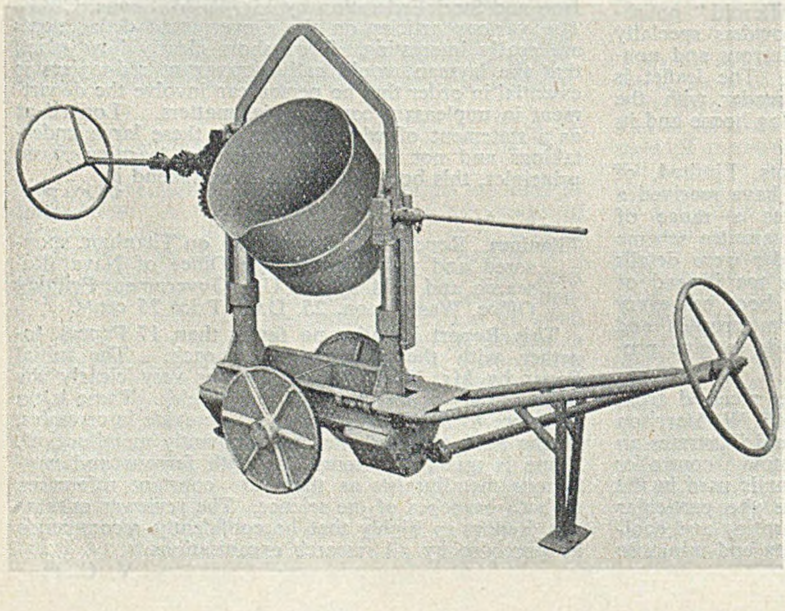


Fig. 1.—" Rocket " Adjustable Ladle - carrying Bogie with a Ladle in Position on the Trunnions. By means of Gears, which are enclosed and thus protected from Metal Splashes, the Ladle can be Raised on the Trunnions through a Distance of 9 in.

Core-box Design in Relation to Venting

By " Chip "

The patternmaker, beside being a skilled worker in wood and metal, has also to possess a fair degree of knowledge of foundry practice to ensure that his pattern equipment will be of service to the foundry. Often, when a new job is being made the patternmaker confers with the foundryman to ensure that his pattern will be as required. Occasionally, however, the patternmaker proceeds on his own initiative and produces equipment that makes it practically impossible to produce good sound castings.

Sometimes, the pattern is such that it can easily be moulded, but, as no provision is made for venting the cores, the equipment has to be modified. Fig. 1(*a*) is an illustration of such a case. The pattern and core boxes for this small winding drum were easily manipulated, but the job could not be cast satisfactorily because of the difficulty of evacuating the gases from the cores. Fig. 1(*b*) shows the cores A and B, both of which were made in one box, and core C which is the centre core. The patternmaker thought that core A would be placed in the mould on moulders' studs, core C in the end-print, and B on top of A, B being kept down by studs. This was satisfactory from an assembly point of view, but no provision was made for removing the gases from cores A and B during casting except, possibly, by transfer to core C—a possibility not realised in practice. Consequently, the core equipment had to be re-made to produce cores as D and E (Fig. 1(*c*), in which the ring-portion made as one piece with the centre core and thus enabled the ring portion to be vented through this portion. This core box was more difficult to use than the earlier equipment, and this was probably the reason why the original had been supplied, the patternmaker being more concerned about the ease in constructing his equipment than the use to which it would ultimately be put.

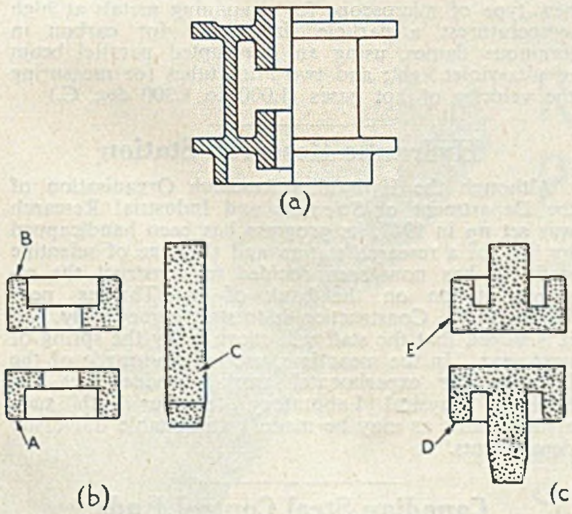


FIG. 1.—CORE EQUIPMENT FOR SMALL WINDING DRUM, SHOWING THE NECESSARY MODIFICATIONS TO OBTAIN SATISFACTORY VENTING.

UNIONMELT AUTOMATIC ARC-WELDING equipment in the United Kingdom will in future be handled by the Quasi-Arc Company, Limited, Bilston (Staffs).

Brazilian Iron Ore

Large Reserves in Various Parts

Brazil's biggest reserves of iron ore are those of Corumbá, in Mato Grosso, according to Dr. Octavio Barbosa, who, in a Paper read before the Brazilian Society for the Progress of Science, and published in the December, 1949, issue of " Mineraçao E Metalurgia," says that these reserves are estimated at 50,000 million tons of proto-itabirite, or banded ironstone, with 45 to 55 per cent. of iron. [Itabirite is an ore composed of alternate layers, ribbons, or plates of hematite and quartz. The original precipitate, non-metamorphic, but merely dried and hardened, is known as proto-itabirite in Brazil.]

The reserves of the Urucum mountain alone are calculated at 3,700 million tons. On the slopes of the mountain other reserves in the order of 100 million tons, with a 60 to 65 per cent. iron content, await exploitation.

The iron mountains of Minas Geraes should yield a minimum of 15,000 million tons of itabirite, with 30 to 60 per cent. iron. In addition, there are 200 million tons of compact hematite, with 65 to 70 per cent. iron, a similar quantity of jacutinga [layers of loose plates of hematite], with 62 to 68 per cent., and tens of millions of tons of canga [a concentration of hydroxides of iron], with 55 to 62 per cent. iron. The principal deposits of compact hematite, suitable for exportation, are those of Casa de Pedra (50 millions), Itabira do Campo (20 millions). Jangada (12 millions), Saraiva (2 millions), Alegria (20 millions), Agua Quente (3 millions), Cauê (40 millions Esmeril and Conceiçao (60 millions).

Promise of Jacutinga

Jacutinga is a raw material of great future promise and will be of importance when the practice of sintering becomes general. This process has been adopted very successfully by the Belgo-Mineira Company at Monlevade.

In Bahia the ironstone deposit of Jequé contains 316,000 tons of ore with over 46 per cent. iron, while the reserves in the municipalities of Santa Sé and Chique-Chique are estimated at 60 million tons of rich itabirite, ranging from 50 to over 60 per cent. A deposit of compact hematite and itabirite was recently discovered in the Amapá Territory, estimated at 14 million tons of ore with 65 to 69 per cent. iron. At Cheval, near Camocim, in the State of Ceara, there is a small reserve of 50,000 tons of hematite with 65 to 68 per cent. iron, and another of itabirite with 30 to 50 per cent.

