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P. 69/51/I

BIBLIOTEKA POLITECHNIKI ŚLĄSKIEJ

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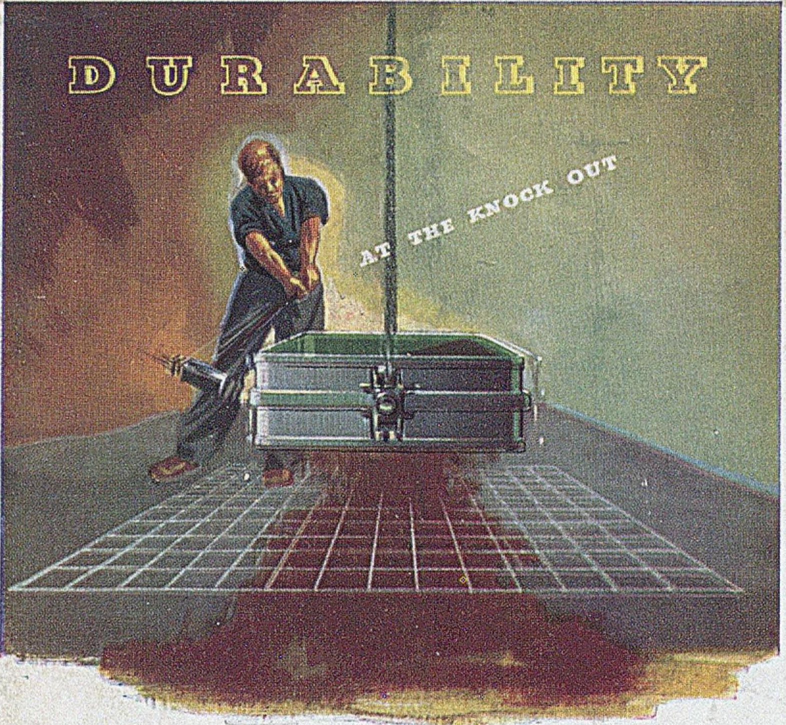

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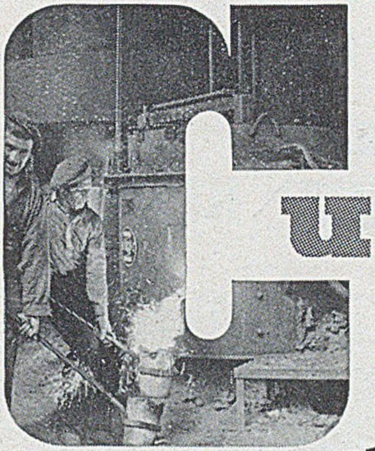
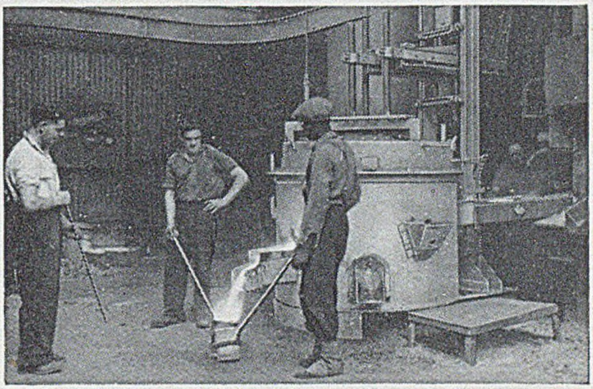


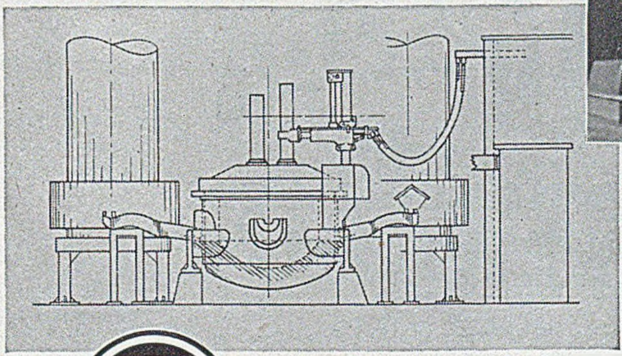
Cupola Iron with ELECTRIC MELTING qualities

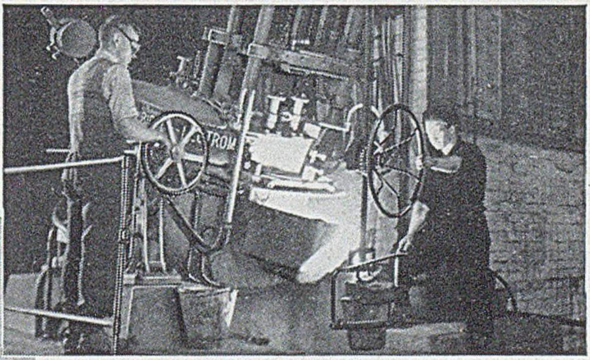


The economic advantages of cupola melting can be combined with the physical qualities of iron melted in an electric furnace by installing a Birlec Lectromelt forehearth or conditioning unit.

The forehearth, essentially a simplified melting furnace, may be of the stationary (above) or tilting (below) type. Some advantages of this "duplex" arrangement are . . . close control of casting temperature . . . variety of accurate alloy compositions from a standard cupola metal . . . hot metal in the casting shop, possibly remote from the melting furnaces, thus eliminating pigging and remelting.

For fuller particulars write for leaflet No. 55a.





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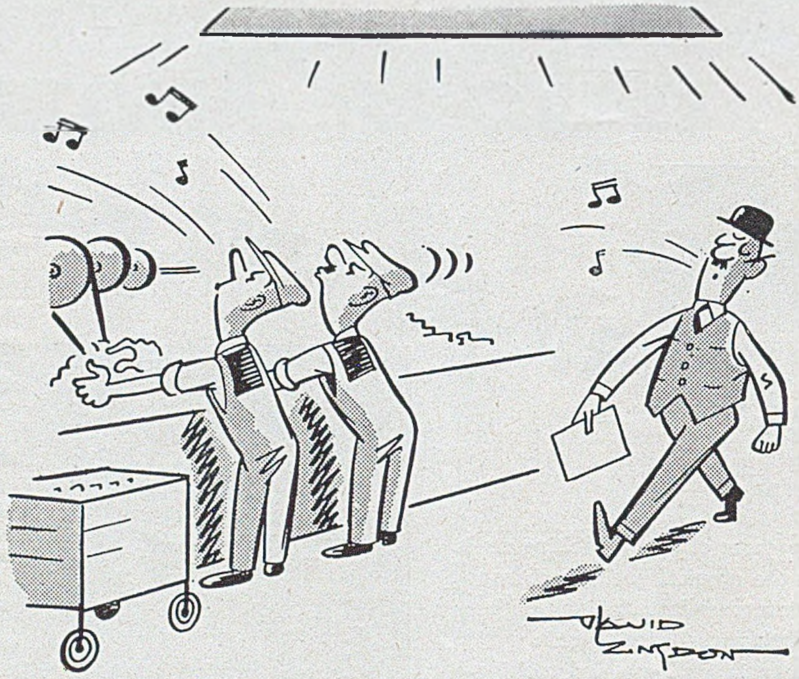

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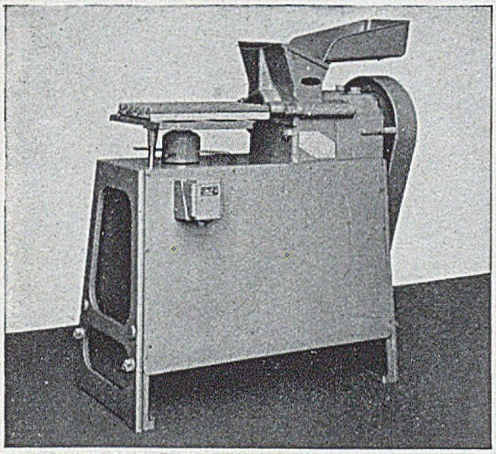
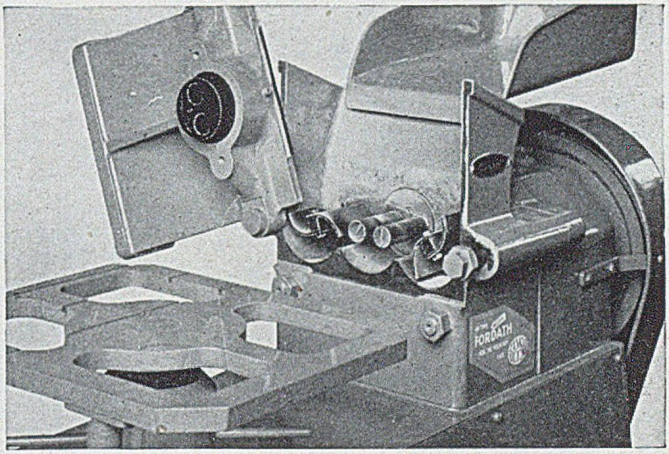
A new chapter in foundry technique

FORDATH "MULTIPLUNGER" CORE MACHINE

(PATENT APPLIED FOR)



Fordath "Multiplunger" Core Machine, showing extruded cores



Main hopper chamber, showing plungers

When, 25 years ago, Fordath introduced the *Multiple* Rotary Core Machines an outstanding advance was made on anything then known. Through the years these machines have been steadily improved and *to-day* many thousands are giving sterling service in all parts of the world.

But Fordath does not stand still. In the newly designed core extruder, plunger action is used, instead of a rotating worm, to thrust the core-mix through the multiple die. The pressure thus developed has an economic as well as a technical advantage:

* *Quality and consistency of the core-sand mixture are* NOT *critical factors. The Multiplunger will extrude satisfactorily even when poor quality core sands only are available; cores can, if necessary, be extruded using facing sand or plain red moulding sand.*

Optimum rate of feed is maintained automatically by the gear-driven synchronized rotating blades which impel a full charge of sand in front of each plunger.

The end-piece of the main hopper chamber can be swung clear on its hinges giving easy access for cleaning and changing the dies.

RANGE. Dies can be supplied for cores of any diameter between ¼" and 3". Ten ¼" cores are produced simultaneously and all dies up to 1½" are multiple, the number of cores produced varying with the diameters. Cores of sizes over 1½" are produced singly.

VENTING. Cores are automatically vented.

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SOLE GLYSO CORE OIL COMPOUNDS MAKERS

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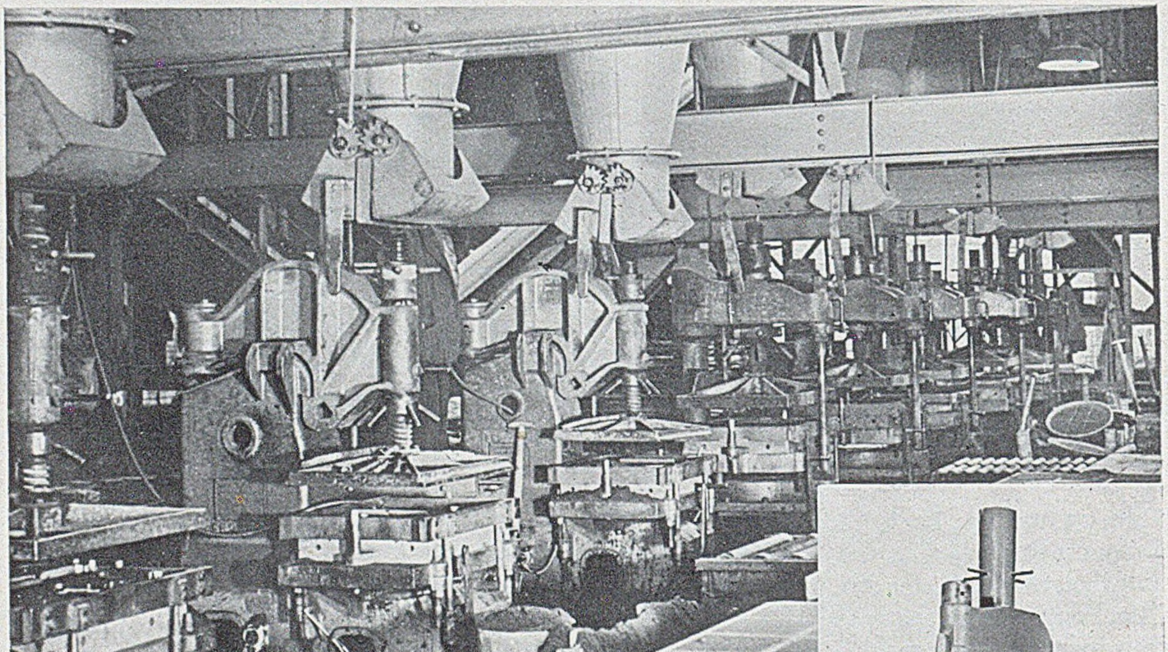
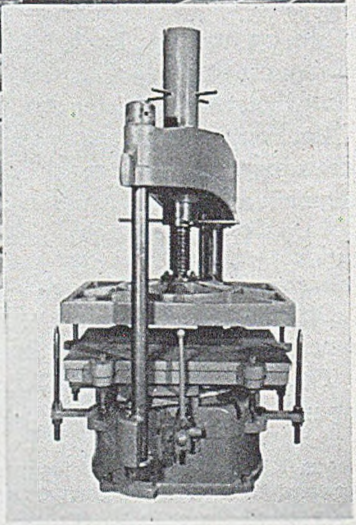
MOULDING MACHINES
F. E. TYPE





F.E.4 MACHINE (FRONT)

F.E.2 AND F.E.3 HYDRAULIC MOULDING MACHINES IN CONTINUOUS CASTING PLANT (FOR MANUFACTURE OF ELECTRICAL FITTINGS)

THESE MACHINES ARE AVAILABLE FOR BOX SIZES UP TO 39in. by 29in. THEY ARE PART OF OUR COMPREHENSIVE RANGE WHICH CATERS FOR MOST REQUIREMENTS—PNEUMATIC AND HYDRAULIC TYPES—ROLLOVERS, STRAIGHT SQUEEZE, JOLT SQUEEZE, PATTERN DRAWING & STRIPPING MACHINES—HAND AND MOULDING MACHINES, ETC.

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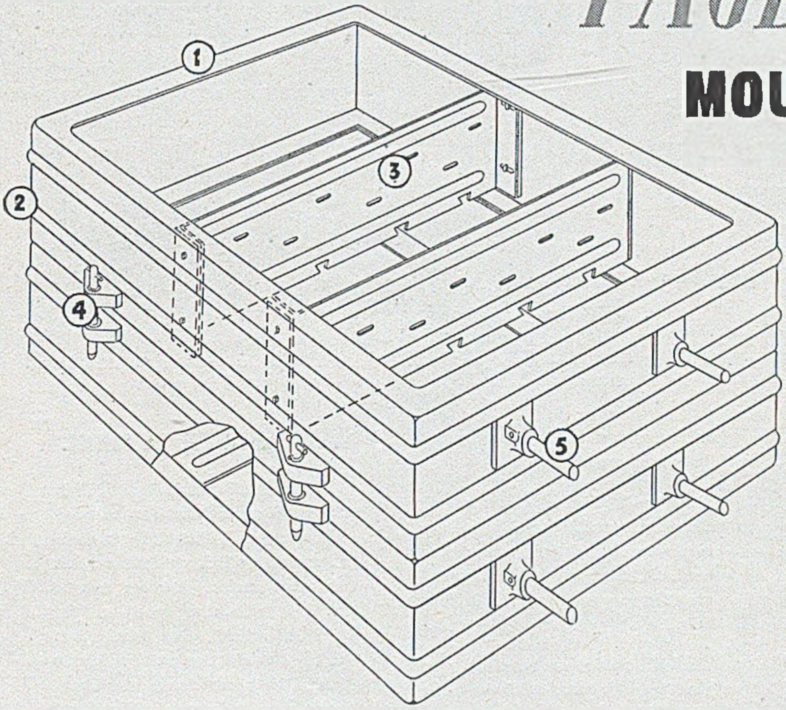
'PAGET' GENERAL PURPOSE MOULDING BOXES



1 *Wide flange for maximum sand support and good joint-faces.*

2 *Deep lateral swaging for wall and corner rigidity.*

3 *Ribs slotted and notched at joint-face edges, for sand-keying. All ribs are removable and adjustable up to 3½ in.*

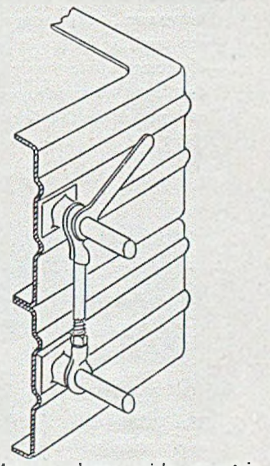
4 *½ in. diameter ground-finished locating-pins, in removable hardened steel bushes.*

5 *1 in. diameter handles, located on lateral centre-line of each box to standardise clamps for boxes of similar depth.*

THE "PAGET" Moulding Box is an important new contribution to Foundry equipment, designed after full consideration of present-day needs and combines great adaptability with a high degree of accuracy. All ribs and stays are adjustable and removable, and frame and ribs are designed for maximum sand-keying. Accuracy of locating-pin centres is constant, and the quick-action clamps give absolutely positive locking. The Box is light yet very strong; the frame is a one-piece pressed steel section, and frame, ribs and stays are deep-swaged for extra rigidity.

A range of forty-two standard sizes is available, from 1 ft. square upwards and from 3 in. to 10 in. in depth, for which parts, standardised to strict limits, are interchangeable. Special boxes can be made for individual needs, to which alternative ribs can subsequently be fitted when required.

"PAGET" MACHINE MOULDING BOXES. These are similar to the General Purpose Box, with narrower flanges, one-piece "grip" type handle, and clamp fitting on spigots. Ribs and stays are not fitted as standard.



Link-type clamp with eccentric bush for quick and positive lock-action.
Clamps will fit all "Paget" Boxes of similar depth.

The Paget Engineering Co. (London) Ltd.

BRAINTREE ROAD - SOUTH RUISLIP - MIDDLESEX

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NEW DUST EXHAUST SYSTEM MAKES SWING FRAME GRINDER NEWS

Complies with Home Office Regulations by Exhausting Dust to outer atmosphere . . .

PATENTS PENDING

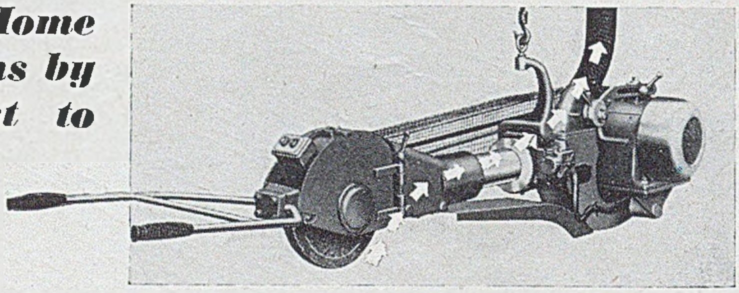

FIG. 1

Research established that the light dust which clings to the periphery of the wheel and envelopes the operator, can only be prevented by exhausting a large volume of air from an area as close as possible to the line of contact of wheel and casting; this cannot be achieved by *external* dust exhaust systems.