In San Paulo, where the ores are magnetic, the following deposits occur:—Serrote, 2 million tons with 52 to 64 per cent. iron content; Jacupiranga, small reserve with 52 to 59 per cent.; Ipanema, 300,000 tons with 60 per cent. These ores are highly titaniferous and somewhat phosphorus, requiring special treatment.

The itabirite deposits of the State of Paraná occur in the Pulador mountain, north of Curityba, with reserves of 100,000 tons containing 40 to 50 per cent. iron; Matulao, near San José dos Pinhais, 1½ million tons with 40 to 66 per cent.; and Antonina, where a probable reserve of 500,000 tons occurs, approximately one-half containing 60 per cent. iron, the remainder being poor.

In the State of Santa Catarina itabirite deposits occur near Joinville, the reserves being estimated at approximately 1½ million tons, with 25 to 55 per cent. iron, but the ore can be concentrated to 1 million with 55 per cent.

News in Brief

MR. W. O. GASCOIGNE, 28, Priory Road, Kenilworth (Warwickshire), has been appointed resident engineer in the Midland area for Renfrew Foundries, Limited.

IN FEBRUARY, 1,378,000 workers received wage increases amounting to £178,000 a week, according to statistics published in the "Ministry of Labour Gazette."

A CARDIFF OFFICE of C. A. Parsons & Company, Limited, engineers, of Newcastle-upon-Tyne, has been opened at 3, Royal Chambers, Park Place (telephone: Cardiff 7679).

THE SPANISH NATIONAL RAILWAYS has ordered £2,713,400 worth of 3,600-h.p. electric locomotives from the English Electric Export & Trading Company, Limited.

TOWARDS the end of April a Norwegian Foundry Productivity team is leaving for the United States. The leader is Mr. John Sissener, the well-known Norwegian consulting engineer.

THE TELEPHONE NUMBER for the Babcock & Wilcox, Limited, auxiliary office at Audrey House, Houndsditch, London, E.C.3, has been altered from Avenue 4272 to Avenue 7171.

A PROPELLER weighing 23 tons and with a diameter of 18½ ft., for Cammell, Laird & Company, Limited, Birkenhead, has been completed by Charles W. Taylor & Son, Limited, South Shields.

UNEMPLOYMENT in the Tyneside area is falling very rapidly and the shortage of skilled labour is creating a serious problem, says Mr. H. Hopwood, secretary of the Tyneside Development Board.

THE LONDON OFFICE of William Jessop & Sons, Limited, and J. J. Saville & Company, Limited, the Sheffield steelmakers, has been moved to 44/46, Kingsway, W.C.2 (telephone: Holborn 7145).

A FINE OF £20 was imposed on a Leeds foundry for having dangerous machinery unfenced. The case arose out of an accident to a sand-plant attendant, who had his right arm broken in three places when it was caught in a pulley on a conveyor belt.

THE DIRECTORATE OF SALVAGE AND RECOVERY, created at the beginning of the last war, has been closed. Between November, 1939, and 1950, says the "Board of Trade Journal," figures of salvage recovered through local authorities included 1,942,140 tons of scrap metal.

DURING a film show designed to interest the local youth in foundry practice, Mr. Matthew E. Swain, of Matthew Swain, Limited, of Newton Heath, Manchester, 10, made a presentation to two apprentices who had made the best showing at the terminal examinations.

THE LAUNCHING of the Allied Ironfounders (Ketley) Social and Athletic Club, eight months ago, was described by Mr. A Sykes (a vice-president) as a step of extreme importance toward the success of the firm's business efforts, when he proposed "The Club and its success," at the first annual dinner held recently at Wellington. Mr. T. Offley Lander (president) announced a gift to the club of a shield for inter-works sporting competitions.

THE COUNCIL of the Institute of Welding have awarded the Sir William J. Larke Medal for the best Paper read to the Institute during the year, to Mr. R. G. Braithwaite, M.I.C.E., M.Inst.W. Mr. Braithwaite is welding consultant to Braithwaite & Company (Structural), Limited, and was last year chairman of the Birmingham branch of the Institute of Welding. His Paper deals with the control of distortion in arc welding.

Physical Society's Exhibition

The 1950 Physical Society's exhibition of scientific instruments and apparatus, held in London from March 31 to April 5, was the 34th of the series and the fifth to be held since the war. In planning the exhibition, the organisers endeavoured to achieve a balance between the displays by commercial firms and the research exhibits by Government departments, universities and other research bodies. The exhibition covered a wide range of instrumentation, and, while the main emphasis lay on tools for physical research, much equipment of interest to many and diverse scientific workers was shown. A feature worthy of note was the increasing use of physical methods for the solution of problems previously solved by chemical or other means.

Weighing a Steelmaking Converter

The British Iron and Steel Research Association's exhibits provided an interesting commentary on the physicist's part in the industry's production drive. Several of the items shown were developments of protoypes previously exhibited, now improved or adapted for works use.

Adaptation of a strain-gauge technique for continuously recording weight changes in an operating steelmaking converter was demonstrated in an exhibit on the B.I.S.R.A. stand. To overcome the difficulties of the usual arbitrary methods of measuring refractory wear in converters, the hitherto unexploited idea of weighing a full-scale unit during operation has been developed. The vessel is supported by a load-meter using strain gauges and associated electronic circuits to give a continuous weight record on a chart. Not only does this equipment give information on refractory consumption, it also provides data on metallurgical factors such as blowing loss, turbulence of steel bath, etc., some of which can be correlated with refractory wear.