INTERNAL DUST EXHAUST

A spark deflector in the new Luke & Spencer 16in. Grinder, deflects all heavy swarf on to the ground behind the casting; where it settles and does not pollute the air. The light dust is sucked through the main duct and passes up the flexible tubing. (fig. 1)

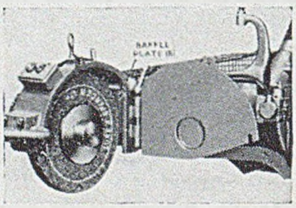

FIG. 2

The baffle plate B. (fig. 2) deflects sparks and dust being carried round by the natural draught from the wheel into the main duct.

TWO SPEED DRIVE AND SAFETY DEVICE

To prevent the wheels losing their efficiency when the speed falls below an economical level, a two speed drive is incorporated.

To provide a simple method of changing speed, a quick release mechanism is included in the motor head. A door in the belt guard provides easy access to the driving belts.

The belts cannot be moved across to give the faster speed until the baffle plate B. (fig. 2) is moved over a pre-determined distance. As the diameter of the wheel controls this distance *overspeeding of the wheel is impossible.*

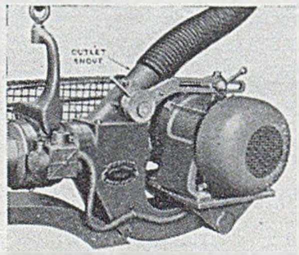

FIG. 3

QUICK WHEEL CHANGE

The wheel head and spindle are designed to enable new wheels to be mounted without exposing the bearings to abrasive grit, etc. A hinged door with captive screws enables the wheel to be changed in the minimum of time.

ABRASIVE WHEEL

BOROLITE Resinoid Bonded High Speed Abrasive Wheels are fitted to the machine. These wheels, manufactured by Luke & Spencer, run at 9,000 surface feet per minute (nearly twice the speed of the vitrified wheel), give tremendous rates of production and are ideally suited for the rapid snagging of iron, steel and non-ferrous castings and forgings, as well as for rectifying high speed and alloy steel billets.

FURTHER INFORMATION ABOUT THIS MACHINE *from* THE SOLE MANUFACTURERS

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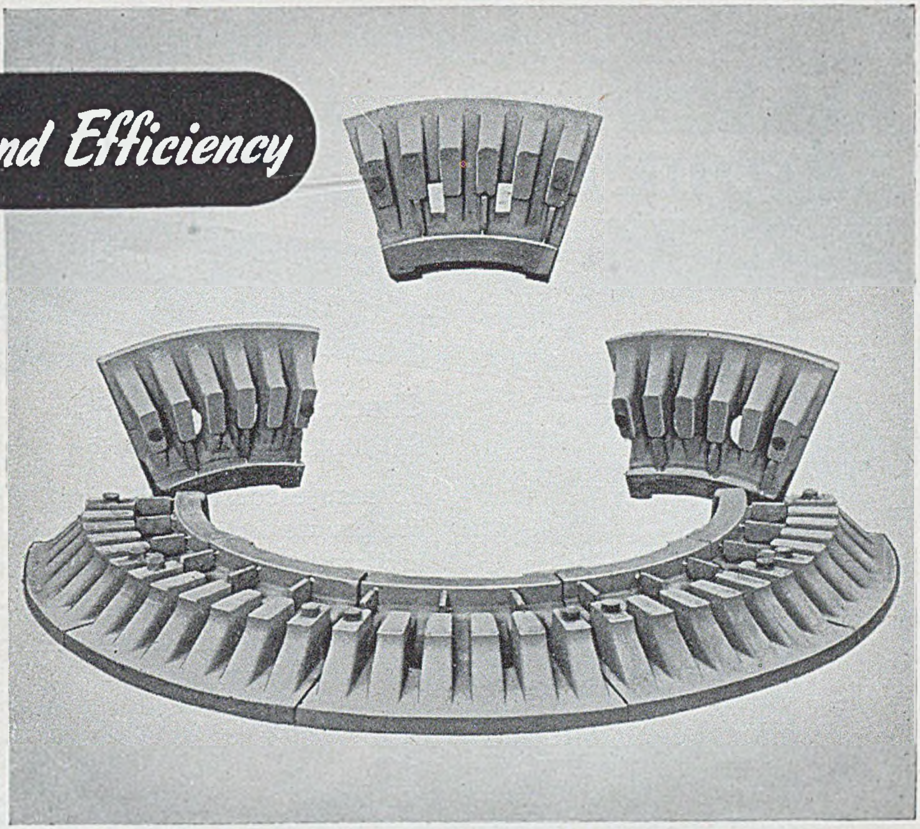

We are greatly indebted to Messrs. C. A. Parsons & Co., Ltd., for permission to reproduce this photograph showing a core in segmented sections for the end plate of a Stator.

The Parson Steam Turbine has a permanent place in the British Engineering tradition and in common with other great inventions, it has contributed to our prestige throughout the world. In the forefront of engineering establishments, Messrs. C. A. Parsons & Co., Ltd., Newcastle-on-Tyne, now operate in a new Foundry of impressive size where every modern device of mechanisation will function consistent with an organisation engaged in the production of castings ranging in weight from a few ounces to many tons.

Work of very exacting quality is essential where castings are required to withstand high pressure and the craftsmanship engaged in Turbine Work is of the highest order.

Materials employed in mould and core preparation are carefully selected for their efficiency and it is a tribute to merit when selection is made.

In all cored work done in this Foundry, G. B. KORDOL is employed and this proof of efficiency is the hall-mark of high quality.

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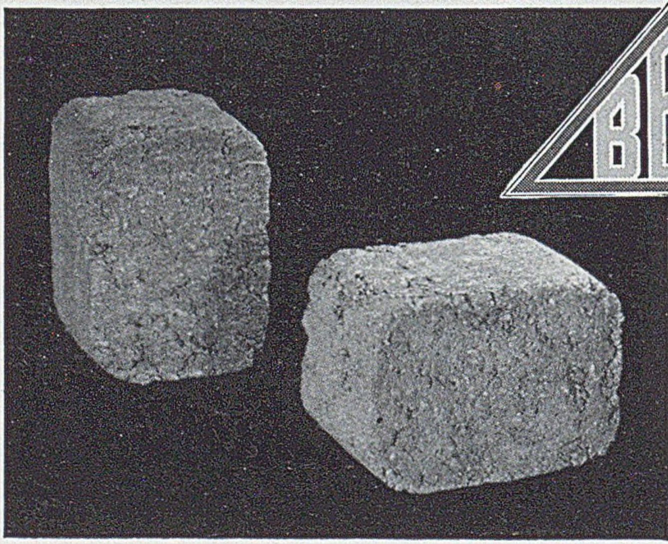
Bemco Manganese Briquettes, rectangular in shape and coloured red, contain 2 lbs. of available Manganese.



BEMCO

Technical literature describing the use of Bemco Briquettes is available on request.

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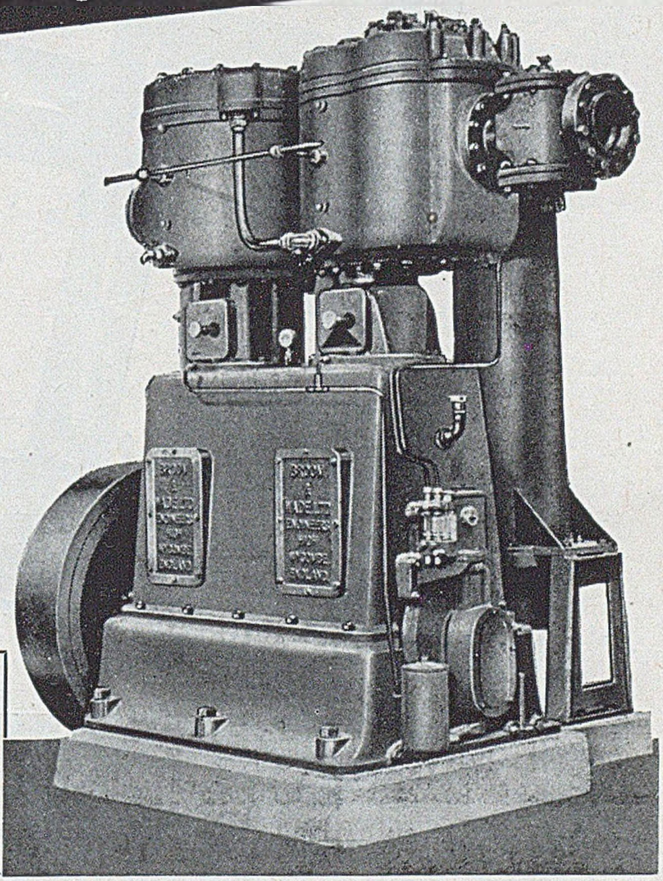

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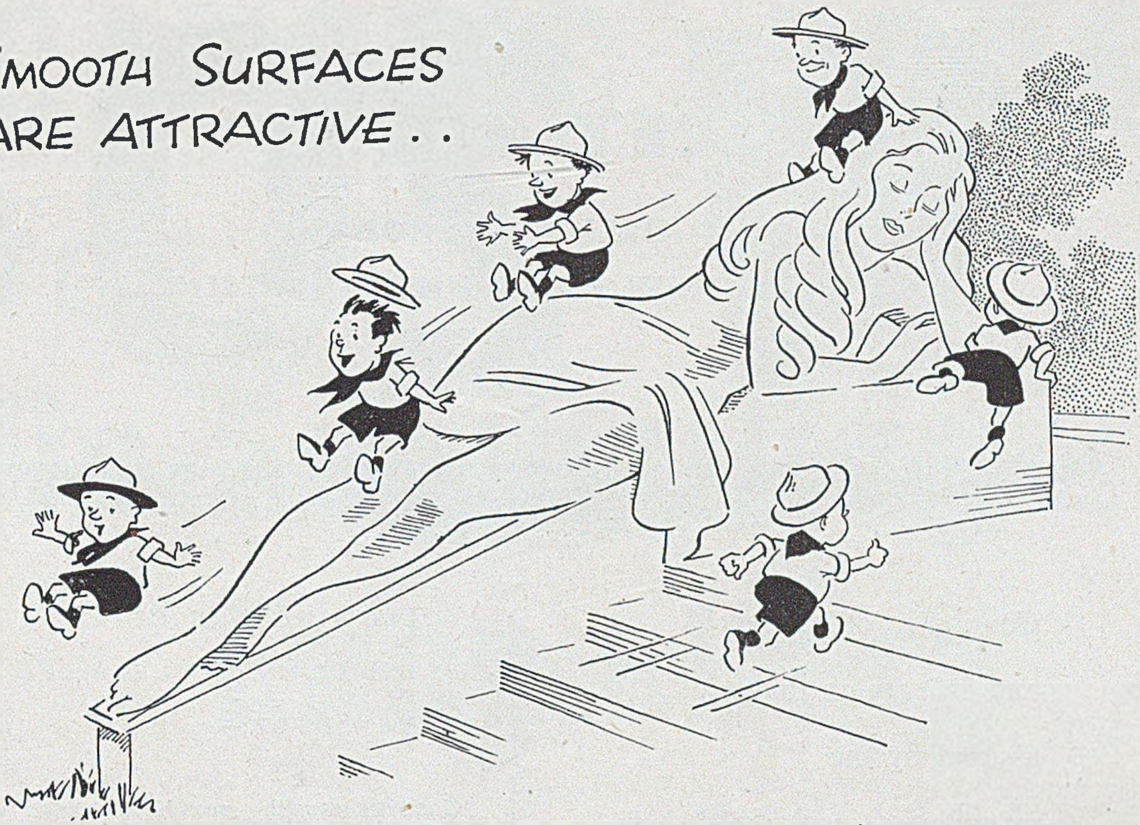

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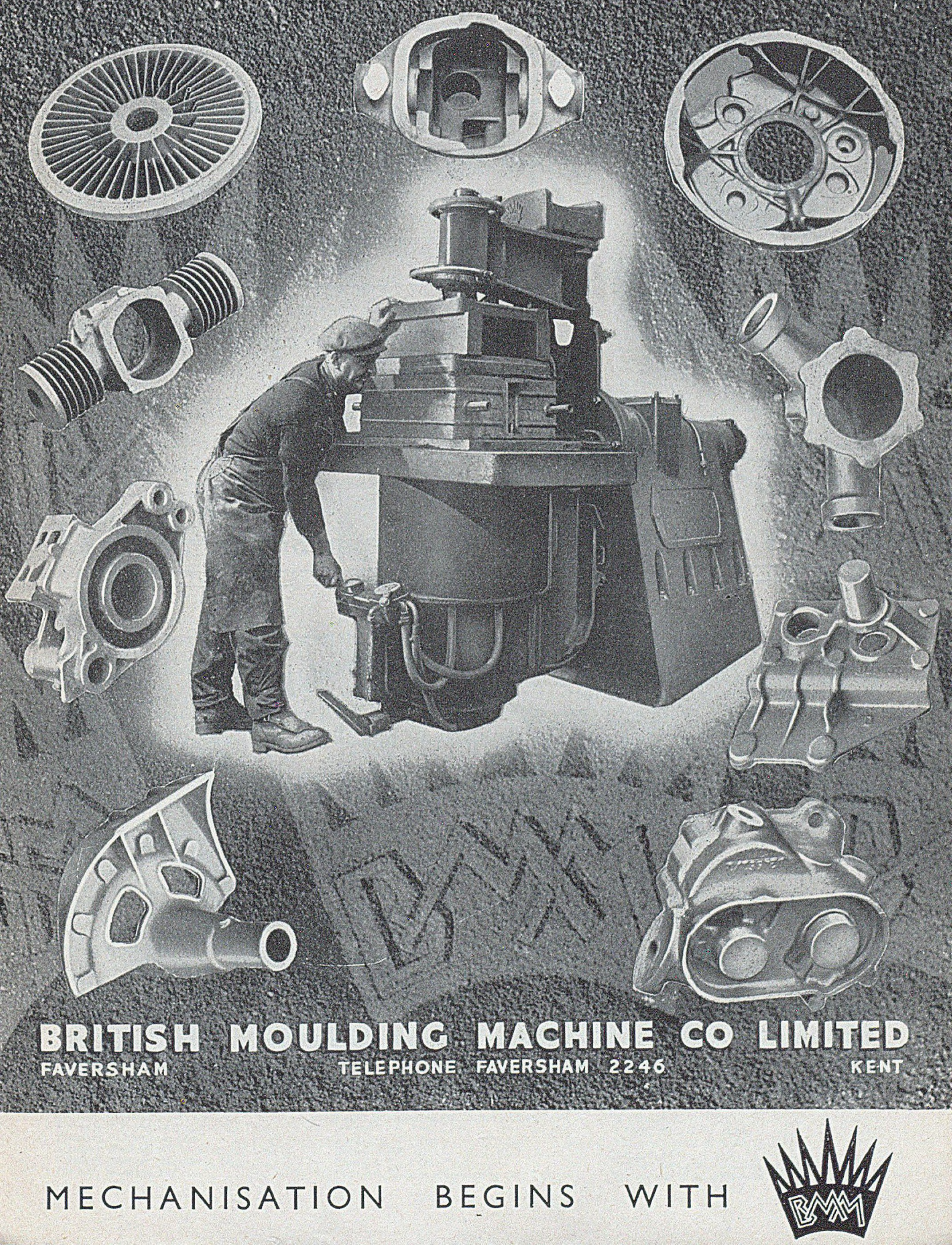
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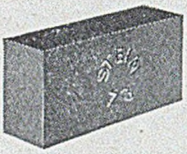

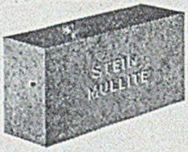

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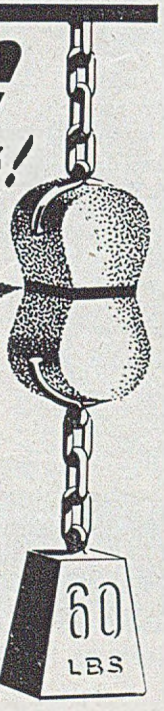

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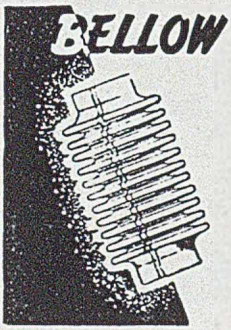

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FOUNDRY TRADE JOURNAL
Established 1902
WITH WHICH IS INCORPORATED THE IRON AND STEEL TRADES JOURNAL

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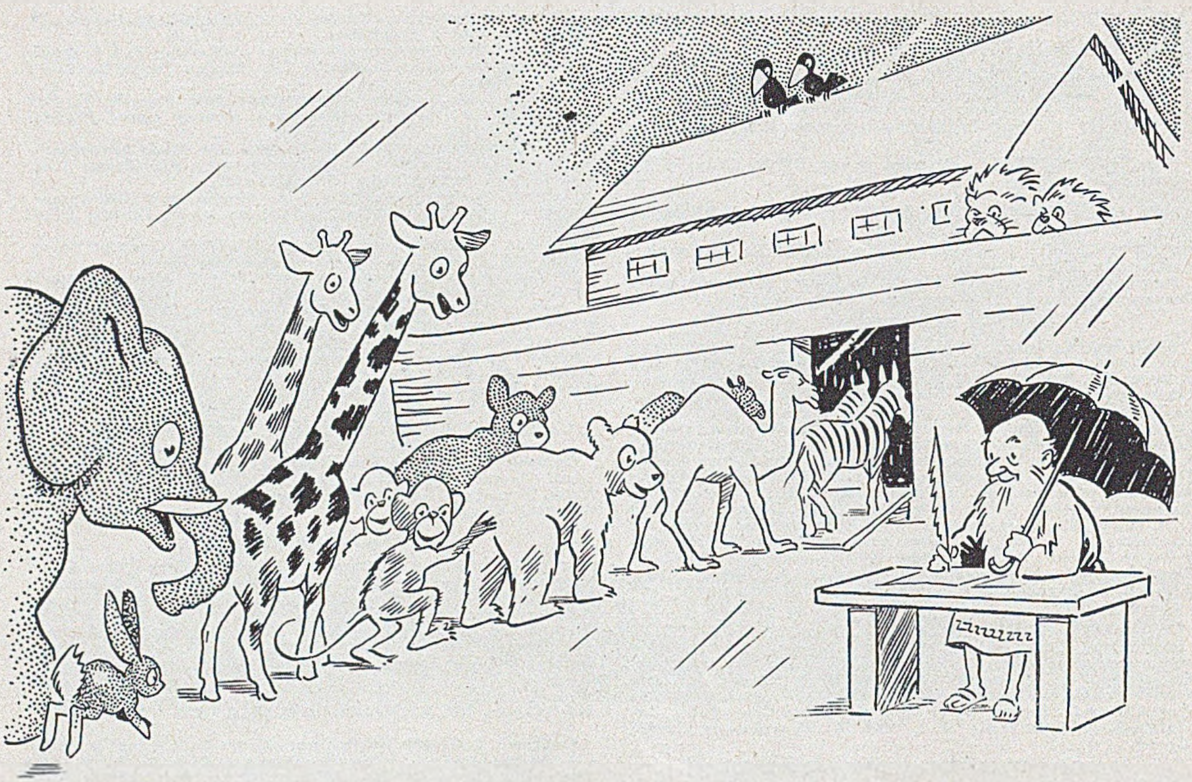

COVERING ALL KINDS – LARGE AND SMALL

No good supposing all requirements are the same. Even old Noah knew that. And in the present flood of foundry production difficulties August's stress their awareness of this whenever they are consulted.