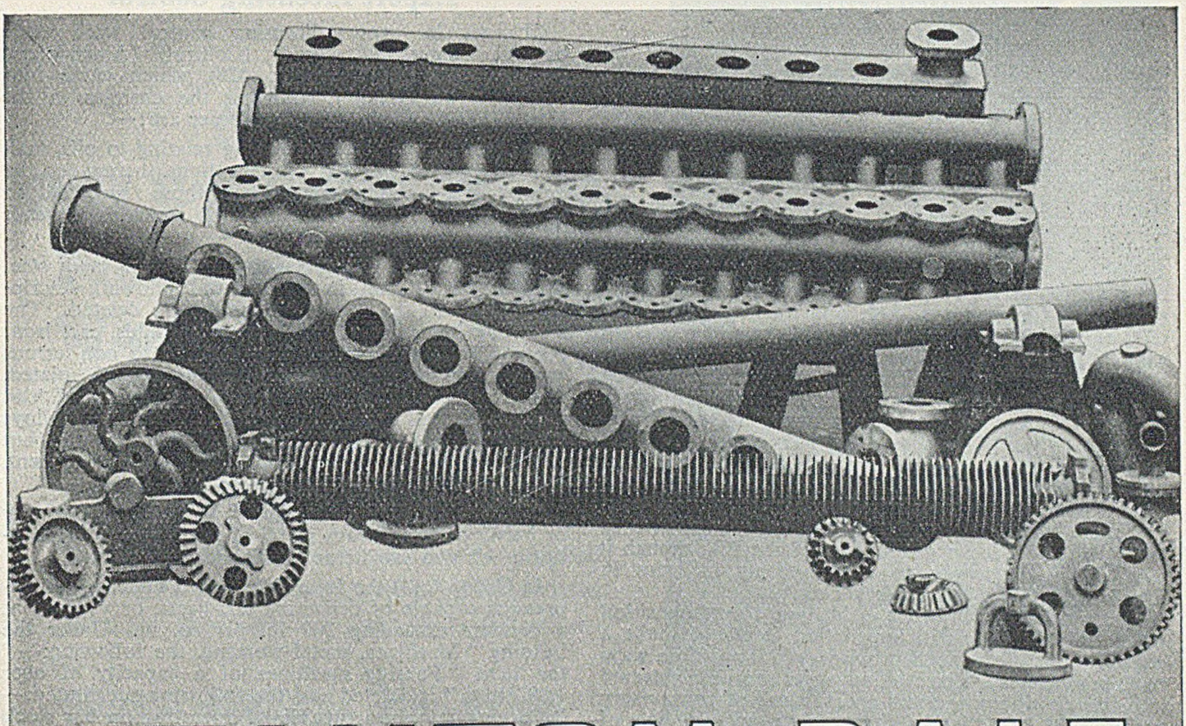
Other instruments shown by B.I.S.R.A. were:—A new type of microscope for examining metals at high temperatures; a particle size meter for carbon in luminous flames, using an interrupted parallel beam of ulta-violet light; and two Pitot tubes for measuring the velocity of hot gases (1,000 to 1,300 deg. C.).

Hydraulic Research Station

Although the Hydraulics Research Organisation of the Department of Scientific and Industrial Research was set up in 1947, its progress has been handicapped by lack of a research station and shortage of scientific staff. It has now been decided to construct the research station on the bank of the Thames near Wallingford. Construction is to start immediately, and it is hoped that the staff will move in by the spring of next year. In the meantime, use is being made of the facilities for experimental work provided by the National Physical Laboratory, together with such arrangements as may be made with suitable university departments.

Canadian Steel Control Ends

Steel control in Canada, which was instituted in 1940, ended on March 31. The control was removed soon after the war ended, but it had to be re-established early in 1946, when world supplies were scarce. The authorities now regard the future prospects of supplies as satisfactory. Permits for the export of some steel products are still required, and if such exports are of strategic importance they can be sent only to specified countries.



Parliamentary

The Distribution of Industry Bill was given an unopposed second reading in the House of Commons on April 4. It empowers the Government to give facilities and financial assistance to firms establishing factories and works in certain areas.

MR. HAROLD WILSON, President of the Board of Trade, who moved the second reading, said that by means of the Bill it was hoped to provide for certain contingencies which were bound to arise in the course of a year or two. A labour force of about 130,000 was employed in various shipyards on the maintenance of the mercantile marine, reconversion of ships used for war purposes, and the replacement of old vessels. Obviously, a considerable part of that work would come to an end. The situation had already arisen in regard to the conversion of troopships. Work had to be provided for miners who had become redundant through the closing of uneconomic pits in Durham and Lanarkshire, and in Wales there was danger of redundancy arising from the reorganisation of the steel and tinplate industries. Individual manufacturers often found that the cost of moving to a development area would be prohibitive, and to provide financial help in those cases was the main purpose of the Bill, though it also contained powers to enable empty factories in development areas to be taken over.

MR. OLIVER LYTTELTON said that the Opposition welcomed the Bill, and hoped that it would make a contribution to a serious problem which would always remain. Wherever possible industries should be steered into the development areas and the use of compulsory powers was undesirable except as a second line of defence. Bringing industries to areas where unemployment existed was comparatively straightforward, but the real difficulties began in areas where there was fairly full employment. Diversification was an object in itself, but in aiming at it we had to be careful industries were not put down in areas where employment was high, thus causing competition between the heavy and light industries for labour.

Dust in Iron Foundries

Replying to MR. M. MACPHERSON, the Minister of Labour said that arrangements for seeking further knowledge as to the various problems connected with dust in iron foundries fell broadly into two groups, namely research in research institutions, especially into such questions as the possibility of using less dangerous materials for various processes, and secondly experimental work in the foundries themselves in trying out methods of suppressing dust and other changes in working methods. Also, the Factory Department had carried out a special inquiry into the incidence of silicosis among various classes of foundry workers, the results of which were about to be published: the Department was making further tests of atmospheres in foundries.

The findings of research so far indicated that certain dusts should be regarded as dangerous to health and that others might be generated in such substantial quantities that they should, so far as possible, be suppressed or removed near the points of origin. Various measures had, in view of this, been taken to reduce dust in foundries, and further experimental work as to improving methods of doing so was being tried in some of the foundries. In the meantime, special attention had been paid to precautions in connection with the process known as blasting, which had recently been made the subject of more stringent regulations. In addition, regulations had recently been proposed to impose restrictions on the use of dangerous parting powders.

Export Licensing Control

Changes in export licensing control were made by the Export of Goods (Control) (Amendment) Order, 1950 (S.I. 1950, No. 426), which came into operation on April 1. Among the changes in the First Schedule of the Principal Order are:—

In Group 3, under the heading relating to oils, fats, and greases, in the list of exceptions thereunder the item "Coal-tar oils, other than those specified in Group 13 (1) of this Schedule" is amended to read: "Coal-tar oils."

In Group 6 (1), the heading "Iron and steel (including alloy steel) in forms of the following descriptions:—" and the items thereunder are deleted. The following items are added:—"Ingot moulds, cast iron; pig-iron." Under the heading relating to non-ferrous metals and alloys (whether or not coated, plated, drilled, or punched) the item "Alloys mainly of lead or tin or of lead and tin" is amended to read:—"Alloys mainly of lead. Alloys mainly of lead and tin, but not including alloys containing less than 10 per cent. by weight of lead."

In Group 6 (3) the heading "Manufactures wholly or partly of non-ferrous metal of the following descriptions:—" and the items thereunder are deleted.

In Group 6 (4) the following item is added:—"Compressors capable of delivering air, gases, or vapours at a pressure exceeding 300 lb. per sq. in. Under the heading "Machines, metal working, the following:—" the item "Forging machines of a capacity of over 1,000 tons" is deleted and the following substituted:—"Forging machines capable of operating on bar stock of a diameter exceeding 3½ in. or of equivalent cross section." Under the sub-heading "Lathes, the following:—" the item "Turret, with a bar capacity of 3 in. and over and a chuck capacity of 24 in. and over" is amended to read:—"Turret, of bar capacity exceeding 3 in. or of chuck capacity exceeding 24 in."

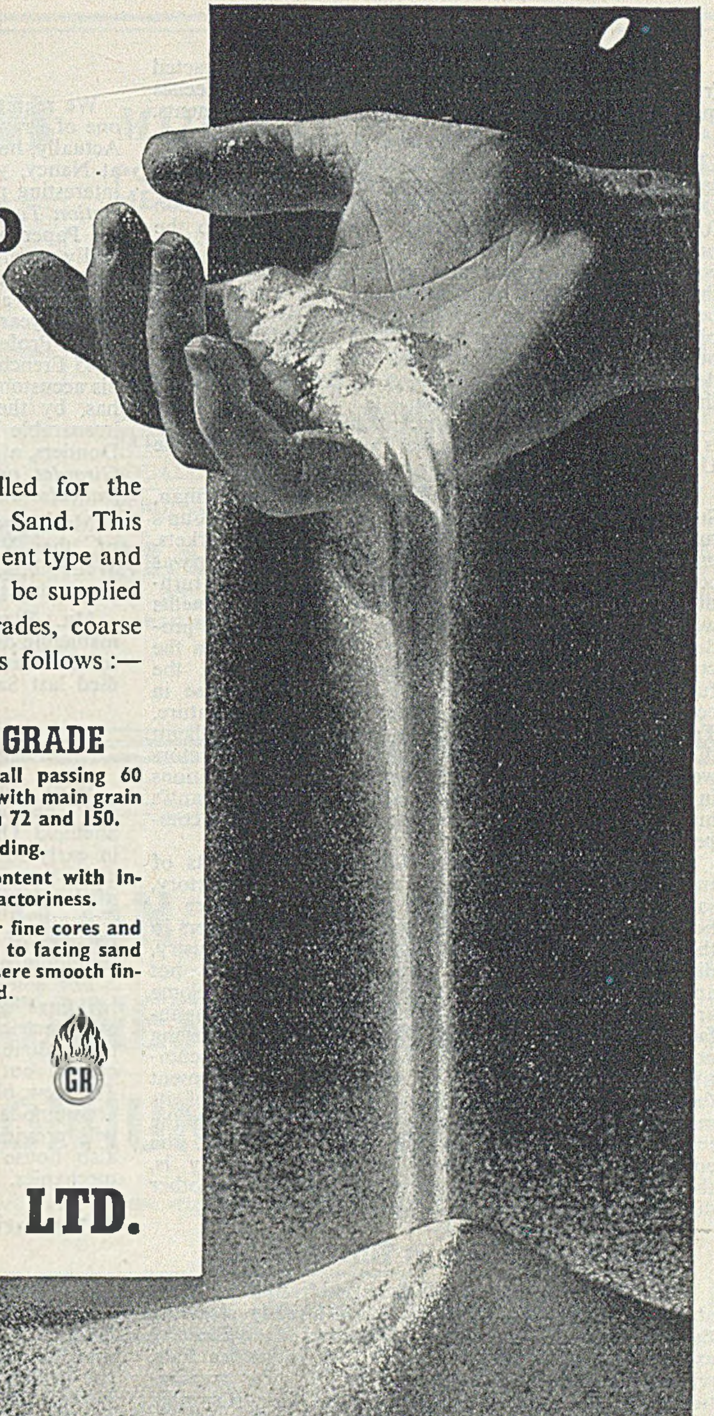
In Group 6 (4) of the Third Schedule the following item is added:—"Compressors capable of delivering air, gases, or vapours at a pressure exceeding 300 lb. per sq. in." Under the heading "Machines, metal working, the following:—" the item "Forging machines of a capacity of over 1,000 tons" is amended to read:—"Forging machines capable of operating on bar stock of a diameter exceeding 3½ in. or of equivalent cross section." Under the sub-heading "Lathes, the following:—" the item "Turret, with a bar capacity of 3 in. and over and a chuck capacity of 24 in. and over" is amended to read:—"Turret, of bar capacity exceeding 3 in. or of chuck capacity exceeding 24 in."

Italian Steel Works Modernisation

In Rome recently, representatives of the U.S. firm of Armco International Steel Corporation, of Middletown, Ohio, signed an agreement with the Italian (Government-owned) Finsider Steel Corporation, providing for the modernisation of the Italian iron and steel industry with the aid of U.S. technicians. A continuous strip mill is to be constructed at Genoa, forming the first project under the agreement.

An exchange scheme for technicians and workmen is included in the agreement, to enable groups of 60 Italian workers, to study for six months each the production methods of the Armco plants, while the U.S. group, also consisting of 60 technicians and workmen, is to stay in Italy for three years.

The agreement is to operate for 12 years.



Company News

The information under this heading has been extracted from statements circulated to shareholders, speeches made at annual meetings, and other announcements.

Birmingham Railway Carriage & Wagon Company, Limited:—The improvement in output in 1949 was a very satisfactory one, says the chairman, SIR BERNARD D. F. DOCKER, but, contrary to expectations, the proportion for export was not increased. This was due to the unexpected cancellation of substantial orders for wagons by the Argentine Government occasioned by that country's shortage of sterling. "As provision had been made for these wagons in our 1949 production plans, the cancellation necessitated an adjustment in our programme, and I consider the increased output, despite such an exacting revision of the programme, all the more creditable," he says.

Keen foreign competition is being experienced and is likely to continue from the Continent, Canada, the U.S.A. and from Japan.

General Refractories, Limited:—The chairman, SIR RONALD W. MATTHEWS, says that the group's turnover for 1949, both for the home and export markets, has established new records. So far as the U.K. group was concerned, there was a very substantial increase in turnover as compared with the previous year, but the benefits which should have accrued from this increase in production were offset by the effect of devaluation on the cost of raw materials purchased from abroad, the further rise in fuel prices, and the heavy increase in cost of repairs and replacements of a revenue nature. Trading conditions in Belgium became very difficult during the last six months of the year. Many factors were responsible for the changed economic conditions in Belgium, the most serious as far as the company's immediate prospects are concerned being German competition.

Metropolitan Gas Meters, Limited:—The results of trading for the current year are, so far, satisfactory, says the chairman, MR. F. C. HELEY. The future is, however, obscure. The sole purchaser of gas meters in this country is now the nationalised gas industry, divided into 12 separate areas, but there does not appear to be at present any co-ordinated policy. Some areas are confining their purchases of meters to manufacturers within those areas, while others are observing no such limitation, and the life of a sales representative is not a happy one, he says. Up to the present the company has been successful in disposing of its meters to the full extent of its manufacture, with the result that the cash resources are in excess of the company's immediate necessities. The company is, therefore, contemplating their employment in other directions, in an effort to safeguard its position.

B.I.F. Exhibits at Birmingham

The world's largest single-floor exhibition building, at Castle Bromwich, Birmingham, is already receiving the first loads of more than 1,000 tons of engineering exhibits in preparation for the British Industries Fair, which will be held from May 8 to 19. Site preparations for the London sections of the Fair (Olympia and Earls Court) started this week.