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CONTENTS

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Thinking Around Statistics

The grey-iron foundry industry in Great Britain is to be congratulated on manufacturing in 1950 the largest quantity of castings ever made in one year. At 3,486,892 tons it exceeded the 1949 output by about 99,000 tons. The output of steel castings was 241,700 tons, as compared with 236,000 tons in 1949. The grey-iron industry employs about 148,000 people (140,444 process workers) which gives an annual production per person of the order of 24.8 tons, a slight increase on last year. We have been trying to make a comparison with American production, but we encountered the following difficulties. The figures available to us lump together all the productive workers in the iron and steel foundries. The American output seems to be of the order of 50 tons per man-year, which after adjustment would come somewhat nearer to British figures, but still considerably higher. Dozens of reasons ranging from beefsteaks to brains, climate to control, and matiness to mechanisation have been put forward. British efforts are, however, quite praiseworthy. During the war production was gradually decreasing. In 1940 it was about 2¼ million tons and decreased to less than 2 million in 1945. Since that time, there has been a spectacular yearly gain, but a constantly decreasing tempo. Whilst the increase in 1946 was over 500,000 tons, last year the gain was but 99,000 tons.

The best use that can be made of statistics is to help people to visualise future prospects. The ones quoted, examined in the light of the present political situation, indicate that modern war conditions make no outstanding demands on the ironfoundry, but they do require a greatly increased production of steel castings. However, production during a rearmament is not, and never will be, as during an actual war, and the impact of the former condition on ironfounding will not be as drastic as during the 1939-45 war. What will have a profound effect is the various shortages. The one at the moment causing trouble to a number of our readers is the dearth of hematite. However, by running the cupola on a Saturday morning on a suitably proportioned charge of steel and iron scrap, ferro-silicon, ferro-manganese, plus good cupola control, an iron can be made which will answer quite well.

The ironfoundry is used to hearing of competition from weldings, plastics, and various other processes, but the statistical position shows that no serious inroads have been made. However, last week we encountered a new form of competition. An engineer buyer had transferred his orders for heavy pressure resistant cylinder castings from the high-grade foundries to the ordinary jobbing shops. The castings he is now receiving are all treated by this "newish" plastic-impregnation process, and are stated to give better service results at a lower cost than those emanating from the "quality" foundries. This, indeed, is an unexpected form of competition! Mr. Tait told of a similar case of an American fettling shop converting poor-looking castings into the best saleable type. These, then, are factors not revealed by statistics, but are helpful in retaining business for the foundry industry. They indicate that co-operation with the customer may produce quite lucrative business. That is why last week we stressed the potentialities of surface treatment.

D

Correspondence

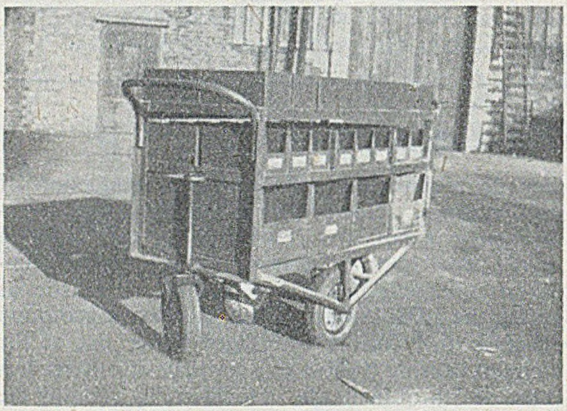
[*We accept no responsibility for the statements made or the opinions expressed by our correspondents.*]

GIVE THEM THE TOOLS

To the Editor of the FOUNDRY TRADE JOURNAL

SIR,—Your editorial "Give them the tools" which appeared in the January 25 issue of the FOUNDRY TRADE JOURNAL brings into the limelight a little problem of foundry servicing that has been of interest to us for some time, and you may be interested in our solution to this problem which has been in operation for the last 18 months.

It consists in sending a truck once daily on a tour of the foundry floor to service the moulder with sprigs, chaplets, parting powder, plumbago and all those little incidentals required in the preparation of moulds. I enclose a photograph of this foundry service truck known in the foundry as the "stop-me-and-buy-one" which as you will see is fitted with compartments which can be removed for filling when required.



"Stop-me-and-buy-one" Truck.

This little addition to the foundry's equipment will soon convince the works accountant that a little capital outlay, coupled with organisation, will remove much waste of materials and foundry executives' times in seeking for explanations to account for the lost materials which, incidentally, can usually be found at the back of the floor moulders' working place, rusty and useless.—Yours, etc.

H. B. FARMER,
Rice & Co., (Northampton), Limited.
Northampton.
February 24, 1951.

Productivity Increased 100 Per Cent.

With 300 fewer employees than in 1937, and working a 44-hour week, with no extended overtime, Ley's Malleable Castings Company, Limited, Derby, are now producing 647 tons of castings a week. Stating that the figure was an increase of 100 per cent. on the 1937 output, Mr. C. H. Hudson, works convenor, commented at a dinner given to 550 employees on Saturday last to celebrate 21 years' service by Mr. F. D. Ley, the managing director (reported in last week's issue), that the increase was "unique" in the annals of the industry. It was due to the good relations which existed between the workmen, the staff, and the management.

International Foundry Congress

Brussels, September 10 to 14

The International Committee of Foundry Technical Associations has entrusted the *Association Technique de Fonderie de Belgique* (A.T.F.B.) with the organisation of the International Foundry Congress of 1951. The A.T.F.B. has accepted this honour and cordially invites the associations which are members of the Internation Committee and all friends abroad, to take part in the Congress which will be held in Brussels from September 10 to 14, 1951, in the house of the Fédération des Entreprises de l'Industries des Fabrications Métalliques A.S.B.I. (Fabrimétal), 17, rue des Drapiers, Brussels.

During the Congress, the following International Committees will meet: (1) The international committee of foundry technical associations; (2) the international committee on foundry defects; (3) the international committee on testing cast iron, and (4) the international dictionary committee. All information concerning these meetings will be sent in due course to the affiliated associations by the hon. secretary of the International Committee: Mr. T. Makemson, M.B.E., St. John Street Chambers, Deansgate, Manchester, 3. Much attention has been given to the organisation of visits to plants so as to make visitors acquainted with the various foundry specialities in Belgium. A special programme will be established for ladies.

Papers

It is suggested that the following themes might usefully be discussed:—(1) The new cast-iron structures; (2) testing methods of cast iron and alloys; (3) light alloys; (4) the foundryman's daily problems and their influence on productivity, and (5) foundry education. The above list is not exhaustive, and the Committee may accept any Papers dealing with steel, iron, malleable and alloy founding. Papers not exceeding 10,000 words, should be sent in triplicate before May 15 to Mr. G. Halbart, c/o A.T.F.B., 17, rue des Drapiers, Brussels.

Papers will be published and discussed in French or English. They may however be sent in another language and the Committee will undertake their translation. Authors of Papers are requested to indicate the characteristics of diagrams, films, or other illustrations. All correspondence should be addressed to the general secretary of the International Foundry Congress, c/o Fabrimetal, at the address given above.

International Foundry Committees

The officers of the International Committee of Foundry Technical Associations for 1951 are:—*president*: Ir F. W. E. Spies, Wenchebachstraat, 9, Velsen, N. Netherlands; *vice president*: Dott. Ing. Guido Vanzetti, Fonderie Acciaierie Milanesi Vanzetti, Vie Nervesa 1, Milan, Italy.

The president of the International Committee on Testing Cast Iron is Prof. Dr. Mont. Frant. Pisek and vice president, Dr. Paul Bastien of Paris.

Metallic and Non-metallic Coatings for Grey Iron.—Mr. V. Delport informs us that the selling price of this book, which was reviewed in our last issue, will be 12s. 9d. His address is 2, Caxton Street, Westminster, London, S.W.1.

Under an Order made by the Board of Trade and operative from March 3, 1951, export licences will be required for some destinations for particular types of high-pressure valves, compressors, blowers and fans, and sulphur burners and pyrites furnaces.

A Compressor Foundry

This article, describing a " tied " foundry at High Wycombe, Bucks., producing mainly compressor castings, shows how layout and methods can be planned and developed in fine detail to suit limited ranges of production. A high standard of organisation has been applied to the fulfilment of the set conditions obtaining. Hand moulding is virtually eliminated; there is a large amount of coremaking and moulding, for both light and heavier work is segregated and well served with mechanical aids. With the greater specialisation, more elaborate planning is possible than for purely jobbing foundries, and much attention has been devoted to the provision of good working conditions.

THE BROOM & WADE foundry, which plays such an important part in that company's compressor output, was established in 1898 almost from the inception of the main works. Its up-to-date equipment and obvious efficiency is due in no small degree to the personal interest and direction of the chairman of the company, Mr. H. S. Broom, and to the good relations among the whole staff.

Keeping step with an ever-increasing demand, this section of the works now produces about 10,000 castings per week. Conveniently located, its two main sections for dry-sand and green-sand moulding are housed in two bays served by four overhead cranes of 5 and 2 tons capacity. In addition, a hand crane of 1 ton capacity serves the fettling shop. At the north end of the foundry, a battery of eight moulding machines is installed, consisting of four Coleman machines and four Pneulec Herman roll-overs. These machines are fed with sand from overhead hoppers. The moulds are cored up on short lengths of roller track, moved on to a moving-plate track, and cast whilst in motion at the pouring station from ladles of 5-, 8- or 10-cwt. capacity. The ladles are suspended from an overhead crane carrying them into the required position (Fig. 1). Alternatively, there is a monorail for pouring. Headers are knocked off soon afterwards and the moulds then travel on the track to the shake-out.

Large Castings Production

Large castings up to 25 cwt. are made in the dry-sand moulding section, where there are two 4,000-lb. and two 1,500-lb. Pneulec Herman roll-overs and an Osborn machine. They are located directly under large sand hoppers and are fed by means of a sand feed belt operated by push-button control. The company has found that by brush finishing the moulds a good appearance is given to the castings

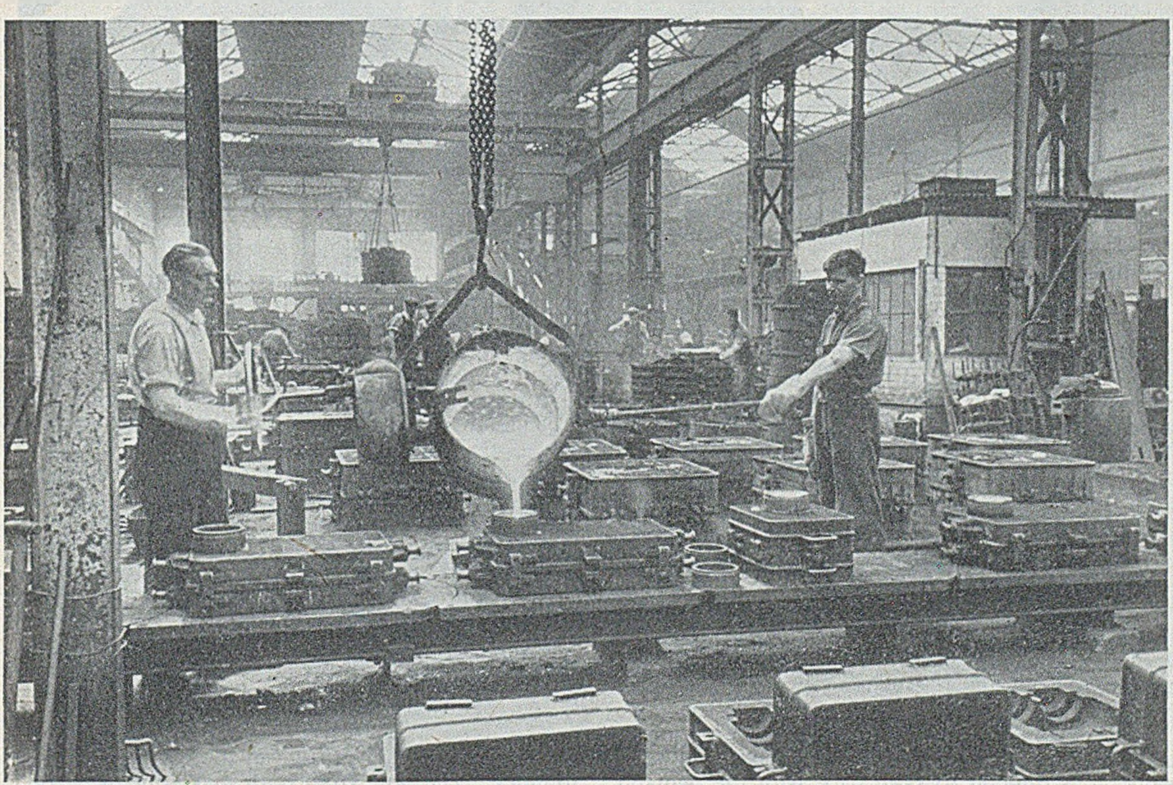


FIG. 1.—*Mould Conveyor on which all the Small Castings are Produced. In the illustration the Ladle is being handled from a Crane, but there is also a Ladle Monorial Track to relieve the Load on this crane.*

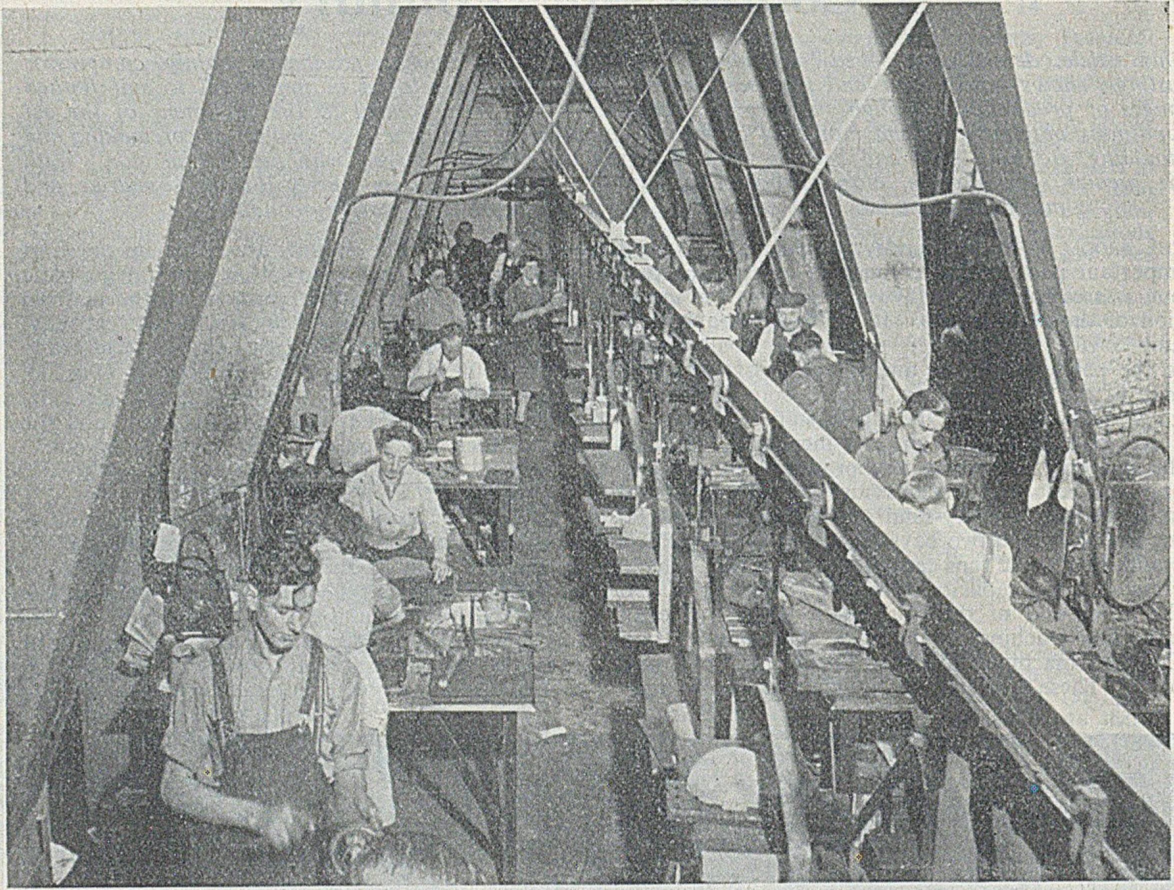


FIG. 2.—*Core-shop producing Small to Medium Cores; between the Rows of Sand Hoppers and the Core-makers' Benches runs a Pendulum Conveyor.*

and that this method is more economical than having to procure the same finish by excessive fettling. After finishing operations, the moulds are removed by crane to three large oil-fired drying ovens.

A notable feature is the elimination of hand moulding, which is now confined to one man engaged in the production of one- or two-off jobs. The amount of skilled labour is thus reduced to a minimum. Most of the 170 workers employed in the foundry were recruited locally or from the distressed areas of South Wales.

Core Shop

To cope with the enormous output of light cores required for the production of compressor parts, a very fine core-shop has been provided. This is efficiently laid out and is exceptionally clean, comfortable, and well-lighted. A large amount of high-quality work is produced, but the consumption of cores is so great that, despite the excellent team work, it is difficult to keep pace with the demand.

The steel work-benches are situated under sand hoppers which discharge the sand as required. Alongside is a pendulum conveyor track moving at the rate of 3½ ft. per min. (Fig 2). The sand used is a single mixture made up of washed Bedford sand, with Kordek and Permol as bonding agents, giving very satisfactory results. The cores, after removal from the two Acme stoves, are dried and then blacked. Drying of the blacking is effected on a pendulum track which travels through an infra-red stove. On emerging from this stove, the cores are taken off the track and loaded on to pneumatic-tyred trucks, of the company's own design, and transported to the moulders. Single-platform trucks are used for the large work and four-rack trucks for medium and small cores. Two core-blowers have been installed, one being an Osborn and the other a Ronceray. This shop produces cores up to 1½ cwt.; the heavier cores being made in the foundry itself, (Fig. 3), where one of the large mould-drying ovens is used for drying.