Many of the heaviest exhibits at this year's B.I.F. will be in the special display at Birmingham of civil engineering contractors' plant, in which 29 manufacturers will present the latest products which they are currently exporting to 70 countries. Organised by the Federation of Manufacturers of Contractors' Plant, this display will occupy some 65,000 sq. ft. of actual stand space.

Obituary

PROFESSOR F. GIRARDET

We regret to record the death of Professor Girardet, one of France's most enthusiastic foundry metallurgists. Actually, he was a Professor in the Faculty of Pharmacy at Nancy, yet almost year by year, he presented most interesting papers to the Annual Congress of the *Association Technique de Fonderie*. Some indeed, such as his Paper on the churning of liquid cast iron made a really novel approach to foundry problems. He presided with great distinction over the French *Association* and was made an honorary president. He was president for several years of the Eastern Foundry Owners' Association. Professor Girardet seemed in poor health at the 1945 French Convention but since that time, he regained his accustomed vigour. The foundry industry of France has, by the death of Professor Girardet, suffered an irreparable loss, a sentiment well expressed by M. Jean Donders, a close colleague, in these terms "*En Fernand Girardet nous perdrous un maitre dont la Fonderie française était ligitimement fière.*"

MR. JOHN RICHARDSON, for 50 years general manager of the Wellingborough Iron Company, Limited, Wellingborough (Northants), has died at Wellingborough, aged 83.

MR. WALTER GRANGER RICHARDS, chairman and managing director of W. Richards & Sons, Limited, ironfounders and rollers, of Ormesby Road, Middlesbrough, died last Saturday. He was 74.

Sheffield University Expansion

Work on the construction and equipping of new engineering laboratories costing £350,000 at Sheffield University will begin either in the spring or in early summer now that the Ministry of Works has given permission. To finance the scheme, which is part of the University's extension plan, the University Grants Committee has made a grant of £250,000, while the balance of £100,000 will be met by the University's development fund.

For some years the inadequacy of the engineering buildings has restricted the number of civil, mechanical, and electrical engineering students, and has also meant that valuable research in those subjects has had to be carried out in congested laboratories and workshops. The new block, which will enable the departments to accommodate three times as many students as at present, will provide for improved research facilities and will also house the new post-graduate school of applied mechanics.

International Co-operation in Corrosion Research

Six Belgian scientists—Messieurs van Rysselberge, Lagae, Oostens, and Bermane, Professeurs Paul, Erculisse, and Campus—are this week touring British installations for corrosion research at the invitation of the British Iron and Steel Research Association. After visiting the corrosion section of the Chemical Research Laboratory at Teddington they will go to B.I.S.R.A.'s exposure stations at Brixham and Derby.

Representing Commission No. 4 of the Belgian Association for the Study, Testing, and Use of Materials (A.B.E.M.), which is concerned with protection against corrosion, and roughly corresponds to B.I.S.R.A.'s Protective Coatings Sub-committee, the scientists will meet some of their British counterparts, and will be able to discuss means of collaboration.

Raw Material Markets

Iron and Steel

The blast furnaces are receiving ample tonnages of raw materials—iron ore, coke, and limestone—and high outputs are being achieved with the plant at present in operation. There are, however, deficiencies in the supplies available for distribution. The demand for low- and medium-phosphorus grades, for example, cannot be fully satisfied and, in consequence, more hematite and refined iron is being used in furnace mixtures. However, the stringency is not acute, and it is expected that one or more additional furnaces will be available for employment shortly.

While the re-rollers would welcome more business in some departments, the outlook for the steelworks' rolling mills in the second period is still encouraging. An increased volume of export orders for heavy sections fully compensates for any slight halt in the flow of specifications from home sources, while specifications for both light and heavy steel plates tax the capacity of the plate mills to their utmost limits. Most commodity markets are inclined to slow down on account of Budgetary apprehensions, but steel users are as keen as ever to secure deliveries before the Government pronounces final judgment on the subject of rail freight charges. Most of the big steel-using industries are very busy, and an expanding volume of exports is foreshadowed during the summer months.

Non-ferrous Metals

Tin suffered a modest setback in the early part of last week, but subsequently there was a recovery and at midday last Thursday, on the eve of the holiday, the market was quoted £591 10s. for cash and £592 15s. for three months. The strength shown by zinc during the past few weeks has been something of a surprise to the trade, but the movement, of course, originated in the United States, and what has happened here is merely the reflection of strength in New York. Actually, demand for zinc is reasonably good, but not outstandingly so, and left to itself the United Kingdom quotation would hardly have registered an advance just now. But this is only part of a larger problem relating to a possible re-opening of the Metal Exchange as a result of the abandonment of bulk buying by the Government.

Metal Exchange tin quotations were as follow:—

Cash—Wednesday, £586 10s. to £586 15s.; Thursday, £591 5s. to £591 10s.; Tuesday, £591 5s. to £591 15s.; Wednesday, £591 10s. to £592 5s.

Three Months—Wednesday, £588 5s. to £588 10s.; Thursday, £592 10s. to £592 15s.; Tuesday, £593 15s. to £594; Wednesday, £593 5s. to £593 10s.

It seems extraordinary that the authorities do not appear to realise the great advantages that could accrue from re-establishing a free market in London for lead, zinc, and copper. As a direct result of price movements in London, the Americans now pay less for tin and we, therefore, receive fewer dollars. But the Ministry of Supply pays for metals from the sterling areas on the basis of the New York quotation converted at $2.80 to the £. All that would be altered were London to be allowed to function once more as a free market for metals, and, what is more, the pound sterling would be strengthened as an international currency.

Business in non-ferrous metals has been on the quiet side, as the Easter holiday interfered with demand. Many factories in the Midlands only started up again yesterday (Wednesday), so that consumption has been reduced.

Scrap metal values are steady, but it looks as if the upward movement in prices has come to an end. In fact, in one or two directions there has been some slight reduction from the top. Government surplus metal is still coming out fairly freely, but it is a pity that the lapse of time between the receipt of the invitation to tender by the prospective buyer and the arrival of metal at the consuming point is so prolonged. Many buyers look back with regret to the time when the Ministry of Supply was in a position to sell scrap in line with its schedule of published prices.

Company Results

(Figures for previous year in brackets.)

CROSSLEY BROS.—Interim dividend of 4% (same).

DUCTILE STEELS—Interim dividend of 20% (same).

JOHN SUMMERS & SONS—Final dividend of 6%, making 8½% (same).

BRITISH ALUMINIUM COMPANY—Final Dividend of 6%, making 10% (same).

WILLIAM DOXFORD & SONS—Interim dividend of 5% (same) on capital increased by 10% bonus.

BRIGHTSIDE FOUNDRY & ENGINEERING COMPANY—Interim dividend of 10% (single payment for the year of 50%).

BRUNTONS (MUSSELBURGH)—Trading profit for 1949, £96,871 (£59,865); provision for taxation, £45,250; depreciation, £19,338; dividend of 15% (same); forward, £60,188 (£52,476).

LONDON ALUMINIUM COMPANY—Trading profit for 1949, £149,464 (£303,045); net profit, after tax, etc., £44,516 (£106,169); final dividend of 10%, making 40% (100%); forward, £31,903 (£30,149).