Sand Plant

The sand plant is situated at the south end of the foundry. The sand from both shake-outs is carried by belt conveyors to the reclamation plant, which includes three No. 2 Augusts mixers. Located nearby is a Fordath mixer for the core sand. Due to the large number of cores used every day, core sand is present in large quantities in the used moulding sand, with the result that a considerable amount of apparently good sand has to be discarded. Permeability is in the region of 100 to 120, so that from time to time it is necessary to add a fine sand. Staff are employed to keep a constant check on sand quality under a sand-control foreman. One mixture of sand is maintained for all work. Both green sand and dry sand are reconditioned with bentonite or Fulbond. The check for moisture is taken at the mill by the foreman and is kept to about 3·5 to 3·7 per cent.

An outstanding feature of the sand-handling arrangements is the success which has been achieved in controlling dust, by using a very fine spray of water at all points where a dust nuisance is encountered. The system has even proved entirely successful at the point where hot and dry sand is hoisted to the mills. Sprays have also been provided underneath the foundry floor to reduce to a minimum any dust that might arise in the sand falling off the turntable underneath the shake-outs.

Patternshop

A spacious patternshop is located on the first floor of the building which adjoins the foundry, a staircase linking the two. The shop has modern lighting and is steam heated. It is equipped with the usual wood-working machines and supplies the foundry with a large proportion of its requirements. However, patterns have also to be obtained from outside sources, particularly for the heavier work. Both iron and aluminium are used for jobs calling for metal patterns, the smaller metalwork being done on the premises. On account of its lightness, aluminium is generally preferred. Generous provision has been made for pattern storage, but a difficult problem is presented due to the very large number of patterns involved.

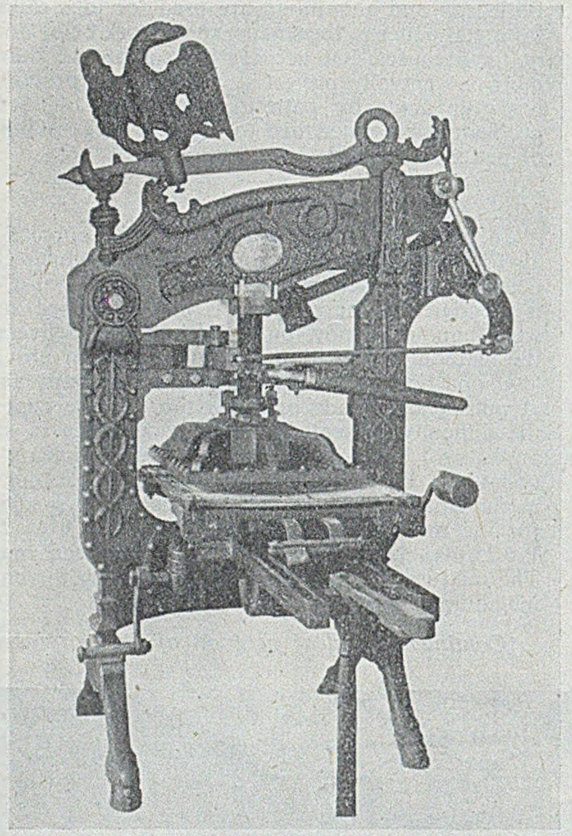
Metal

The melting equipment consists of two cupolas of 3½ tons per hr. capacity, and one unit which can deliver up to twice that amount. The stockyard, at right angles to the cupolas, is partly finished and, when equipment now on order has been delivered, the material for melting will be weighed at ground level and hoisted for charging. The company aims at putting one grade of metal through the cupola, the difficulty presented by the wide range in size and weight being overcome by a ladle inoculant to counteract the effect of the rapid rate of cooling in the smaller castings. The composition specified for the melt is T.C 3.35, C.C 0.45, Si 1.9 to 2.1, P 0.25 max., Mn 0.6 to 0.8, and S 0.1 per cent. max. The mixture is under close supervision by the chief metallurgist at every stage.

(*Continued overleaf at foot of column two*)

FIG. 3.—*Section of the Foundry Devoted to Heavy Core making. Fume-extraction Ducts over the Entrances to the Core-drying Stoves can be seen on the Right-hand Side.*

Historic Printing Press



The "Columbian" printing press illustrated above is among recent additions to the Birmingham Art Gallery and Museum. Of American origin, the design is representative of presses in use rather more than a century ago, being especially popular for book work. These machines were mainly produced in cast iron. The elaborate combination of ornament and utility shown in the "Columbian" was a typical phase in the transition from wood to metal for machine construction which was taking place at the time.

Australian Pig-Iron Prices

Prices of Australian pig-iron were advanced by £3 per ton on February 1, bringing the price for an average grade up to £13 2s. 6d. per ton. A correspondent, writing on February 12, giving this information, intimated that the price of coke was expected to be stepped up from its current figure of £6 2s. per ton within a week or two.

The price increases reflect a wage increase granted and made restrospective to December 1 last. Our correspondent says that as the full impact of the wage increase becomes felt the prices of both pig-iron and coke will move up to still higher levels.

LANARKSHIRE STEEL COMPANY, LIMITED, are to extend their Motherwell works at an estimated cost of £63,000, and Colvilles, Limited, are to erect buildings in the town at an estimated cost of £10,000.

More Unemployment

After falling for two months, unemployment increased during December last and reached the highest level for eight months. An increase of 31,800 brought the total out of work on January 15 to 333,600, compared with the March, 1950, figure of 347,300. There is normally a rise in unemployment during December, but figures issued by the Ministry of Labour show that the increase was much greater than in December, 1949, when it was only 6,700. This upward seasonal trend can be expected to continue for three months. The heavy increase at the end of last year, bringing the total to a level 3,300 above that of a year previously, may mean that the first effects of raw material shortages on employment are being felt.

While unemployment rose, the number of people at work fell—by 64,000 to 23,225,000 at the end of December. This fall, composed of 6,000 men and 58,000 women, is about the same in total as that which occurred in December, 1949.

There was a decline of 7,000 in the labour force of the basic industries during December, but the number of wage earners on colliery books showed a rise of 2,000 to 689,000. The metals, engineering and vehicles group showed a fall of 2,000 during the month to 4,086,000. The total employed in the basic industries at the end of December was 4,153,000, compared with 4,198,000 a year previously, while in the manufacturing industries the figure was 8,620,000, as against 8,406,000 at the end of 1949.

Forty Years Ago

In the FOUNDRY TRADE JOURNAL for March, 1911, there is a long illustrated description of the Wolseley Motor Car Works at Addeley Park, Birmingham, and nothing could show greater progress than comparison with to-day's counterpart. There was certainly a good gangway going through the foundry and extensive use was made of pattern plates. It shows a high, apparently in daytime, well-lit shop. A full account is given of the inauguration of the London Branch of the British Foundrymen's Association at the Institution of Mechanical Engineers. Mr. (later Dr.) Longmuir—the then president—officiated at a gathering of 50 people. Mr. J. Oswald was elected branch-president. It was reported that the Rustless Iron Company, Limited, were building a works at Lawkholme Lane, Keighley, and amongst new company registrations appears the names of Thomas Perry & Son, Limited, and H. Hollindrake & Son, Limited.

A Compressor Foundry

(*Continued from previous page*)

Castings are produced in good-quality cylinder iron and range in weight from a few ounces to 25 cwt. Many small castings are of heavy section, so that careful attention to moulding, running and pouring is essential. A large number of the castings are machined all over, with thick and thin sections lying adjacent to each other; therefore the quality of the finished work must be of a high standard. Components such as cylinders, cylinder heads, valves, etc., have to withstand a water pressure of about 120 lb. per sq. in. Both analytical and physical testing laboratories play an important part in the Broom & Wade foundry organisation. These are fully equipped for the rigid control necessary in this type of work.

Five-year Review of Iron and Steel Research

THE METALLURGICAL INDUSTRY in this country has always borne its full share in research work aimed at increasing the efficiency of operations and the improvements of the quality and versatility of its products. Reviews covering much of the modern research work in the British iron and steel industry are brought up-to-date by a publication entitled "Five Years of Co-operative Research, 1946-1950," recently issued by B.I.S.R.A.

Preparation of Raw Materials

Work has been carried out over the last three years on the crushing and screening of ores. The behaviour of jaw, roll and cone crushers with different types of ore, has been examined in various member firms and an adequate yet economical sampling method has been developed. The relation between the size of the lumps crushed and the fines produced is important in the selection of a crushing technique. A works in South Wales, for example, applied this knowledge and found that in their conditions the use of a jaw crusher instead of a double roll crusher at the primary stage resulted in a reduction of fines made from 12 per cent. to 2.5 per cent. of the whole. Full-scale investigation on production of sinter from wet Northamptonshire ore fines at the works of Stewarts and Lloyds, Limited, during the last three years falls into two parts—factors affecting the quality of the sinter and those affecting the rate of output. The first part required the design and installation of experimental engineering equipment, including part of its development for full-scale production. Observations made during periods of normal production and during experimental periods when additional control was exercised, have shown that the most important factors influencing the quality of sinter are the proportions and quality of the raw materials. Variations in the operation of the sinter plant have much less effect. The question about sinter quality has largely been answered; others concerning output remain.

Increasing supplies of fine grained concentrates present a problem of agglomeration, as conventional sinter plants can only deal with them at the expense of a reduction in output. Work is therefore in progress on other agglomerating techniques, particularly pelletising, which consists of passing fine ore of suitable size distribution and moisture content through a rotating drum, in which balls or pellets are formed and grow by a snowball effect. These can then be fired to give adequate strength for use in the blast furnaces. Enough has now been discovered about the strength, drying, firing and bonding of pellets to justify erection of a pilot plant at the Redcar Works of Dorman, Long & Company, Limited; this it is hoped will come into operation early this year. Here the particular problems related to continuous as opposed to batch operation can be studied, and data will be provided for subsequent full-scale operation.

Pig-iron and Steel-making

A knowledge of the actual and relative velocities of the gas within the blast furnace is important in assessing the advantages of the American development of high top pressure, the effect of which is to make the gas travel more slowly, giving more time for the reactions between the reducing gases and the burden in the stack. This gives quicker reduction of the ore and increases production. Radio-active radon gas has been used for measuring gas velocity through the furnace. Radon is projected into one tuyere by a small explosive charge, and sampling starts simultaneously at the furnace top. Successive samples of the gas are tested for radio-activity and the transit times of the gas are deduced and the difference in speeds at the centre and near the walls has been estimated. In the various furnaces studied the gas takes about seven times longer to pass through than had been thought.

Practical experiments on slag control by lime injection through the tuyeres have been carried out on a furnace working mainly on a mixture of home and foreign ores. Normally, when lime is added at the stockline the time lag between the additon and its effect on the slag is from 6 to 8 hrs. With tuyere injection, there is a delay of only 1 to 2 hrs. before the slag analyses show the maximum lime content. As much as 3 tons of lime have been introduced in 2½ hrs. at half the tuyeres without detriment to the hearth or significant change in lime content of the flue dust.

Furnace Design

The search for ways to improve production and economy in steel-making has led to the study of furnace design, equipment and operation. The open-hearth furnace, because of its predominance in the manufacture of steel, has been the subject of much of this work, and an experimental open-hearth furnace placed at the Association's disposal by the Shelton Iron, Steel & Coal Company, Limited, has played a large part in it up to the present time. A simplified and more efficient open-hearth design known as the "single uptake" furnace has been developed. The idea of a single air uptake terminating immediately below the gas port or oil burner (in place of two air uptakes leading into a conventional air port) is not new but seems not to have been seriously studied until it was brought before the appropriate B.I.S.R.A. committee. Several firms had been considering its use, but had insufficient evidence in its favour to risk a practical trial on a production furnace. Small scale trials were begun at the experimental furnace at Shelton, and most promising results were obtained there and later by fundamental work carried out on models by the Association and by the United Steel Companies, Limited. Now there are 18 single uptake furnaces in operation in at least 11 steel works and more are being installed.

Five-year Review of Iron and Steel Research

Experience has shown that this design gives rapid and increased production, better control of melting, and lower fuel and refractory consumption. Although a conventional furnace can often give a good performance in one or more of these ways, and it must also be remembered that major improvements in performance are seldom the consequences of one factor alone, the new design does appear to give the best combination of desirable features.

Refractories and Ingot Moulds

The most important recent development in the use of refractories is the incorporation of basic bricks for open-hearth furnace roofs. Four all-basic furnaces are in operation in the United Kingdom and detailed observations are being made to see how far greater output and longer life justify a construction cost of about three and a half times the normal. The work of the research committees on ingot moulds and casting practice has led to changes in the method of use and in the design of moulds leading to increased yield and life. For example, an inserted brick type of feeder head has been developed which gives reduced piping and which has a very low maintenance cost. Other investigations have emphasised the bad effect of setting moulds too close together in the casting pit; in one works mould life was increased by about 50 per cent. by simply setting two moulds on each bogey in place of the usual three. The relationship between the composition of the iron of which the mould is made and mould life has also been studied, and it is found that moulds up to four tons capacity last longer when made of iron combining relatively high phosphorus (about 0.25 per cent.) with low silicon (about 1.0 per cent.). Large economies could be effected at the soaking pits if a more exact method could be found than those now used for deciding how long the ingots shall remain in the pits. Time studies of the transport of ingots from stripping to the pits and mould and ingot temperature studies are being used in an attempt to reduce fuel consumption per ton of steel passed to the rolling mills. In connection with this work a radiation method of solving the difficult problem of measuring surface temperature of red hot masses of steel has been developed.

Fundamental Work

Regarding fundamental work, much of the heat transfer in the open-hearth furnace occurs by radiation from the flame. In work on this problem it is necessary to experiment on a furnace not very much smaller than those in which the radiation is to be predicted. Such a furnace with a flame about one-third as long as that of an open-hearth furnace has been made available by the Royal Dutch Steelworks for joint trials by scientists from France, Holland, Sweden and Great Britain. The Association is playing a leading part in this work, and collaborates with the British committee of scientists and industrialists concerned with the experiments by providing staff and equipment for the trials in Holland. The size of carbon particles responsible for the luminosity of flames is being measured and the ignition and combustion times of heavy fuels are being compared.

John Cockerill's New Furnace

The new blast furnace at the works of the Soc. Anon. John Cockerill at Seraing, Belgium, is of up-to-date design and is unique in its method of charging from the top by belt conveyor—the only one in existence. It is completely automatic, and any variation in charging can be carried out almost instantaneously. The furnace, and all its ancillary equipment, was started up at the end of last month, the inauguration ceremony being conducted by the director-general, Mr. Neef de Sianval.

The plant consists of modern ore-preparation equipment, with ore crushing, stocking, screening, and continuous sampling. There is also a continuous sintering machine, together with its necessary feeding bunkers and coke-preparation plant. A complete set of reinforced concrete bunkers is installed, together with all the necessary feeders and control gear, for adequately belt-charging three new blast furnaces.

The plant has taken approximately three years to complete, and was designed by John Miles & Partners (London), Limited, which company also supervised the erection of the entire plant.

Engineering Constructional Work Regulations

A pamphlet containing a revised preliminary draft of regulations under the Factories Acts, 1937 and 1948, as to safety, health, and welfare in connection with work of engineering construction, has been issued by the Ministry of Labour and National Service (Stationery Office, 1s. 6d.). This draft is a revision of a first preliminary draft published by the Ministry in October, 1945. Many of the amendments suggested were also relevant to the draft of a parallel code in connection with building operations. The points raised in connection with the building code have been cleared up and regulations have been made. In the meantime, the Ministry has given further thought to the parts of the code for work of engineering construction relating to diving operations and to work in compressed air.

Amendments of the 1945 draft now contemplated are numerous. A pamphlet containing the revised preliminary draft is therefore now published for study and consideration by persons affected, as a preliminary to conferences with the Ministry to consider and discuss points raised, before the regulations, revised in the light of such discussions, are formally issued in draft under the statutory procedure which has to be followed before they can finally be made.

B.S.F.A. Research Headquarters

The Research and Development Division of the British Steel Founders' Association has recently moved from its temporary address in Collegiate Crescent into more spacious premises at Broomgrove Lodge, Broomgrove Road, Sheffield 10. It is understood that Broomgrove Lodge is to be the Division's permanent administrative headquarters and that the acquisition of these new premises is an important part of the expansion programme of this research organisation, which as recently announced, has now assumed sole responsibility for collective research in the steelfoundry industry.

Core-blower Application and Operation*

By G. W. Fearfield

In this concluding section, recommended venting methods are discussed in detail as well as defects arising from poor venting. Thereafter, reinforcement, core permeability and the design of the blowing head are dealt with, followed by the Author's conceptions of desirable standardisation of coreboxes and blowing-plate holes. The Paper would be incomplete without reference to core driers or shells and points in this connection taken from experience are enumerated. Finally, methods available for boosting core production are listed in addition to a code of good practice. In the discussion, interest centred around drying shells, and their accuracy and life, resin-bonded blown cores, cleaning of boxes, reclaimed sand and the possibilities of using wooden boxes for blown cores.

(*Continued from page* 210)

Slatted and Gauze-type Vents

Possibly the simplest, most efficient and economical method of venting is by the use of slatted or gauze-type vents. They are positive, clean, easily fitted, easy to replace, and are produced in convenient sizes from $\frac{1}{8}$ to 1 in. The versatility of the slatted type makes it more widely adopted, as, due to its construction, it may be effectively blended to the contour of any core profile, thus materially improving its working quality. The gauze or mesh-type vent, whilst performing a similar function, does not lend itself so efficiently to blending and consequently is limited in its application. Irrespective of type, the location of the vents is of the greatest importance and requires careful study. From personal experience, it is suggested the first vents in any core-box be situated as close as possible to the parting line, this applying to both halves of any core-box. This arrangement has the effect of relieving the pressure strain at the parting line, again emphasising the desire to maintain as efficient a seal as is possible. The remaining vents may then be disposed relative to blowing holes, loose pieces, ribs, pockets, etc.

Experience here again must control the imaginative mind as to the flow and direction the sand will take on entering the core-box, thus deciding the location of vents. Some machine operators try to reduce to a minimum the vents employed, but this only leads to hourly variations during blowing. It may be experienced, after a job has been sampled and found to be satisfactory, that when production commences, certain failures occur, this being due to a tendency of vents "making up" with sand inclusions, when they become ineffective. By the addition of intelligently-placed extra vents, this trouble will be obviated. Faulty blown cores are often blamed on to low air-pressures, close investigation, however, reveals lack of sufficient venting area. In spite of this it is reiterated that pressure should be maintained at as high a level as possible.

Defects Due to Poor Venting

From these latter statements, it must not be concluded that indiscriminate venting will provide accurately-blown cores, on the contrary, over-venting leads to trouble. Where over-venting appears to have occurred, closer inspection may reveal that the same number of vents located differently would satisfy requirements. This implies that one should vent with caution, and experience will guide the choice of quantities.

The intricacies of certain specialist jobs may necessitate the placing of vents in the blowing-head plate, but again experience should be the controlling factor. Breathers or vents located in the cope half of any core-box should not be permitted to exhaust through the top face, but should exhaust to atmosphere at the side. To fulfil their task efficiently all vents must exhaust to atmosphere through easily accessible channels, and one is reminded at this stage of the necessity for core-box cleanliness. Regular cleansing of vents repays the effort in the form of a soundly made core, and in this connection a useful tool to employ is a ground hacksaw blade. The Author's method is to soak the core-box overnight in cold water, and this is followed by a good blow out next morning with the air gun, restoring the vents to their effective working efficiency. Prior to immersion in water, the dowels are treated with grease to prevent excessive corrosion. When it is found necessary to vent loose pieces, the rear face should be channelled, the grooves emerging to connect to atmosphere through the external face of the core-box. Placing of breathers at the furthest distance from the blowing holes is necessary to expel initial air from the core-box, enabling the extreme ends of the core to be correctly rammed and free from air pockets.

Reinforcing Agents

Due to the even ramming produced by the blowing machine, blown cores are considerably stronger than hand-produced cores, due to this also, and by careful study and design, reinforcing agents (rods, or wires) may be to a large degree eliminated, but it should be realised that quite apart from the strength required for handling under certain casting conditions it is often imperative that reinforcing wires be used.

To obtain the best results, it is necessary to include the wire or iron as an integral part of the core as blown. To achieve this, supports, located wherever possible in the core-prints, are constructed in the drag half of the core-box, and the cavity so formed is filled when necessary after withdrawal of the box from the core. Caution must be exercised in selecting the position of supports if success is to be

* A Paper read before the Lancashire Branch of the Institute of British Foundrymen, Mr. D. Fleming presiding.

assured. Where specially-shaped rods are used, it may be necessary to bed the rod in the drag-half in loose sand, prior to blowing. Under no circumstances must the blowing stream of air and sand tend to spring the rod, otherwise cracked or badly rammed cores will result. Trial and error appears to be the best guide before embarking upon routine production.

Gas Vents

Whilst a blown core is more permeable than a hand-rammed product, the necessity for artificial venting is not entirely eliminated and many methods of venting are practised. The simplest method is to allow the vent rod to rest in the extreme ends of the core-box. Where and when it is desirable to connect the vent through the end of the core-box, then extreme caution is necessary to prevent excessive blow out. The use of a female hardened dowel may be usefully employed in conjunction with a hardened bright steel rod, bringing the vent through the dowel (the latter being screwed into the end of the box), thus reducing the risk of sand erosion, and also allowing ease of replacement.

Combined venting and reinforcing systems should be given careful and prolonged trials, before embarking upon production, as any slight change with any existing satisfactory method may upset the whole efficiency of the job with disastrous results and in many cases it may be best to leave well alone.

Blowing Head

Possibly two of the most important parts of the core-blowing machine are the blowing head and the sand reservoir. When using a sand reservoir which has a larger surface area at the bottom than at the top, it also being without an agitator, there is a marked tendency for a tube or passage to be produced in the mass of sand after blowing, subsequently reducing the effective blowing area for each succeeding blow. Should blowing be attempted under these conditions, one discovers that possibly only two-thirds or three-quarters of the correct amount of sand enters into the core-box, this feature having a marked detrimental effect upon the walls of the box, reducing its life to a minimum.

These somewhat adverse conditions may be overcome by using a metal insert attached to the inside of the blow-plate and assisted also by a liberal amount of taper in the blowing hole. This simple attachment helps the sand to collapse over the blowing hole after each operation. The use of these devices, however, is restricted to jobs where equal blowing centres are used, and where interchangeability is not practiced on a large scale. A more efficient method is to blow different jobs in sequence, on a common blow-plate, using different blowing holes for each blow; it may be that the blow-plate may have twenty or more holes. To operate this method, it is necessary to use a blanking off plate on the core-box, thus saving many hours in changing the blowing-head plate. Combined with standardisation among core-boxes, this method can be a worthwhile production factor, completely eliminating the necessity for duplication of core-boxes and allowing four or five different cores to be blown by a team of operators.

Standardisation of Core-boxes

Standardisation of core-boxes enables the blowing machine to become more versatile in its application, and is advocated wherever possible. Standardisation requires core-boxes to be constructed of identical depths, heights and widths; though widths may vary with horizontally operated boxes. Three simple methods of incorporating these factors are:—(1) By increasing core-print size; (2) by suitable extra ribbing, and (3) by blowing two or more boxes side by side.

The last method is chiefly employed where narrow, vertically-parted boxes are used. Due to the minimum distance between the automatic clamps, it would be necessary to increase the width by ribbing of excessive proportions, and this then becomes a retarding factor in production. By blowing more than one core-box per cycle, it is not necessary that the boxes produce identical cores, this again reducing the necessity for duplicating the boxes. Where necessary, due to the fact that moulding-box restrictions as to depth may make it impracticable to increase core-prints, blanking off of the internal core-print in the core-box may be practised. Where horizontally-parted boxes are used, the standardisation of depth may be effectively carried out by a simple system of steel-faced aluminium runners. The blanking-off plate, mentioned earlier, is constructed of aluminium or steel, suitably drilled for its particular core-box. Fastened to the top of the core-box it is automatically registered under the blowing head, allowing only the holes in the blow-plate which are required to be brought into use when blowing. The location of the core-box under the blowing head is effected by a simple system of stops situated on the blowing-head plate, or, alternatively, where circuit teams are operating, a simple spring-loaded stop on the machine table may be used.

Blowing-plate Holes

Blowing-plate holes are usually from $\frac{1}{4}$ to 1 in. dia., depending upon the individual job, and are countersunk from the inside; they represent a simple and efficient method of control. Some operators prefer to slot out a section of the plate, but whilst this method may be successful, there is a very strong tendency for air to escape between core-box face and blowing-head, resulting in a loss of pressure and volume.

The clearance between core-box and blowing-head is $\frac{1}{8}$ to $\frac{3}{16}$ in., therefore core-box depth size must be accurately controlled. Necessity for machining the external face is more readily appreciated when one considers the clamping action between machine table to core-box, and core-box to blowing-head; each must be parallel to ensure even clamping pressure. Failure to consider and also to regularly check these points results in rapid shortening of the core-box life. Where vertically-parted boxes are used, it then becomes essential to use automatic clamps. Every precaution should be taken to ensure that the whole of the ribbed section of the core-box should be registered along its entire length against the machined face of the clamp. This, together with baffling, provides a constant protection against sand and air forcing a passage between faces of the core-box, and neglect to provide such outer facing will result in expensive repairs.

The totally enclosed and horizontally parted core-box with baffles has been found to give the best and most consistent results; the life of the box being good, and repairs amounting to only minor adjustments and replacements, *e.g.*, of vents, blow-tubes, protecting pieces, etc. It may be argued that this type of box demands the use of driers, or shells, but here it is suggested that this is not a deterrent, but a distinct advantage. More than one can hope to achieve is a really good flowable sand, combined with a high or reasonably-high green strength. It is appreciated that these two sand characteristics do not combine, so ultimately, unless shells are used there is ever present the danger of sagging. It is appreciated also that the cost of the apparatus suggested is heavy, but on the production figures obtainable, associated with reduced rates per piece, the initial outlay may be quickly recovered. It is true to say that a core-blowing machine is only as efficient as the equipment surrounding it, thus the necessity for high initial expenditure is made clear.

Where a foundry is employed on repetition work, and the executive decides that orders on hand justify metal pattern and core-box equipment, then it is suggested that provision should initially be made in the master patterns for adapting the core-box for the core-blower should the necessity arise. By utilising standardisation as described, it should be possible to offer a complete range for production requirements.

Driers or Shells

As will be appreciated from previous remarks, shells play a very important and prominent part in core-blower equipment, and as with the core-box, care in their construction and preparation of design will be well repaid. Shells are constructed frequently of aluminium, the clearance between the core and shell being kept to a minimum, the maximum clearance at any point being $\frac{1}{16}$ in. This ensures that an accurate reproduction of the core-box is obtained, and a core conforming to close tolerances can be produced easily and rapidly. The location of the shell is usually effected by the normal register of male dowels, which are $\frac{1}{4}$ in. less height than the half core-box. Provision is made in the master pattern for vent holes to be incorporated in the production drier, a very important factor, especially for the larger cores. Great care must be taken when sampling shells to ensure a perfect seating at strategic location points, otherwise costly castings will be scrapped. The quantity of shells required will be controlled by the rate of production allied to the time-cycle of the core stove. Also, when considering quantity, one should bear in mind that less reinforcing of cores is used when blowing; consequently it is desirable to allow cores to be cool before being removed from their shell, this preventing breakage at weak points.

One of the outstanding characteristics of core-blowing machines, operating over a period of two years, sometimes both night and day, was the small amount of maintenance that had been necessary, a factor that must not be overlooked. Possibly the chief contributory factor towards this was cleanliness, coupled with regular inspection and intelligent training of machine operators to use and understand the primary features of their machine.

At this stage, many readers may be wondering whether core-blowing is worthwhile; however, it is suggested that if orders are large enough and the producers are prepared to incur the cost of good equipment, then there is every reason to attempt core-blowing, which does undoubtedly open up new avenues of production. Given well-designed core-boxes, sufficient air pressure and volume, together with reasonable working conditions, it is contended that almost any medium-size core may be blown either wholly or in part. Having successfully produced a small quantity of cores by the blower, it is not sufficient to consider that all jobs can be tackled with confidence. From experience, it is advocated that any job going into production requires careful examining during the initial period, as unexpected obstructions occur, despite careful sampling, but by careful study and common sense, these snags may often be surmounted. This Paper is not presented in the vein of saying how to, or how not to blow cores, but is intended to convey methods and practices carried out under production conditions.

Boosting Production

Where maximum production is required, many methods of boosting are available. The number of operators to each machine will depend upon the layout of accessories to the machine. Three or four operators are usually sufficient, but as conditions change so must the disposition of labour vary accordingly. The common factors controlling the quantities of boxes and labour are as follows:—

(1) Sand supply; (2) ease of removal of the box from the machine; (3) number of loose pieces; (4) applying the shell and the turnover operation; (5) cleaning the box; (6) applying the vent and reinforcing rod, and (7) closing the box and returning it to the machine.

By the use of teams of operators, core-boxes may be placed rapidly under the blowing head (3 per min.), blown and discharged for stripping, and any operator will appreciate at this stage, good design and light core-box construction. Machines should be located as near as possible to core stoves, and their production should not be impeded by lengthy conveyor leads. A closed-circuit roller conveyor passing under the blowing head and forming a circuit around the machine provides a useful aid to production, the operators working on the outside of the circle. Whilst stress has been laid upon team operation of core-blowers, the use of one operator per machine must not be overlooked, or even underestimated. Production figures for one operator are high, and are an important factor during initial attempts at core-blowing.

Storage of cores in relation to the foundry consumption must be carefully considered, especially where cores produced on a given day are not used until two or three days hence. Ample rack facilities should be available to protect cores against abrasion. Heating, lighting, and height of storage should be carefully controlled to assist in preserving the quality of cores and for facilitating their removal at convenient times.

Conclusion

To sum up, the following may be suggested as useful guides to follow for good core-blowing practice:—

(1) Cleanliness;
(2) free-flowing sand;
(3) constant air pressure;
(4) ample volume of air;
(5) removal of sharp corners;
(6) breathers used with discretion;
(7) blowing holes as small as possible;
(8) regular checking of machine and boxes, and
(9) common sense.

Many may have better methods and ideas appertaining to core-blowing, and constructive remarks during discussion will be much appreciated.

Finally, the Author wishes to thank the directors and management of Ley's Malleable Castings Company, Limited, for permission to publish this Paper.

Vote of Thanks

The PRESIDENT said that Mr. Fearfield had adopted a somewhat apologetic attitude with regard to the practical nature of his Paper, but the Lancashire branch particularly welcomed the practical character of his contribution.

Mr. F. W. NIELD proposed that a very hearty vote of thanks be accorded to Mr. Fearfield for his Paper, remarking that what was desired by the members of the Institute generally was Papers prepared from a similar practical point of view. He had himself learned a very important thing during the course of the lecture, namely, that core-blowing was a specialised process in the foundry industry. Core-blowing must necessarily be a scientific process when there had to be 188 vents in a core box. They had heard so much of the high degree of American productivity that it seemed like a breath of fresh air to learn of the excellent progress which had been made in Great Britain. Core-blowing appeared to be as well advanced in this country as it was in the United States.

Mr. G. LAMBERT seconded the vote of thanks, observing that Mr. Fearfield had made it quite clear that he was an expert in core-blowing.

The vote was carried unanimously by acclamation, and suitably acknowledged by the lecturer.

DISCUSSION

MR. HULME mentioned that he had visited Leys Malleable foundry with which Mr. Fearfield was associated, and had seen the machines working, successfully. Personally, he had experienced considerable trouble with distortion of the drying shells in passing through the ovens. Could Mr. Fearfield state what life he expected?

MR. FEARFIELD said his firm had never had trouble with the life of a drying shell. The long-pole job, which was the first one made, lasted 2½ yrs. The only thing required was to send the shell for straightening about once every six months. As regards distortion and dimensional discrepancies of the contour of the drier, no trouble at all was experienced. With rather lengthy cores there was bending but beyond having the job straightened there was no more trouble.

MR. TATE enquired whether there had been a checking of the weight of a hand-rammed core as compared with a blown core.

MR. FEARFIELD said there was very little difference but the blown core was slightly heavier. As to dimensional accuracy, on their drying shells as nearly as possible, only $\frac{1}{16}$ in. tolerance at the top of the joint was allowed.

A MEMBER asked if the pressure in the corebox had been measured.

MR. FEARFIELD replied that an attempt had been made unsuccessfully to do this. He felt that a question of volume was involved as well as one of pressure.

Resin-bonded Cores

MR. COLWELL was in charge of a battery of core-blowers, using fine sand and phenolic resin, and working was very successful. No gas vents were inserted in the cores, and they dried in 55 min. at 350 deg. F (177 deg. C). There was very little trouble experienced in the foundry which of course was dealing with malleable material. Had Mr. Fearfield any experience with resin-bonded sand?

MR. FEARFIELD answered that his foundry had used resins with success, a typical mixture being Congleton sand 168 lb., cereal 13 lb. and resin 1¾ lb. The tensile strength of the cores was 124, 126, and 128, repeated, and there was a scratch test at 70 to 80. A fine sand proved rather sticky.

MR. COLWELL had experienced a great deal of sticking and had tried using paraffin and all kinds of powders and sands. One day, in sheer desperation, he tried rubbing the box with cold water. This was quite successful. The corebox was now rubbed with cold water, the film washed off and the corebox polished with a very dry cloth, and the treatment was satisfactory for quite a long time.

MR. FEARFIELD said that his firm soaked the coreboxes and cleaned the vents. A great deal of trouble with core-blowing occurred with the sand, but quite frankly no serious trouble had been experienced. No attempt was made to wash or clean the corebox with paraffin.

MR. LAMBERT mentioned that the Institute's technical council would be issuing very soon a report about the use of synthetic-resin for core-making which would contain a summary of the experience of a very large number of users.

Mr. Reynolds asked for details of the corebox vents.

Mr. Fearfield said the illustrations were more or less self-explanatory, one type being the slatted vent. There was available a certain thickness of the slatted-type vents, and it was possible to file or cut down to the shape of any gauze profile. If it was flat material it could only be bent so far. With very rapid blowing, such vents blew away. Reinforcing rods were bent to a master jig situated at the end of the table at which the operator worked. It was quite a simple and effective arrangement.

Use of Reclaimed Sand

Mr. H. Haynes had been very much impressed with the subject-matter of the Paper as he considered himself to be an amateur in core-blowing. It was extremely interesting to learn of the speed at which the work could be done, and also to be assured that the Americans could not excel the workers in this country in that respect. He had been recently studying the machine used in conjunction with reclaimed sand, which it had been said was impossible. As the result of using common sense he had now got into the knack of blowing with reclaimed sand, though not at the speed which had been mentioned by the lecturer.

Mr. Fearfield had no doubt heard about cores having " whiskers " which were present owing to the occurrence of strains. Did he get any such strains in his cores after they had been blown?

Mr. Fearfield said that the answer to the question was if you blew the core, you blew the core and the cores should not need to be touched after they were blown. The only core which was re-touched was the pole core of which an illustration had been shown.

The use of reclaimed sand was merely a matter of technique, and any difficulty associated with it could be solved by dint of practice. Possibly there was no one in the room who could definitely say how to blow a core, because each one had its own individual characteristics. The start had not been made with high speeds; those had been achieved over a period of years. The pole core really represented his firm's initial experiment, and the present speed with which it could be produced by the three operators was entirely a matter of technique. When they were blown on the machine the cores were sufficiently strong for ordinary use.

Metal or Wooden Coreboxes

Mr. Ainley as a patternmaker said wooden coreboxes did not appear to be suitable even though they were steel faced so that they would keep their shape and only metal coreboxes were satisfactory.

Mr. Fearfield answered that it was almost as cheap to make metal coreboxes, but with the cartridge-type of core-blower wooden coreboxes could be used. He had in mind a job made at the rate of 450 per hour, with a little modification to the machine, and by the addition of vents to the wooden corebox. Adding aluminium and pieces of cast iron to the corebox would of course add to its weight, and perhaps, make it rather more difficult to handle. On the other hand, if a master pattern could be made in the first instance, providing there was a suitably equipped machine-shop and patternshop available, it would be far less trouble to make a metal box. His firm, of course, were in the fortunate position of having a really good patternshop. The core-blower was only as efficient as were the accessories around it.

Mr. Wallwork enquired concerning the economics of core-blowing. What were the smallest numbers that Mr. Fearfield would consider blowing, and also what was the number normally blown.

Mr. Fearfield assumed that Mr. Wallwork referred to the vertical machine and not the cartridge type. Considering the manufacture of a special corebox for core-blowing, he would say 1,000 off was the minimum. At the end of the 1,000, if the job was a repetition one, it could soon be found out whether there were possibilities of further blowing the core. It was not possible to define what should be hand-produced cores or blown cores. The more that were made as time went on, the more the overheads would decrease by leaps and bounds.

A real problem with wooden coreboxes was not due to abrasive action but to the effect of moisture. As the wood tended to absorb moisture there was not possible the rapidity of draw associated with a metal box.

Answering another questioner, Mr. Fearfield said he had had no experience of metal spraying on the working surfaces of coreboxes.

Leicester Productivity Meeting

Organised by the Leicester and District Ironfounders Employers' Association, on February 16, an interesting gathering took place in the Kings Hall at the Grand Hotel, Leicester. Over one hundred and forty ironfounders, including directors, foremen, shop stewards and representative workmen met together for a meal, lectures and discussion with a view to increasing productivity. Guests present included Mr. Craddock, secretary of the Leicester and District Engineering Employers' Association, and Mr. Brooks, area representative of the Foundry Workers' Union. The visiting speakers were Dr. H. T. Angus of the British Cast Iron Research Association, and Mr. H. B. Farmer of Rice & Company (Northampton), Limited, both of whom had been members of the team which visited the United States about a year ago to study the reasons for the higher output per man obtained there. They were preceded and introduced by the leader of the team, Mr. S. H. Russell of Leicester. Mr. Farmer illustrated his remarks with lantern slides prepared from photographs taken in America. The chairman, Mr. C. M. Warren, kept the proceedings as informal in character as possible, and after the speakers had introduced the subject he threw the meeting open for questions and comments. This could have continued much longer than was possible, and it was with regret that the chairman had to close the meeting after a vote of thanks had been proposed by Mr. Taylor.