A.C.E. MACHINERY—Profit to September 30, 1949, £43,191 (£59,283); net profit, after depreciation, etc., £36,871 (£52,646); to profits tax, £5,540 (£6.790); income tax, £14.960 (£21,210); dividend of 20% (same); forward, £40.474 (£30,703).

BREEDON & CLOUD HILL LIME WORKS—Trading profit to January 31, 1950, £89,632 (£90,346); net profit, after depreciation, tax, etc., £34,441 (£34,810); final dividend of 27½%, making 35% (same); forward, £11,657 (£11,575).

BLOCK & ANDERSON—Consolidated net profit of the group for the year ended November 30, 1949, £27,652 (£30,516); unrequired taxation, £4,000; available, £94.590; dividend of 50% (50% dividend and 10% bonus); forward, £76,715 (£62,938).

INTERNATIONAL HARVESTER COMPANY OF GREAT BRITAIN—Trading profit for the year to October 31, 1949, £295,319 (£390,342); net profit, after depreciation, tax, etc., £184.520 (£186,821); forward, £996,153 (£811,633). No dividend (same).

CLAYTON DEWANDRE COMPANY—Group profit for 1949, after all charges, including UK tax, £99,812 (net profit £57,940); to reserves, £55,000; provision for replacement of fixed assets, £15,000; final dividend of 8%, making 12% (same); forward, £25,127.

BROKEN HILL PROPRIETARY COMPANY—Half-yearly dividend of 10d. per £1 share on the fully paid shares (same) and 6⅔d. per share on the new shares paid to 16s. 8d. each. Similar dividends of 10d. per share were paid on the old capital in October and April last.

C. & W. WALKER—Group profit to January 31, after all charges, including tax, £32,329 (£31,870); profit after deducting amount attributable to outside interests, £30,359 (£28,587); dividend of 10% and bonus of 5% (same); to reserves, £11,950 (£15,125); forward, £35,784 (£26,928).

P. & W. MACLELLAN—Net profit, after debenture interest, depreciation, directors' fees, etc., and providing for taxation and contingencies, £52.578 (£47.315); to reserve fund, £29,530; plant replacement reserve, £40,389; pensions reserve, £6,000; dividend of 7% (same); forward, £26,661 (£22.780).

JOHN C. PARKES & SONS—Net profit for 1949, £14,116 (£12,899); fees, £3 (£4); to general reserve, £5.000 (£3,750); debts reserve, £3,000 (building reserve of £3,000); interim dividend of 1s. (9d.) per share, £1,170 (£861); debenture interest, £1,504 (£1,476); final dividend of 2s. 6d. (2s.) per share, £2,925 (£2,296); forward, £22,659 (£22,140).

ALFRED HERBERT—Consolidated trading profit to October 31, 1949, £1,834,903 (£1,980,898); net profit, after depreciation, taxation, etc., £818,090 (£871,304); proportion to outside holders, £20,894 (£7,793); to capital reserve, £519 (£1,740); sundry revenue reserves, £8,205 (nil); dividends, £130,475 (£142.612); forward, £2,472,882 (£1,814,885).

H. & J. HILL (WILLENHALL)—Trading profit for 1949, £30.946 (£32.505); net profit, after depreciation, taxation, etc., £12.722 (£15,261); tax reserve transfer, £117 (£108); final dividend of 35%, making 50% (same); amount written off buildings, £500 (nil); general reserve, £5.000 (£1,000); future taxation, nil (£6.000); written off goodwill, nil (£2,499); forward, £1,403 (£1.370).

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

(Delivered, unless otherwise stated)

April 12, 1950

PIG-IRON

Foundry Iron.—No. 3 Iron, Class 2:—Middlesbrough, £10 4s.; Birmingham, £10 0s. 6d.

Low-phosphorus Iron.—Over 0 10 to 0.75 per cent. P, £11 15s. 6d., delivered Birmingham. Staffordshire blast-furnace low-phosphorus foundry iron (0.10 to 0.50 per cent. P, up to 3 per cent. Si)—North Zone, £12 2s. 6d.; South Zone, £12 5s.

Scotch Iron.—No. 3 foundry, £11 18s. 3d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £12 14s. 6d.; South Zone, £12 17s.

Refined Malleable.—P, 0.10 per cent. max.—North Zone, £13 4s. 6d.; South Zone, £13 7s.

Cold Blast.—South Staffs, £15 16s. 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, £11 16s. 6d.; Scotland, £12 3s.; Sheffield, £12 9s.; Birmingham, £12 15s.; Wales (Welsh iron), £11 16s. 6d.

Spiegeleisen.—20 per cent. Mn, £17 8s.

Basic Pig-iron.—£9 17s. 6d., all districts.

FERRO-ALLOYS

(Per ton unless otherwise stated, basis 2-ton lots, d/d Sheffield works.)

Ferro-silicon (6-ton lots).—45 per cent., £33 15s.; 75 per cent., £49.

Ferro-vanadium.—35/60 per cent., 15s. per lb. of V.

Ferro-molybdenum.—70/75 per cent., carbon-free, 8s. 6d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., carbon-free, £100 per ton.

Ferro-tungsten.—80/85 per cent., 7s. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 8s. per lb. of W.

Ferro-chrome.—4/8 per cent. C, £60; max. 2 per cent. C, 1s. 5½d. lb.; max. 1 per cent. C, 1s. 6d. lb.; max. 0.15 per cent. C, 1s. 6¾d. lb.; max. 0·10 per cent. C, 1s. 7d. lb.

Cobalt.—98/99 per cent., 13s. 6d. per lb.

Metallic Chromium.—98/99 per cent., 5s. 1½d. per lb.

Ferro-manganese (blast-furnace). — 78 per cent., £25 14s. 8d.

Metallic Manganese.—96/98 per cent., carbon-free, 1s. 5½d. per lb.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—Basic: Soft, u.t., £16 16s. 6d.; tested, up to 0.25 per cent. C (100-ton lots), £17 1s. 6d.; hard (0.42 to 0.60 per cent. C), £18 16s. 6d.; silico-manganese, £23 19s.; free-cutting, £20 1s. 6d. Siemens Martin Acid: Up to 0.25 per cent. C, £22 4s.; case-hardening, £23 1s. 6d.; silico-manganese, £26 6s. 6d.

Billets, Blooms, and Slabs for Forging and Stamping.—Basic, soft, up to 0.25 per cent. C, £19 16s. 6d.; basic, hard, over 0.41 up to 0.60 per cent. C, £21 1s. 6d.; acid, up to 0.25 per cent. C, £23 1s. 6d.

Sheet and Tinplate Bars.—£16 16s. 6d.