Because of nationalisation, the employees of the Lanarkshire Steel Company, Limited, Motherwell, may be deprived of their diamond jubilee celebrations, which should take place next month.

Book Reviews

"Basic Refractories," by J. R. Rait, D.Sc. Published by Iliffe & Sons, Limited, Dorset House, Stamford Street, London, S.E.1. Price 60s. 8d.

Dr. Rait is well known for his writings and thoughts on the constitution of basic refractories, and in this book he has collected together surely all the published and much of his own previously unpublished information on the thermal-equilibrium chemistry of those oxides which make up the basic refractory, used and unused.

For the specialists in such studies, and in promoting a more scientific outlook towards all refractories, not only basic, the Author has performed a welcome service. To the general reader, however, it is rather unfortunate that on the whole the book reads as a long, highly referenced Paper to a technical journal or, as the abstract indicates, as a thesis for a doctor's degree. It is essentially a reference manual, full of facts, results, theories, and detailed criticisms of other published work. The student, manufacturer, or user who buys this volume may well find his thoughts expressed in one of the verses of Hilaire Belloc:

"The question's very much too wide,
And much too deep, and much too hollow,
And learned men on either side
Use arguments we cannot follow."

It is important to bear in mind that the information contained in "Basic Refractories" has taken many years to collect and that even the latest information must be a few years old. These few years have been vital in the development of basic refractories, particularly in the production of magnesia from sea water and in the manufacture of chrome-magnesite bricks for the all-basic furnace. Dr. Rait has unavoidably missed a great deal of this post-war development and the book is, therefore, to some extent already dated. It is rather alarming, for example, to turn to Table 31 for "typical" seawater magnesia analyses and find some twenty samples of "Britmag" listed with an average lime content of nearly 6 per cent.! Apart from the unfortunate use of an accepted brand name, no basic refractory manufacturer would use such high lime material to-day when "typical" British seawater magnesia figures are down to almost 2.5 per cent.

The section on performance of basic refractories is interesting and instructive in its approach to the problem and in the treatment by the Author. Dr. Rait's theories of mechanism of wear will not find full acceptance by all technologists, but his views are at least respected and stimulating. The price of £3 for "Basic Refractories" is further proof that the cost of some technical books is to-day reaching fantastic levels. In spite of this there are many who should have a copy on their shelves.

The Practical Engineer Pocket Book (63rd year of issue). Edited by Mr. P. W. Moore. Published by Sir Isaac Pitman & Sons, Limited, Parker Street, Kingsway, London, W.C.2. Price 8s. 6d. net.

A book which has been published for such a long period must obviously have much to commend it. It is set out in 22 chapters very much like an ordinary text-book, but carrying mainly tabular matter, except in such sections as metallurgy where description has been used. A small French and German technical dictionary has been included, but the foundry side has been virtually neglected. This pocket book runs to about 750 pages, a mass which largely defeats its object. It is however sufficiently light in weight for an erector or mechanic to pack in his suitcase when jobs take him away from his workshop.

House Organs

Albion Works Bulletin, Vol. 8, No. 1. Issued by John Harper & Company, Limited, Albion Works, Willenhall, Staffs.

The influenza epidemic has caused a record high absenteeism throughout the works in recent weeks—a feature no doubt experienced generally. This issue, it is pleasing to record, details the considerable reduction in scrap returns from customers in 1950 as against 1949. This constant striving after quality is a major factor in keeping castings really competitive with components made from other materials. The issue as usual records the various social activities of the works and news of the personnel.

Murex Review, Vol. 1, No. 7. Published by Murex, Limited, Rainham, Essex.

This issue opens with a long article on Pioneers of the Modern Steel Industry. It makes interesting reading, but is somewhat unbalanced as the name of Hadfield has not been included. A second describes heat-resisting steels—heat-treatable, ferritic and austenitic are all covered. A few well-chosen abstracts complete the issue.

Broomwade News Bulletin, Vol. 14, No. 1. Published by Broom & Wade, Limited, High Wycombe.

This issue carries an announcement of a 45,000 sq. ft. additional manufacturing space, and an illustration shows the new shop in course of erection. Much of the balance of the contents is taken up with accounts of the efforts of the firm's agents to promote sales.

The Iron Worker, Winter. Published by the Lynchburg Foundry Company, Virginia, U.S.A.

This issue is a vivid reminder that tobacco comes from Virginia and half the issue is devoted to this industry, which was started in 1612. In the balance there are views and news—well illustrated—about the doings at the plant.

Publications Received

The Use of Aluminium Alloys in Structural Engineering. Published by the Aluminium Development Association, 33, Grosvenor Street, London, W.1. Price 2s. 6d.

This brochure assumes the aspect of a high-grade magazine. It is frankly publicity for aluminium, but it carries at the end a fair quantity of tabulated strength data. The two sections merit rather different treatment. The magazine part is designed to interest the reader, whilst the second is for conservation for future reference and application. Both sections are very nicely presented, yet the reviewer thinks that a well-bound data book, minimising the lettered specifications, would be welcomed by the designer to be a companion to the one they invariably possess covering steel sections.

Anuario Metalurgica de Zaragoza. Published by the Secciôn Económica Sindicato Provincial del Metal, Av Marina Moreno, Zaragoza, Spain.

This book covers the whole of the engineering industries of the city of Zaragosa. Amongst them are 21 iron and 29 non-ferrous foundries. It is very nicely presented, and we suggest the various Chambers of Commerce should write for a copy.

Suspension and Biscuit Strength of Titanium Enamels*

Discussion of Mr H. Laithwaite's Paper

Following the presentation of the Paper on "Suspension and Biscuit Strength of Titanium Enamels" at the Annual Meeting of the Institute of Vitreous Enamellers the CHAIRMAN (Mr. C. P. Stone) said there was no doubt the subject of Mr. Laithwaite's Paper was very important from every point of view. Before he put the Paper to discussion he would like to stress two items. One was the importance of clay and it was hoped by investigation to make available to the Institute a considerable amount of information.

The second point was the importance of water used in the milling of the enamel. It was found that different results with enamels were obtained in various parts of the country with the same grinding, and the reason for this was obvious, and had been confirmed by experiment. Water hardness varied from 10 parts per million at Keighley in Yorkshire to 400 parts per million in Leamington and this affected the mill addition considerably. Whilst, generally speaking, water hardness for a district was consistent, in the case of Liverpool, which took its water from four sources, it varied from 11.2 parts per million to 283 parts per million. This could account for considerable variation in results in the same town. It was hoped that this subject would receive the consideration of technicians and possibly the lectures at the Spring Conference would throw some light on this with advantage to the Institute.

DR. J. E. HURST (president) asked, with regard to biscuit strength, was the property measured purely the strength of the actual biscuit and not the adhesion of the layer to the metal underneath.

MR. LAITHWAITE said one of the things they had been concerned with in testing was to get a clean break in the biscuit layer itself and it was found in practice that the coating did not strip from the metal.

DR. HURST said it should be realised, the forces responsible for the adhesion were not the same as those responsible for the breaking strength.

Drying

MR. S. E. A. RYDER asked, when Mr. Laithwaite dried the layer of enamel, was it necessary to put the whole apparatus into the oven? Another point, when breaking the film of dried enamel on the disc, was there not a certain vacuum effect to be overcome and had that any effect on the results? He presumed from the description of the apparatus that there was no enamel between the disc and the platform, would Mr. Laithwaite confirm this?

In connection with the experiments in which milling time was varied, the fineness of the particles in the milled frit also varied, of course, and he would have thought that the effect of the particle size was probably of greater importance than the effects of the electrolyte or other ingredients. He would also like to know what was meant by the Na_2O content of the mill liquor; was it the total amount of sodium in solution or was it the titratable alkali?

MR. LAITHWAITE said the drying was done in an ordinary laboratory oven; it was important that it should not be done too quickly, but it had to be done thoroughly. There was no suction effect between the disc and the platform; both were perfectly ground and nothing could get between them. He had been interested in finding whether enamel finer than normal would improve the biscuit strength, but the figures did not show that. With the long milling times—ten or eleven hours—the enamel was very fine—finer than needed for commercial purposes. While fineness would obviously have some effect on the intrinsic strength of the enamel, the investigators were mainly concerned with the electrolyte effects, which seemed to be of far greater importance.

Effect of Urea

MR. S. HALLSWORTH said Mr. Laithwaite had disagreed with the American viewpoint on the addition of urea. It was somewhat surprising to find that he had found the addition did not affect biscuit strength, particularly when he mentioned that he had tried it on a production scale in addition to his tests. He himself had found that urea did help, and increased the biscuit strength. He would like Mr. Laithwaite's further remarks on this matter.

MR. LAITHWAITE stood by his earlier remarks. Their results had proved so contrary to all prognostications that they obviously had checked them very carefully and he was quite satisfied that the results achieved were reliable. It was possible that in practice the urea might affect other properties beneficially. His company preferred the use of urea to sodium nitrite, which was undesirable in its secondary effect in some cases. Urea seemed to prevent tearing troubles, but he was sure it had no effect on biscuit strength.

DR. H. W. WEBB (past-president) congratulated the Author on his interesting and ingenious approach to the subject. Since it was clearly a preliminary exploration of the field, he had no doubt that many of the points which had struck him in listening were already in the Author's mind for subsequent investigation. Some of the work with which he had been associated in ceramics, however, had some bearing on the lines of working and it might be helpful if he commented briefly on them.

* Paper presented to the 1950 Conference of the Institute of Vitreous Enamellers at Harrogate and printed in the JOURNAL, February 1, 1951.

Suspension and Biscuit Strength of Enamels

Grain Size and Effect of Alkali

There was shown a curve of the relationship between milling time and film strength. (Dr. Webb found a little difficulty in using the term "biscuit strength," as "biscuit" in ceramics meant clayware which had been fired once.) Milling time, in fact, involved at least three variables:—(*a*) grain size and hence packing density and surface of contact; (*b*) content of particles of size below the colloid limit which affected the thickness of the water film and drying shrinkage; (*c*) alkalinity developed in the suspension and consequently the degree of deflocculation of the suspension. All these factors affected film strength. Dr. Webb did not propose to discuss them in detail, but merely referred to one or two general points which might be of interest. First, if one ground a mixture of non-plastic materials of ordinary commercial fineness and a very limited amount of plastic clay, the tensile strength of the dried product would increase at first to a maximum and then fall. The result was probably explained by the increase in surface of the non-plastic particles resulting in a system in which there was insufficient clay to coat the particles with a continuous film. (The increase of surface of normal plastic clay on further grinding was very small, as the bulk of the particles were already below the colloid limit of size.)

If an aqueous suspension of non-plastic material and clay were deflocculated (*e.g.*, by alkalis), the tensile strength of the dried product would decrease with the increase in the degree of deflocculation. The two curves (viscosity and tensile strength) were almost parallel when a deflocculant such as sodium carbonate was used. By contrast, if a suspension of non-plastic materials and clay were flocculated, *e.g.*, by $CaCl_2$ or $MgSO_4$, the film strength of the dried product would increase. There were also secondary effects on defects such as cracking or tearing, as he thought the enameller called it, which he would not pursue.

The effect of a high proportion of sub-colloidal-size particles in non-plastic materials was rather peculiar. Owing to the greater thickness of the water film (which was, of course, influenced by the ions present), the material developed a greater drying shrinkage without any corresponding increase in tensile strength and consequently tended to crack more readily.

Dr. Webb then made a plea for getting away from screen tests as a measure of fineness. The really important grain sizes were those which passed easily through the 120- or 200-mesh sieves used. The small amount of coarse residues left on such sieves was not a good indication of the size distribution of the material which had passed through, and he doubted if it could be used in establishing any really scientific relationship with other factors. He had spent some time working out rapid methods of estimating the finer grain sizes, so that the previous criticism that such measurements took too long no longer applied.

Organic Additives

The use of additives, organic and otherwise, to give greater film strength to enamel must, of course, be well known. In ceramics the use of a chlorinated dextrin known under the trade name of Amisol had given good results; likewise, a cellulose sulphite lye (sold under the trade name of Likstract or in another form as Totanin) and polyvinyl acetate were also used. Some of these caused increased cost, of course, and methods of developing film strength by suitable clays and treatment and the right flocculating conditions should be tried before falling back on organic additives. He found it difficult to explain why some organic materials had such a profound effect on the tensile strength of a substance such as clay, and it offered an interesting field for research work, since it did not appear to be related to the quality of the additive as an adhesive.

Dr. Webb suggested that in quoting $Na_2O:B_2O_3$ ratios in relation to enamel slips, the ratios used should be molecular ratios and not ratios of percentages of each. In that way the figures could be much more informative. Finally, Dr. Webb said, although the Author had found that there was no obvious relationship between viscosity and film strength, he thought that the possible relationship between thixotropy and film strength might be investigated in some future work.

MR. LAITHWAITE agreed with Dr. Webb's remarks in regard to milling time and the practice involved, but his difficulty, in such a big field, was to pick the portion on which to concentrate. Rightly or wrongly, he had expended most of his effort on the effects of electrolyte additions.

Screen Tests

On the question of screen tests for fineness he could not altogether agree; he felt that basically both were after the same sort of information, but thought the viewpoints of the ceramic industry and the vitreous-enamelling industry were a little different. Generally speaking, enamellers did not mill their materials as finely as their opposite numbers in the ceramic industry. Slurries had been prepared by milling in different ways and different relative amounts of various particle sizes were obtained, with the same screen tests, but for practical purposes there was no appreciable difference in their behaviour. There was therefore no strong reason to induce enamellers to abandon the screen test; it had the merit of being quick and satisfactory. He had used Amisol and agreed it was very good, but a personal opinion was that enamellers only wanted biscuit strength up to a point and beyond that the higher biscuit strength of ceramics was a hindrance. Too high a strength in enamel defeated the object because, having put enamel on and dried it, part of it had to be brushed off. Also, too high a strength led to tearing. His own reaction to Amisol was that it was effective but more costly than other means available. With regard to the organic reactions, Dr. Webb had touched on a most interesting field. In progress at the present time in his own organisation was a much larger investigation on the relationship between viscosity and other properties of slurries, as part of a long-term programme.

Practical Requirements

MR. E. J. HEELEY asked about the term biscuit "strength" and thought some qualification was desirable as it appeared that the "shear" stress was being measured. The property of interest to the enameller was the ability of the biscuit to withstand handling without being damaged, and in this connection he would like to know if the shear stress was a suitable criterion.

MR. LAITHWAITE agreed that the term "biscuit strength" was used because it was familiar to the industry. The measure was of the ultimate shear strength of the material. His criticism of the American work was that the Americans did not measure tensile strength. Their bending test and determination of the amount of run-back in the enamel layer he thought was not a measure of anything relating to biscuit strength.

As to whether the conception of biscuit or shear strength was related to production, he had mentioned that in one instance it had been related to practical experience.

MR. A. R. PARKES asked if any observations were made of the atmospheric humidity when the tests were made, as this was surely a significant variable. Why was 100 deg. C. chosen for the drying temperature? It was very difficult to dry material properly at 100 deg. C. and residual moisture was said to be very critical in its effect. What degree of scatter of results would be caused by paying too little attention to those factors?

MR. LAITHWAITE pointed out that the drying temperature quoted in the Paper should have been 110 deg. C. That correction was worth making. As to the second point on humidity, he had mentioned that dryness did affect the result. If the specimens were allowed to stand and to absorb water it was quite likely that they would lose strength.

In the work described, the specimens were tested immediately after drying.

High-temperature Effects

DR. G. T. O. MARTIN was specially interested in the apparatus described and its development. In the discussion of the effect of urea, perhaps biscuit strength was being confused with biscuit hardness; urea undoubtedly minimised tearing. It would be useful to study the change in biscuit strength with change in temperature, and to see what happened as the temperature was raised and combined water was lost from the clay. It might be that effects not apparent at room temperatures became obvious at high temperatures.

MR. LAITHWAITE had not investigated this aspect. The point was interesting and he preferred to consider it further before expressing a final opinion but he saw no immediate reason for altering his conception of biscuit strength. Ware was handled in production and in brushing-off' and, if that operation could be performed safely that was the criterion.

MR. A. BIDDULPH said so often in the past technicians had concentrated on developing the frit and neglected the use to which the frit was put in the factory. While improvements in frit were necessary and were proceeding, he knew as a working enameller that even with a very good frit, unless the milling was satisfactory it could give a poor finish. The consideration of adequate biscuit strength and titania opacity he thought was a result of problems caused through the modern practice of using thinner enamel coatings and reduced amounts of clay to procure adequate acid resistance. The old type of enamel stood up to considerable abuse in handling and titania enamels milled and applied in the same way gave good results, but when later used with less clay their biscuit strength was not so good. While urea may not add to biscuit strength it may help to heal the damage at a later stage. In the use of urea, the suggestion that it should be added after milling was not sufficiently explicit. It should be added, surely, just before actual spraying.

MR. LAITHWAITE confirmed that modern enamels were intrinsically weaker than the older types. Urea hydrolysed very quickly and should certainly be added immediately before application and not immediately after milling, which perhaps his Paper seemed to suggest.

Drying Procedure

MR. BARKHOUSE, speaking on behalf of the practical enamellers, was disappointed to find so little attention given to drying procedure and its effect on the biscuit strength; it was the speed and temperature of drying which were critical. To his mind too-rapid drying was the reason for the failure of titanium enamels to stand up to normal handling during the brush edging operations.

MR. LAITHWAITE reiterated that the work was not complete. Very recently his firm had put on order quite an expensive piece of equipment for drying under carefully-controlled conditions. The present experiments were carried out in the laboratory under more or less standard drying conditions and the drying time was not really short. He agreed from the practical point of view, that a drier in which the humidity was too low and the temperature too high produced surface drying, giving a sort of shell-like surface, which was brittle, broke in brushing and caused considerable trouble. They had not investigated that problem but hoped to do so.

MR. BIDDULPH said the question had arisen recently as to how quickly one could dry a cream titanium acid-resisting enamel and what effect would drying very quickly have on the biscuit strength. A job was sprayed and immediately passed through a radiant heat drier. Complete drying was achieved in eighty seconds. The ware was then brushed in the normal way, and when fired showed no ill effects from the quick drying. This system was now in use on production quantities of ware.

Grinding

MR. T. TIDDER was interested in the speed of grinding. He thought the frit particle size had a

Suspension and Biscuit Strength of Enamels

lot to do with the biscuit strength and investigation might show it was possible to get more even grinding over a longer period. In other words, the grinding time should be extended and the ball loading of the mill controlled. Was there any particular thickness of biscuit in the tests outlined by the Author ?

MR. LAITHWAITE said that the tests were all carried out at or near a thickness of ten thousandths of an inch. The full conclusions of the experiments were not given in the Paper but were summarised.