FINISHED STEEL

Heavy Plates and Sections.—Plates, ship (N.-E. Coast), £20 14s. 6d.; boiler plates (N.-E. Coast), £22 2s.; chequer plates (N.-E. Coast), £22 19s. 6d.; heavy joists, sections, and bars (angle basis), N.-E. Coast, £19 13s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., untested, £22 6s.; flats, 5 in. wide and under, £22 6s.; rails, heavy, f.o.t., £19 2s. 6d.; hoop and strip, £23 1s.; black sheets, 17/20 g., £28 16s.

Alloy Steel Bars.—1-in. dia. and up: Nickel, £36 8s.; nickel-chrome, £52 16s. 6d.; nickel-chrome-molybdenum, £59 9s. 6d.

Tinplates.—I.C. cokes, 20 × 14, per box, 41s. 9d., f.o.t. makers' works.

NON-FERROUS METALS

Copper.—Electrolytic, £153; high-grade fire-refined, £152 10s.; fire-refined of not less than 99.7 per cent., £152; ditto, 99.2 per cent., £151 10s.; black hot-rolled wire rods, £162 12s. 6d.

Tin.—Cash, £591 10s. to £592 5s.; three months, £593 5s. to £593 10s.; settlement, £591 15s.

Zinc.—G.O.B. (foreign) (duty paid), £91 10s.; ditto (domestic), £91 10s.; "Prime Western," £91 10s.; electrolytic, £92 5s.; not less than 99.99 per cent., £93 15s.

Lead.—Good soft pig-lead (foreign) (duty paid), £84; ditto (Empire and domestic), £84; "English," £85 10s.

Zinc Sheets, etc.—Sheets, 10g. and thicker, all English destinations, £107 10s.; rolled zinc (boiler plates), all English destinations, £105 10s.; zinc oxide (Red Seal), d/d buyers' premises, £87 10s.

Other Metals.—Aluminium, ingots, £112; antimony, English, 99 per cent., £160; quicksilver, ex warehouse, £18 5s. to £18 10s.; nickel, £321 10s.

Brass.—Solid-drawn tubes, 15¾d. per lb.; rods, drawn, 19¾d.; sheets to 10 w.g., 20½d.; wire, 20⅝d.; rolled metal, 18⅞d.

Copper Tubes, etc.—Solid-drawn tubes, 17¾d. per lb.; wire, 177s. per cwt. basis; 20 s.w.g., 205s. 6d. per cwt.

Gunmetal.—Ingots to BS. 1400—LG2—1 (85/5/5/5), £101 to £115; BS. 1400—L.G.3—1 (86/7/5/2), £110 to £122; BS. 1400—Gl—1 (88/10/2), £158 to £200; Admiralty GM. (88/10/2), virgin quality, £185 to £195, per ton, delivered.

Phosphor-bronze Ingots.—P.Bl, £162-£210; L.P.Bl, £120-£128 per ton.

Phosphor Bronze.—Strip, 27¾d. per lb.; sheets to 10 w.g., 29⅝d.; wire, 29½d.; rods, 27½d.; tubes, 32¾d.; chill cast bars: solids, 27½d., cored, 28½d. (C. Clifford & Son, Limited.)

Nickel Silver, etc.—Ingots for raising, 1s. 9½d. per lb. (7%) to 2s. 7¾d. (30%); rolled metal, 3 in. to 9 in. wide × .056, 2s. 3½d. (7%) to 3s. 1¾d. (30%); to 12 in. wide, × .056, 2s. 3¾d. to 3s. 2d.; to 25 in. wide, × .056, 2s. 5¾d. to 3s. 4d. Spoon and fork metal, unsheared, 2s. 2d. to 3s. 0½d. Wire, 10g., in coils, 2s. 8¾d. (10%) to 3s. 7½d.; (30%). Special quality turning rod, 10%, 2s. 7¾d.; 15%, 3s. 0½d.; 18%, 3s. 4½d.

Personal

DR. A. G. QUARRELL, research manager of the British Non-ferrous Metals Research Association, has been appointed head of the new post-graduate school of physical metallurgy at Sheffield University.

MR. E. AIRD, manager of the electrical department of Sunderland Forge & Engineering Company, Limited, Pallion, Sunderland, has retired after 50 years with the firm, as also has MR. J. J. RUTTER, manager of the switchboard department.

MR. J. H. GROOCOCK, formerly a regional electrical engineer of the South Wales factories of I.C.I., Limited, has been appointed chief electrical engineer for the Abbey, Margam, and Port Talbot works of the Steel Company of Wales, Limited.

MR. E. BIBBY, assistant melting-shop manager with Samuel Fox & Company, Limited, Stocksbridge Works, near Sheffield, has been appointed as understudy to the manager at the Llanelly Steel Company (1907), Limited, South Wales.

MR. A. C. W. IMPEY, traffic superintendent with Dorman, Long & Company, Limited, Middlesbrough, has retired after 30 years' service. He will continue to act in a consultative capacity. The new traffic superintendent is MR. W. V. GOLDING.

SIR JOHN COCKCROFT, director of the British Atomic Energy Research Establishment, recently received in Paris the cross of Chevalier of the Legion of Honour in recognition of his war work and the assistance he gave to French scientists under his direction.

MR. J. CRAWFORD has been appointed by the Lord President of the Council as a member of the Advisory Council for Scientific and Industrial Research in place of MR. J. BOWMAN, who resigned on his appointment as chairman of the Northern Division of the N.C.B.

LT.-COL. W. P. ANDREWS has been awarded the Derby gold medal, and MR. C. O. R. BELL the Sir John Larking medal of the Liverpool Engineering Society (Inc.). MR. J. ECCLES, chairman of the Merseyside and North Wales Electricity Board, has been elected president of the Society in succession to MR. A. CALDWELL.

MR. MAURICE FIENNES, managing director of the Davy & United Engineering Company, Limited, Sheffield, has returned from a week's business tour of North America, where he visited the firm's two U.S. associates, the United Engineering & Foundry Company, Pittsburgh, and the Morgan Construction Company, Worcester (Mass).

SIR MURRAY STEPHEN, chairman of the British Shipbuilding Research Association, chairman of Alexander Stephen & Sons, Limited, shipbuilders, of Govan, Glasgow, and a director of R. & J. Dick, Limited, belting manufacturers, of Greenhead, Glasgow, and of the Steel Company of Scotland, Limited, has accepted the invitation of the Institute of Marine Engineers to succeed LORD ROTHERWICK as president.

VISCOUNT WEIR, a member of the F.B.I. council and a director of I.C.I., Limited, and of the International Nickel Company of Canada, Limited, was elected honorary president of the British Employers' Confederation at its annual meeting on April 5, in succession to SIR GREVILLE MAGINESS, who is chairman and managing director of the Churchill Machine Tool Company, Limited, Manchester, chairman of Associated British Machine Toolmakers, Limited, and deputy chairman of Tube Investments, Limited. President of the Confederation is SIR CUTHBERT CLEGG, with MR. ANDREW GRAHAM STEWART, chairman of Stewarts and Lloyds, Limited, a director of Stanton Ironworks Company, Limited, and a member of the F.B.I. executive committee, as vice-president.