ANOTHER MEMBER supported the view that grinding had a greater influence than was borne out by the Paper and also thought high-temperature tests would be useful. He considered that Amisol and polyvinyl alcohol both were useful for helping to withstand increased handling but that Amisol reduced gloss. Chemisol was used very widely in the ceramic industry and was markedly effective.

MR. LAITHWAITE was of the opinion that the question of grinding was a big subject on its own. He pointed out that in Table I it was shown that though the titania enamels were finely ground they were not excessively so. It was not purely a question of the size of the particles, though he agreed that particle size must play a part. On the question of high temperature, it might be that the effect of the urea was as suggested. It obviously had some beneficial effect, but in his organisation the biscuit strength of titanium enamels applied thinly was low and to have put it on twice as thickly would have made it handle better. What effect the urea had at a higher temperature he would like to know and hoped to learn in the not too distant future. He was satisfied that titanium enamels were not too strong in spite of finer grinding. The ground-coat tests had not all been done at the same fineness, some had been prepared at a fineness down to 6 gm. retained on 200 mesh.

MR. J. H. GRAY also stressed milling conditions. He mentioned the type and percentage of electrolytes added at the mill would vary considerably depending upon the sort of enamel used and the work to be processed, also the biscuit strength of the enamel would have to be adjusted depending on the class of ware to be processed.

MR. LAITHWAITE agreed that if "brushing" was not required the problem was changed.

Worthwhile Research

DR. H. HARTLEY underlined Dr. Webb's remarks on the need for tackling scientifically problems associated with the art of enamelling. It had to be realised at the outset that one was dealing with a complicated subject. The experimenter was faced with a problem of two competitive factors—particle size and electrolyte content. Being out of touch with the subject he was assuming that it was impossible for Mr. Laithwaite to vary both at will. Obviously, in his first attempt, he had tried to find a scientific basis for assessing the strength properties. The more discussion that was engendered, the better it would be for the technologist and the practical man. He was glad to have the opportunity of endorsing the type of work Mr. Laithwaite was doing.

THE CHAIRMAN said he had listened with great interest to the discussion and felt that the influence of clay and water had been dealt with at considerable length and that the discussion had thrown a lot of light on the question of biscuit strength and suspension media. He proposed a hearty vote of thanks to Mr. Laithwaite for his Paper, for the admirable way it had been presented, and for the way it had been received.

Institute of Vitreous Enamellers

Southern Section

The annual general meeting of the Southern section of the Institute of Vitreous Enamellers was held at the Howard Hotel, London, on February 21. The chairman, Mr. A. B. Kent (Sterling Vitreous Enamels, Limited), who has held that position for the past two years, had intimated that he would be resigning from the chair and nominations had been invited from members to fill the vacancy. The only nomination received was in favour of Mr. J. H. Gray (Stewart & Gray, Limited), who was therefore unanimously elected to this office. Mr. John Hooper (*Sheet Metal Industries*) was unanimously re-elected as secretary to the section and the executive committee, comprising Mr. B. B. Kent, Mr. J. J. Guy and Mr. W. E. Ebel, with the immediate past-president and honorary secretary as *ex-officio* members, was re-elected for a further term. The chairman, however, expressed the view that he thought it would be in the best interests of the section if service on the committee was restricted to two years only, so that more frequent changes in its composition occurred, and this proposition is to be further considered. The new chairman would take office from the beginning of the 1951-52 session in September.

Then followed a discussion on "Some Practical Plant Economies in View of the Imminent Shortages of Fuel and Raw Materials," which was introduced and led by Mr. E. Williams. Several references were made to current practice which was wasteful of materials and equipment, and a number of suggestions were put forward for reducing losses by such practices. This part of the programme was concluded with a vote of thanks to Mr. Williams, proposed by Mr. Ebel and carried with acclamation.

Following the technical session, the honorary secretary announced that on March 7 the section would be the hosts of the Institute for a one-day meeting in London at which a Paper would be presented by Mr. K. H. Broadfield, at the Charing Cross Hotel, on "The Enamelling of Hollow-ware," and in the afternoon of that day there would be a visit to the works of Frigidaire, Limited. The final assembly of the session would be the section social evening on April 19, a detailed programme of which would be announced later.

BORAX & CHEMICALS, LIMITED, faced with further increased costs of production, packaging, port-handling, delivery and, especially, ocean freight, are now under the necessity to increase prices, taking effect on April 1, by £2 10s. on borax (dekahydrate), £3 10s. on "Pyrobor" (dehydrated borax), and £4 on boric acid, all grades, per ton. During March the firm will supply, at prices now current, customers under contract with the proportionate monthly quantity and other regular customers on a basis not exceeding the monthly average of supplies during 1950.

Pattern and Core-box Repairs

By " Checker "

Pattern equipment needing repair and overhaul after large numbers of castings have been produced from it, often fails to get the required time spent on renovations necessary to put it into good condition again. The result is that before many more castings have been produced, the equipment has deteriorated to a state where it is difficult for moulds and cores to be made that are reasonably accurate in size and shape. Often, patterns and core-boxes are kept in production long after they should be returned to the patternshop for rehabilitation, possibly because no-one has sufficient authority, or will not take the responsibility of stopping the job which is in continuous operation, or, maybe, because castings are still getting through the inspection department. When, however, the job is eventually stopped for repairs, it may be found that a large number of scrapped castings have been made.

Repairs in the patternshop can best be carried out if patternmakers are at the outset fully informed as to the extent of repairs required to be done, or, better still, what time is available before the equipment must be back in production. Obviously, any large job needing considerable attention cannot be repaired satisfactorily if required in the foundry "first thing to-morrow morning" or "must be back for the night shift." This often happens, however, so that most of the available time is spent giving the pattern equipment a coat of paint, leaving little time for repair, a situation which is most unsatisfactory to everyone concerned. In many instances it is possible that a little planning would allow the equipment to be retained in the patternshop for a longer period so that a better and more lasting job could be effected.

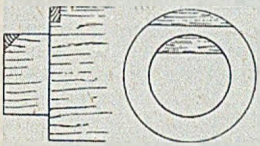


FIG. 1.—*Repairs to Core-prints by the Insertion of New Pieces.*

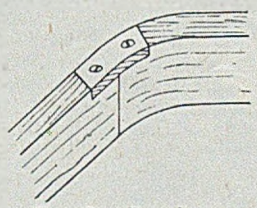


FIG. 2.—*Repair across the Joint of a Curved Pattern.*

Core-print Renewal

When repairing patterns, special attention should be given to all core-prints to ensure they are made up to their correct shape, and so guarantee that the original core seating is maintained in the moulds. When corners are badly worn, they could be restored by first slicing off a portion of the print at an angle to cover the affected part, then glueing and fixing with fine nails another piece of wood to form the original shape. This is a quicker and easier method than cutting back to form a shoulder, Fig. 1 shows an example of both methods. If two pieces of wood forming a butt joint, such as are used for constructing an outside curved web, should become broken or loose, they can be repaired and strengthened at their top by inserting a piece of wood across the joint, and securing it by glue and fine screws, as shown in Fig. 2.

With framed core-boxes, battens should be added to preserve the sides and ends where signs of wear from rapping are apparent, or if previously fixed should be replaced where necessary. Patterns made in softwood are better if repaired with a hardwood to give a more durable surface in those places where most required.

The use of aluminium or brass sheet-metal of approximately $\frac{1}{16}$ in. or $\frac{1}{8}$ in. thickness gives excellent protection if fixed on flat surfaces which are liable to show signs of wear, as illustrated in Fig. 3 on both core-print and pattern-face. Metal can also be used satisfactorily for facing coreboxes, especially on their sides, as shown in Fig. 4, to ensure sharp corners being maintained, and to eliminate any reduction in core length through the corebox faces becoming worn from continuous strickling off.

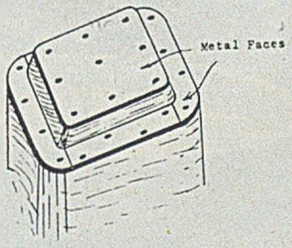


FIG. 3.—*Sheet Aluminium or Brass applied to Flat Surfaces.*

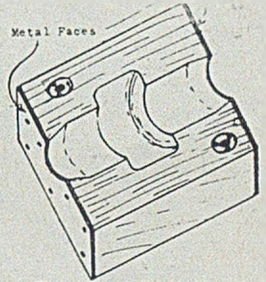


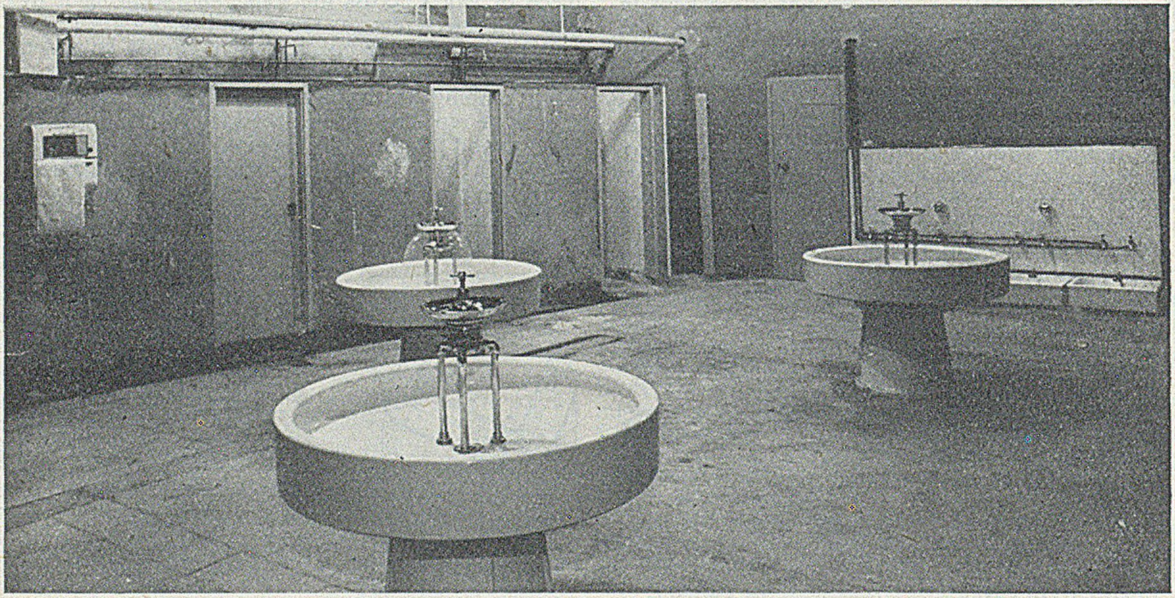
FIG. 4.—*Metal Facing for the Protection of Corebox Edges.*

Mr. Churchill's Visit to Sheffield

There is little doubt of the great welcome which awaits Mr. Churchill when he goes to Sheffield on March 5 to receive the freedom of the city. The 2,400 seats in the Oval Hall of the City Hall will not be adequate, and the proceedings will be relayed from there to the Memorial Hall, the Central Suite, and to the awaiting crowds outside. An illuminated copy of the resolution conferring the Freedom will be inscribed on a scroll of vellum placed in a handsome Sheffield-made cabinet of cutlery. The following night Mr. Churchill will be the principal guest at the 315th Cutlers' Feast, which will be held at the Cutlers' Hall.

More Foundry Amenities in Scotland

Shaw Glasgow, Limited, of Maryhill Iron Works, Glasgow, have installed spray bath and cloakroom accommodation for the benefit of its workers, at a cost of £3,500, part of which is shown in the accompanying illustration. The opening ceremony took place on February 7, and was performed by Lord Inverclyde. After the ceremony a luncheon was held, attended by Lord Inverclyde, representatives from two of the Maryhill foundries, trade union officials, representatives of the operatives, and the Company's managers. The premises are well equipped, and favourable comments have been freely made upon them by the operatives. The new baths are not an innovation, as the firm first installed such facilities some 30 years ago. The new building includes a very spacious locker room, with direct entry to the wash room, and a boiler room. Our illustration shows a section of the new bath room (still to be painted), with modern group wash basins, at which it is estimated that eight men can wash together. Foot baths are at the bottom of the room. The cubicles are of the double-compartment type, one compartment for dressing, the other for the shower. Continuous towel machines are fitted to all the walls. The new cloakroom accommodation is expected to provide for about 200 employees. The firm, which supplies flanged iron pipes to shipbuilders and power stations in many parts of the world, is at present engaged on a substantial order for the Braehead Power Station.



Parliamentary

Iron and Steel Corporation Membership

Mr. Errol asked the Minister of Supply whether he had yet received the resignations of those members of the Iron and Steel Corporation of Great Britain who were appointed primarily for the purpose of securing the vesting of the privately-owned industry; and what steps he was taking to appoint new members to the corporation to enable it to carry out its functions.

In reply, Mr. G. R. Strauss said he could not accept the implications of the question. He had not received, nor did he expect, any resignations from members of the corporation, whose appointments with one exception ran from three to five years. He was not at present making further appointments to the corporation.

Steel Production Figures

Asked by Sir Waldron Smithers if he would give an assurance that steel production figures would continue to be published on the same basis as at present, the Minister of Supply pointed out that statistical returns on the activities of the publicly-owned companies were primarily a matter for the Iron and Steel Corporation, and he understood that arrangements for future comprehensive returns were at present being considered.

Joining Athenæum Committee

Under a ruling which empowers the annual election of persons distinguished in science, literature, and the arts, or for their public services, Viscount Weir has been elected a member of the committee of the Athenæum Club. Chairman of G. & J. Weir, Limited, the Glasgow engineers and founders, he has held many offices of national importance. During the first world war Viscount Weir was Scottish Director of Munitions, 1915-16, and Controller of Aeronautical Supplies, and a member of the Air Board, 1917-18. In 1918 he served as Director-General of Aircraft Production at the Ministry of Munitions and during the same year he was also Secretary of State and president of the Air Council. The following year Viscount Weir became chairman of the Advisory Committee on Civil Aviation. His experience and knowledge again proved of great use during the late war, and in 1939 he was appointed Director-General of Explosives at the Ministry of Supply and in 1942 chairman of the Tank Board.

Honorary president of the British Employers' Confederation, in 1938 Viscount Weir founded the fracture clinic at Victoria Infirmary, Glasgow, and in 1943, to mark his 50th anniversary with G. & J. Weir, Limited, he donated a further £10,000 to the clinic.

Prohibited Uses of Copper, Zinc, and their Alloys

STATUTORY EFFECT HAS been given to the announcement made by the Minister of Supply on December 28 last about the prohibition of the use of copper, zinc, and their alloys in the manufacture of certain goods. Two Orders have been made, which come into operation to-day (Thursday). The Orders provide that these metals may not be incorporated in articles on the attached schedules. A number of amendments have been made since the provisional list was published by the Ministry of Supply on December 28, wherever possible in consultation with bodies representing the industries concerned.

Some inessential goods—such as cocktail shakers—previously omitted have been added to the list, and a few articles now regarded as essential—such as oil-lamp bodies—have been deleted. Some definitions have been revised to include small mechanical parts—such as rollers for curtain rails—and in a number of cases the wording of the definitions has been brought into line with trade practice.

Manufacturers may use until July 1 stocks of copper, zinc, and their alloys in fabricated or partly processed state, which they had in hand on March 1. The Orders cover alloys containing copper and/or zinc to the extent of 40 per cent. or more by weight. The Order therefore prohibits the use of brass, mazac, gilding metal and nickel silver, but not pewter. Dustbins are included as articles which may not be galvanised, but arrangements are being made administratively for the use of galvanised bins for containing food or for collection of waste food.

The issue of licences will be considered for special purposes, such as rearmament, or for ships or where anti-corrosive metal is a necessity. Consideration will also be given to articles in which very small amounts of zinc and/or copper are needed for essential purposes, such as for gear wheels. Applications for licences should be made in the first place to the regional office of the department concerned.

The Orders are:—The Copper and Zinc Prohibited Uses (Board of Trade) Order (S.I. No. 275, 1951), made by the Board of Trade for those articles for which it is the sponsoring department, and the Copper and Zinc Prohibited Uses (Ministry of Supply) Order (S.I. No. 277, 1951), made by the Ministry of Supply for all other articles.

Ministry of Supply Schedule

The schedule of prohibited uses under the Ministry of Supply Order is in two parts. Part I contains articles, the body of which may not contain copper, zinc, and their alloys, but which may be surface finished with these metals—they may be galvanised, plated, sprayed, etc. Part II consists of articles which may not contain these metals even as a surface finish.

PART I

NON-ILLUMINATED ADVERTISING.—Signs; equipment.

AGRICULTURAL AND GARDEN REQUISITES.—Forks; garden rollers; rakes; spray nozzles over 9 oz. in weight.

BUILDERS' HARDWARE AND FITTINGS.—Bells; door chimes (*except* current carrying parts).

Bolts of the following descriptions: Barrel—extruded, stamped; blind; cast; cranked; cupboard; door-reversible; espagnolette; flush; necked; spring; wardrobe; *except*—stamped or extruded brass barrel bolts up to 1 in. wide having steel shoots not sheradised—(*a*) in sizes 2 in., 3 in., and 4 in., overall length, and (*b*) having necked shoots in sizes 3 in. and 4 in. overall length; brass or bronze flush bolts in sizes 8 in. by 1 in.

Brackets; chains exceeding 16 oz. in weight per dozen yards; cills; cornice coverings; counter strips.

Door furniture—including centre knobs; door knobs, *except* stamped brass, $1\frac{3}{4}$ in. dia., cast brass or bronze, round $1\frac{3}{4}$ in. dia., oval $2\frac{3}{8}$ in. long, brass or bronze lever handles on plate up to 6 in. by $1\frac{3}{8}$ in.; door knockers; finger plates; kicking plates; name plates; numbers and number plates; postals with or without knockers.

Draught excluders; drawer pulls; expansion joints; fanlight joints; fanlight fittings: excluding gearing, brass pulley; floor plates and flooring strip; glazing bars; grilles; cutters and rainwater goods; handles: *except* brass or bronze door handles up to 9 in. overall length (measured without the backplate); hangers for sliding doors; hasps and staples; hinges: *except* lavatory seat hinges; hooks; linings; plaques; rails and railings; sash lifts, sash fasteners, and screws for either; sheathing; step treads; turnbuttons; weather vanes.

Window fittings—the following for standard metal window or cottage section or corresponding window executed in other materials—hinge or pivot: excluding the pin and collar; handle, handle plate: excluding the pin and striking plate; peg stay: excluding the knuckle and stay screw; sliding stay: excluding the top arm, barrel, and thumb screw; stay pegs: excluding the peg pin.

ELECTRICAL AND GAS EQUIPMENT, FITTINGS, ACCESSORIES, AND APPLIANCES.—Bodies and lids of—electric kettles, saucepans, coffee percolators, waffle plates, and similar portable cooking or water-heating appliances; conduit bushes and conduit fittings; conduit tubing: *except* conduit tubing incorporated in machinery; covers for tumbler switches; domestic fan—blades, guards; junction box covers; plates for—bell-pushes, sockets, switches; reflectors, guards, and ornamental parts, of electric radiators or of bowl fires; wiring clips; non-current carrying ports of wiring equipment, fittings, and accessories.