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

EXECUTIVE in medium-sized London non-ferrous foundry (aged 40), seeks change offering greater administrative interest and scope for enterprise; experience mainly in loose pattern production of castings in brass, bronze and light alloys, labour control, costing, purchasing, negotiations, correspondence accounts, and general foundry and commercial management.—BM/AFNN, London, W.C.1.

FOUNDRY FOREMAN (non-ferrous) age 49; practical moulder, experience jobbing work, training unskilled labour; able to supervise machines, also used to general layout of pattern plates and general foundry work.—Box 342, FOUNDRY TRADE JOURNAL.

HARD-WORKING Indian (25), with 7 years' practical experience in engineering castings—ferrous and non-ferrous—seeks opportunity to further experience under advanced conditions; ready to serve at any position with moderate remuneration.—Box 330, FOUNDRY TRADE JOURNAL.

FOUNDRY RATEFIXER, residing Manchester area, 28 years' practical and technical experience of iron, steel and non-ferrous castings, desires similar position, due to closing down of foundry; A.M.I.Brit.F.; own house; willing to travel.—Box 290, FOUNDRY TRADE JOURNAL.

METALLURGIST, Cambridge Graduate, ex-Forces, seeks position in foundry.—Box 276, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT

ANALYTICAL CHEMIST (male or female) for analysis of cast iron and related material; previous analytical experience with ferrous alloys an advantage. —Apply, stating age, experience, and qualifications, to BRITISH CAST IRON RESEARCH ASSOCIATION, Alvechurch, Birmingham.

CORE SHOP FOREMAN required by Steel Foundry in Yorkshire; must be experienced in both repetition and jobbing work, energetic, and able to organise and control; salary approx. £450 p.a., with staff conditions.—State age and give full details of experience to Box 332, FOUNDRY TRADE JOURNAL.

FOREMAN required, to supervise production at Grey Iron Foundry; age 30-40; sound knowledge of floor, machine and mechanised production essential; applicant must have proved himself in similar capacity, and should preferably have experience of cupolas, metal and sand control.—Write, stating age, experience, and full history of employment, to JONES & ATTWOOD, LTD., Stourbridge, Worcs.

MOULDERS (experienced) required.—Apply to SEAGER'S FOUNDRY, The Brents, Faversham, Kent.

SITUATIONS VACANT—*Contd.*

FOREMAN PATTERNMAKER. — A progressive Foundry in Yorkshire wants a man with drive and initiative, to take charge of newly equipped Pattern Shop; work done comprises pattern manufacture, repair, and mounting on plates for machine work; salary about £500 p.a.; give age, experience, and state where apprenticed.—Box 299, FOUNDRY TRADE JOURNAL.

MOULDER required; experience in non-ferrous jobbing and odd-side work; South London area.—Box 344, FOUNDRY TRADE JOURNAL.

REQUIRED, for Aluminium Foundry in South Wales, young ambitious INSPECTOR; thoroughly experienced in casting inspection, marking off, and A.I.D. procedure; good prospects for man not afraid of hard work and long hours; salary approx. £400 per annum.—Replies to state full details, age, education, and experience, to Box No. C., W. H. SMITH & SON LIBRARY, Gloucester Buildings, 23A, Commercial Street, Aberdare.

SUBSTANTIAL Foundry Organisation requires Midlands Technical SALES REPRESENTATIVE; must have good experience and connections; full details previous experience, salary required.—Box 340, FOUNDRY TRADE JOURNAL.

UNDER-FOREMAN required for Iron Foundry; state experience, age, and salary required.—CARTER, WILKINSON, LTD., Kingsfield, Hooley Lane, Redhill, Surrey.

WANTED.—Experienced CLERK, to take charge of progressive Foundry Office in Swansea area; state experience and salary required.—Apply Box 270, FOUNDRY TRADE JOURNAL.

WORKS MANAGER for small Foundry; South-West Yorks; must be thoroughly conversant with production of baths, light castings, and bath enamelling; state age, experience, and salary required.—Box 334, FOUNDRY TRADE JOURNAL.

RATE-FIXER/ESTIMATOR required for large Mechanised Foundry at Doncaster, producing wide range of medium-heavy and light Iron and Steel Castings; applicants must have experience of estimating from drawings for quotation purposes, and rate-fixing on a mechanised plant.—Write, giving full particulars of experience, age, and salary required, to JOHN FOWLER & CO. (LEEDS), LTD., Sprotborough Works, Doncaster.

QUALIFIED METALLURGIST required by Engineering firm in the Dudley area to control quality of castings from new general Iron Foundry, with an output of 50-60 tons per week; applicants should state qualifications, age, experience, and salary required.—Box 304, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT—*Contd.*

NIGHT FOREMAN wanted for Non-ferrous Metal Ingot Foundry in Birmingham; also FURNACE MEN.—Apply Box 284, FOUNDRY TRADE JOURNAL.

PATTERN CHECKER required for mechanised Foundry producing Iron and Steel Castings; must be fully experienced in all types of Wood and Metal Pattern work, and would have the responsibility of final checking of patterns into foundry; the position is permanent and progressive, and a good wage would be paid to a first class man.—Apply in confidence to JOHN FOWLER & CO. (LEEDS), LTD., Sprotborough Works, Doncaster.

REPRESENTATIVE, on commission basis, required by Non-ferrous Foundry, London area; mechanised, producing first-class work.—Box 282, FOUNDRY TRADE JOURNAL.

WANTED.—WORKS MANAGER for Steel Foundry and Engineering Concern situated in the North-East Coast, employing approximately 700; present output of metal 100 tons per week from basic electric furnaces; large proportion of output finished machined castings.—Apply by letter, stating age, remuneration expected, and giving full details of past experience, with references, to Box 302, FOUNDRY TRADE JOURNAL.

BUSINESS OPPORTUNITIES

SUBSTANTIAL Buyers Grey Iron Castings; interested co-operating Foundry able to supply up to 50 tons monthly; would consider taking financial interest; also supplying commercial technical assistance to small or medium sized Foundry capable development; replies in strict confidence.—Box 338, FOUNDRY TRADE JOURNAL.

ACCOMMODATION

REPUTABLE Firm of Grey Iron Founders, shortly opening London office, will have accommodation with Secretarial services available; admirable for non-ferrous or malleable concern to share.—Box 326, FOUNDRY TRADE JOURNAL.

MACHINERY WANTED

GEARED Ladle, 1½-2 tons capacity, required immediately.—IAN ROSS (CASTINGS), LTD., Trading Estate, Slough.

WANTED.—A.S.E.A. 2/3-Ton Hoist, or near type, in good condition; 20 ft. lift and 400 volt, 3-phase, 50 cycles. Particulars of where seen and price to Box 296, FOUNDRY TRADE JOURNAL.

WANTED.—Spencer & Halstead Centriblast Airless Shot Blast Barrel Machine, together with Spenstead Dust Collecting Plant.—Box 306, FOUNDRY TRADE JOURNAL.