Shop's built-in—fittings, fronts, showcases; coin- or disc-operated machines for games; fun-fair machinery.

PART II

Air bricks; brackets other than gutter brackets; coal bunkers; door plates, door frames; gates, latches; gratings; iron castings other than malleable-iron fittings; manhole covers; railway spikes; scaffolding tubes, scaffold fittings; seed hoppers; wheelbarrows.

Board of Trade Schedule

The Board of Trade Schedule is also in two parts, Part I consisting of articles in the body of which zinc, copper, and their alloys may not be incorporated, but which may be galvanised or plated, and Part II articles in which zinc, copper, and their alloys may be not incorporated in any form—they may not be galvanised or plated. In the schedule below where a heading in the list is defined as including "an article" the inclusion is for the sake of illustration. All articles covered by the heading are prohibited.

PART I

BATHROOM AND LAVATORY FITTINGS.—Bath seats; bath trays; curtain rails; tumbler holders; mirror holders, except mirror clips; soap dispensers; soap holders; sponge holders; toilet paper holders; toothbrush holders; towel rails and holders.

DISPLAY EQUIPMENT, *except* clips and connectors for display stands.

DOMESTIC AND KITCHEN UTENSILS, FITTINGS AND ACCESSORIES.—Bottle openers; chestnut roasters; condiment containers; cocktail shakers; corkscrews; cruets and cruet stands; crumb brushes; crumb trays; domestic mops; dustpins; fruit dishes; funnels; hardware, except pot scourers and soap savers; hollow-ware, including bins, bows, buckets, and jugs; nut-crackers; serviette rings; table hollow-ware; tankards; tea caddies; teapot stands; toasting forks; trays; vacuum bottles; vacuum jugs.

DRESS AND PERSONAL ACCESSORIES.—Badges; beads, bead trimmings, and articles made from beads; clothes brushes; garment hangers; hair brushes; jewellery and artificial jewellery, *excluding* screw and snap posts, wire pegs, screws, rivets, catches of pin stems, and other fittings; jewellery boxes; jewellery caskets, excluding catches, hinges, and locks; key rings and key chains; lipstick cases; powder bowls; powder boxes and powder compacts, *excluding* catches and

Prohibited Uses of Copper, Zinc, and their Alloys

hinges; razor-blade sharpeners; razor cases; safety razor handles and guards; safety razor blade magazines and dispensers; shot lifts; shoe racks; shoe trees; slipper boxes; thimbles; tie presses; tinsel thread and tinsel braid; trouser presses; watch bands; watch bracelets; watch chains.

Fancy and Ornamental Articles for personal or domestic use not included elsewhere in this part of the schedule.

Garden Implements and Accessories.—Bird baths; flower baskets; garden ornaments; hedge cutters; hose reels; lawn sprinklers and lawn sprinkling systems, *except* spray nozzles not exceeding 5 oz. in weight; plant and flower supports, holders, and stands; shears; sundials; trowels.

Hearth Furniture.—Ash pans; bellows; coal boxes; coal buckets; coal helmets; coal hods; coal scoops; coal scuttles; coal vases; coal waterloos; companion sets; curbs; draught sheets or plates; fireguards and sparkguards; fire dogs; fire irons and fire iron boxes; fire lighters; fire screens; frets; hearth brushes; hearth plates; hearth stands; log boxes; trivets.

Furniture, Furniture Parts and Fittings and Articles Commonly Used for Domestic Purposes.—Bells (including call bells) or chimes; book-ends; book rests; book stands; Candelabra; candlesticks; mirror, picture, photograph, and other display frames and plates, *except* mirror clips; coat racks; clothes lines and racks and pulleys and reels therefor; curtain and portiere rails, rods and fittings, *except* for brass rollers for runners, hollow rings not exceeding 1 in. in dia., and sew on hooks not exceeding 16 oz. per gross in weight; deed boxes, *except* locks; door porters; fancy nails; fern and flower pots; furniture and furniture parts, not being musical instruments, office and industrial equipment, or designed exclusively for hospitals and other health services, for the storing or preparation of food, or for ecclesiastical purposes.

Furniture fittings; brackets; bureau and cocktail cabinet fittings and actions; castors; door and drawer handles, pulls, and knobs; door and cupboard buttons; escutcheons, other than thread escutcheons; fillets and plates; hinges, other than butt and piano hinges and butterfly hinges not exceeding 2 in. by 2½ in.; mirror movements; ornamental and decorative fittings; rails and rods.

Furniture nails; gongs (wall, table and tubular); hat racks; ironing boards and tables; magazine stands; moulding hooks; ornamental ware and ornamented ware; picture hooks; picture chains; picture wire; pipe racks; racks; stair carpet clips, holders, rods, and fittings; stationery cabinets, *except* locks; telephone directory holders; transfer cases; trays; umbrella stands; vases; warming pans; wastepaper bins; workboxes.

Illuminated Advertising Signs and Display Equipment, *excluding* transformers, cable, and other current carrying components.

Lighting Fittings and Accessories.—Ornamental lighting fittings, including table and standard lamps and lampshades, but *excluding* flex and current carrying components incorporated in such fittings, nose pieces and necks, nuts, screws and bolts, inserts for mouldings and nipples; lighting reflectors, shades, galleries, shade carriers, and suspension chains, but *excluding* nuts, screws, and bolts, inserts for mouldings and nipples.

Ornamental Brassware and Copperware and Imitation Antique Metalware.

Smokers' Requisites.—Ashtrays; cigar cases and boxes, cigarette cases and boxes, and articles of which such cases or boxes form a part, *excluding* catches, hinges, locks, and other fittings; cigarette rolling devices; match boxes, covers, and stands; matchbox holders; pipe cleaners; pipe scrapers; smokers' ash receptacles; smokers' stands; spill holders.

Sports Goods and Outdoor Games.—Discus; putters; winding mechanisms for tennis posts.

Stationers' Sundries.—Blotters; blotting paper holders; dispensers of adhesive tape, adhesive labels, and gummed paper; drawing pins; eraser holders; file eyelets and other file fittings; filing tags and laces; ink pots and stands; letter clips; letter openers; loose-leaf fittings; paper fasteners; paper knives; paper weights; pen holders; pen nibs; pencil holders; pencil sharpeners; pin boxes; propelling pencil barrels and caps; rubber stamp, ferrules, and mounts; rulers and rules; school geometry sets and school drawing instruments; screw binders; stamp boxes; telephone indexes.

Toys and Games containing more than 5 per cent. of controlled material by weight of the finished article.—Carnival novelties; children's toy apparel; educational toys: indoor games and accessories and apparatus or requisites for such games; models and model construction sets; musical toys; toy sewing, toy carpentry, and other toy handicraft sets.

Miscellaneous.—Bedpan sterilisers and racks; bird and pet cages and stands and chains therefor; ornamental cases and containers, excluding catches, hinges, and locks; statues and statuettes; tent poles and fittings, excluding eyelets.

PART II

Cinder sieves; coat hooks; contractors' greenhouse, paint, and toilet cans; dustbins; foot scrapers; garbage or refuse pails; garden or trug baskets; hand bowls; hat hooks; hods; lamp shades; manure bowls and jets; rubbish burners; scoops, scuttles; slop pails; tar buckets.

Notes from the Branches

London

At a meeting of the London branch of the Institute of British Foundrymen held in the Waldorf Hotel on Wednesday, January 31, with Mr. F. Tibbenham in the chair and Mr. A. R. Parkes, acting as secretary (in the absence through illness of Mr. W. G. Mochrie), Mr. A. B. Lloyd, director of F. H. Lloyd & Company, Limited, presented three films, illustrating his company's activities. They were entitled, respectively, "Flawless and British," "All Star Castings" and finally "And Now." In introducing these films, Mr. Lloyd, after expressing his pleasure at visiting the London branch, explained that the films were primarily commercial, but he hoped that they would contain points to interest members.

DISCUSSION

A short discussion followed the showing of the films. The questions were confined mainly to details related to the last film which dealt with the production and properties of castings in ductile iron. Points arising from the discussion included in answer to a question on the types of moulding sand used, that normal foundry sands and techniques were applied for ductile iron as for ordinary high-duty grey-iron castings. To a question concerning the annealing of the castings to improve physical properties, Mr. Lloyd emphasised that the new ductile iron could be used either as-cast or annealed, the latter grade being employed where highest ductility was required. For maximum wear resistance and where the highest ductility was not necessary, the material was used as-cast. For the annealed ductile iron, a tensile strength of 35 tons per sq. in. was obtained with an elongation of 15 to 20 per cent.

Some discussion centred around the relative cost of the new iron castings as compared with steel. Mr. Lloyd stated that, based on current experience, his firm were finding that a fettled casting in ductile iron cost about the same as a similar casting in steel. The subsequent processing of the ductile iron, however, including machining, was considerably less than for steel. Mr. Templeton (past-president of the Institute and of the branch) asked for information concerning the yield of castings when making them in ductile iron, steel and ordinary grey iron respectively. In reply, Mr. Lloyd stated that the yield of castings in ductile iron was lower than that of ordinary grey iron and approached more that of steel. In answer to a further point raised by Mr. Templeton, Mr. Lloyd emphasised that the new iron was cast by his company in green-sand moulds.

Other questions related to the melting practice involved and the composition of the raw materials used. Mr. Lloyd emphasised that his company used a normal acid-lined cupola but stated that they were interested in the possibilities of a basic-lined cupola, as the low sulphur content in the metal as then tapped led to economy in the amount of additional alloy required. A further point which emerged was that on re-melting in the cupola, the typical structure of the ductile iron and its magnesium content would be lost. Otherwise, the melting practice was similar to that for ordinary high-duty cast iron, although it had been found desirable to use specially-selected pig-iron.

Dr. A. B. Everest, in proposing a hearty vote of thanks to Mr. Lloyd, drew attention to the fact that he had been the technical director of the films which they had seen, and he complimented Mr. Lloyd on his success in this rôle. Mr. Barnard seconded, and stated that, having visited Lloyds' foundries, he had found the films of particular interest.

News in Brief

PERMISSION HAS BEEN RECEIVED by Henry Wilson & Company, Limited, to erect a foundry at Marl Road, Kirby Trading Estate, Simonswood, Lancashire.

WORK costing £40,000 will begin shortly on extensions to the fabricating shop and the erection of a new fitting shop at the works of R. & W. Hawthorn, Leslie & Company, Limited, Hebburn.

FOR THE FIRST TIME since the war, Great Britain will be represented by a national stand at this year's *Foire de Paris*, the Paris annual international trade fair, which will be open from April 28 to May 14.

A FOUNDRY in operation until the early part of this century at Louth, Lincs., is recalled by the discovery of a notice relating to the foundry on a door at a furniture shop in the town during painting work.

IT WAS STATED at a meeting of the Western New York Chapter of the American Foundrymen's Society that 70 foundries in the United States and 30 in Europe were making cupola-cast nodular iron castings.

THE ADDRESS of the Central Price Regulation Committee as from to-day will be Clive House (7th Floor), Petty France, London, S.W.1 (telephone: Abbey 8010). The committee's office will be closed on that day, reopening on Friday.

THE DIRECTORS of N. Greening & Sons, Limited, wire manufacturers, of Warrington, propose increasing the authorised capital of the company to £500,000 by creating 800,000 ordinary shares of 5s. each. No further issue is contemplated in the immediate future.

INCREASED PRICES for antimony came into effect on February 19. The new prices are as follow, the amount of the increase being shown in parentheses:—Crude, £275 (£25) per ton; refined, 99 per cent., £360 (£35) per ton; refined, 99.6 per cent., £372 10s. (£35) per ton.

DORMAN SMITH HOLDINGS, LIMITED, has acquired a modern iron foundry which will be operated by its wholly-owned subsidiary company, John Booth Foundries, Limited, Preston.

UNDER THE AEGIS of Fabrimetal, the Belgian organisation which caters for the general interests of the foundry industry, a grey-iron productivity team has left for the States. It is headed by Mr. G. Halbart, a vice-president of the *Association Technique de Fonderie de Belgique*.

A TWO-DAY TOUR of factories of the Brush-Aboe group of companies has just been completed by a party of nearly 60 journalists from 26 countries. Intended to emphasise the importance of the group's part in the export drive, the tour covered the factories of Henry Meadows, Limited, Brush Electrical Engineering Company, Limited, and Mirrlees, Bickerton & Day, Limited.

THE MEEHANITE METAL COMPANY (SA) (PTY), LIMITED, have concluded servicing agreements with H. Incledon & Company, Limited, of Johannesburg and Benoni, and with Johnson & Fletcher, Limited, of Southern Rhodesia. The former company represents Blakeboroughs of Brighouse and the latter have a plant at Gatooma catering for the needs of that rapidly-growing industrial area.

TO MARK THE SUCCESS of the Coalbrookdale Company in being the first of the five firms in the Shropshire group of Allied Ironfounders to win the president's trophy put up for competition between the companies by Mr. F. O. Lander, a celebration dinner was held on Thursday last in the canteen at the Coalbrookdale works. The placings of the five companies were:—1, Coalbrookdale, 28 points; 2, Aga Heat Company (24); 3, Sinclair Iron Company (15); 4, James Clay, Limited (12); and 5, Allied Rainwater (11).

Personal

MR. R. S. HUDSON has been appointed chairman of the Conservative Party's Trade and Industry Parliamentary Committee.

MR. ROBERT JAMES EYRES, a director of J. & S. Eyres, Limited, ironfounders, etc., of Manchester, has been chosen as the prospective Liberal candidate for the Oswestry Parliamentary Division.

MR. H. H. JUDSON, who once came to England to present the American Exchange Paper to a meeting of the Institute of British Foundrymen, has been appointed plant manager of the Kencroft Malleable Company of Buffalo, New York.

MR. GEORGE DARLING, M.P., has been appointed Parliamentary Private Secretary to the Minister of Supply, Mr. G. R. Strauss. Mr. Darling was the BBC's industrial correspondent before he entered the House of Commons at the last election.

MR. EDWARD H. PATTERSON, who has been appointed general manager of R. Y. Pickering & Company, Limited, railway wagon builders, etc., of Wishaw, served his apprenticeship with Brown Bros. & Company, Limited, makers of hydraulic machinery, etc., of Edinburgh, and from 1925 was with G. & J. Weir, Limited, the Glasgow engineering firm.

MR. ELLIOTT A. EVANS, Chief Chemist of the Wakefield group of companies, has retired. He joined C. C. Wakefield & Co., Ltd., in 1915 and is well known for his pioneer work in the use of metallic soaps in hydrocarbon oils. Mr. Evans is a past-president of the Institute of Petroleum and is, at present, chairman of the automotive division of the Institute of Mechanical Engineers. Consequent upon Mr. Evans' retirement, the following appointments within the Wakefield group are announced:—MR. G. H. THORNLEY, to be technical manager; MR. P. W. L. GOSSLING, laboratory manager; MR. J. S. ELLIOTT, research chemist, and MR. N. E. F. HITCHCOCK, development chemist.

Obituary

MR. WILLIAM HEPBURN. MCALPINE, chairman of Sir Robert McAlpine & Sons, Limited, building and civil engineering contractors, has died at the age of 79. His name is chiefly associated with the building of the Methil Dock (about 1910), and the new entrance lock and dry docks at Tilbury in 1928.

MR. G. E. MASON, who died recently at Colwyn Bay, had the distinction of being the first apprentice of the Lancashire Dynamo & Motor Company, Limited —now Lancashire Dynamo & Crypto. He first joined the company in 1899. In 1908 he went to Canada and a year or two later became the first president of the newly formed Lancashire Dynamo & Motor Company of Canada, Limited. Returning to this country in 1916 he became a director of the home company and in

MR. HARRY PARSONS, who died at his home near Southampton February 17, was a distinguished motor and marine engineer. Early in his career he was chief designer for the Rudge Whitworth Company, Limited, and later became manager of the Beeston Motor Works. He handled many early makes of motor-cars. In 1904 he founded the Parsons Engineering Company, Limited, at Southampton, and the company's products, especially the Parsons marine engine, became world famous. He was a past-president and an honorary director of the Southampton Chamber of Commerce, of which he was a member for 41 years. Mr. Parsons was vice-president of the Association of British Chambers of Commerce and from 1923 to 1944 he was chairman of Southampton Harbour Board, during which period the Empire air base was established. He was 79.

Imports and Exports of Iron and Steel in January

The following tables, based on Board of Trade returns, give figures of British imports and exports of iron and steel in January, 1949, 1950, and 1951.

Total Exports of Iron and Steel

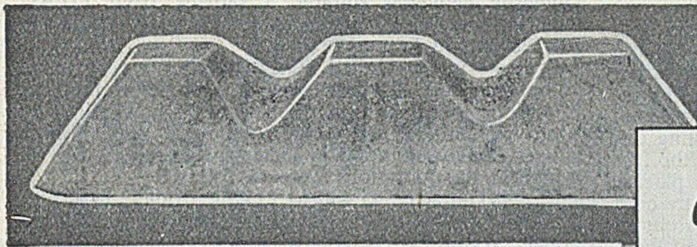
Destination.	Month ended January 31.		
	1949.	1950.	1951.
	Tons.	Tons.	Tons.
Channel Islands	1,018	776	609
Gibraltar	111	149	47
Malta and Gozo	486	490	317
Cyprus	360	189	701
Sierra Leone	559	403	253
Gold Coast	1,128	3,193	1,904
Nigeria	2,232	5,720	5,643
Union of South Africa	13,786	9,378	12,829
Northern Rhodesia	899	2,159	1,930
Southern Rhodesia	1,968	5,922	3,019
British East Africa	5,008	8,095	9,077
Mauritius	513	1,104	581
Bahrein, Kuwait, Qatar, and Trucial Oman	3,026	506	326
India	6,418	6,905	11,217
Pakistan	1,642	3,414	5,187
Malaya	4,438	9,138	6,613
Ceylon	1,519	2,820	3,067
North Borneo	1,940	873	158
Hongkong	2,750	4,141	7,586
Australia	9,421	23,615	42,722
New Zealand	8,806	17,509	15,075
Canada	1,993	7,575	13,710
British West Indies	7,403	4,838	5,040
British Guiana	393	595	559
Anglo-Egyptian Sudan	1,009	1,622	930
Other Commonwealth	928	1,133	976
Irish Republic	5,436	5,782	7,465
Soviet Union	3,466	53	71
Finland	8,682	6,187	3,137
Sweden	4,610	6,919	6,594
Norway	6,152	6,320	7,803
Iceland	527	946	265
Denmark	8,160	13,292	8,689
Poland	108	63	149
Germany	124	58	125
Netherlands	10,986	5,239	8,099
Belgium	813	1,039	1,235
France	3,765	1,073	1,117
Switzerland	1,834	643	1,181
Portugal	1,380	1,082	1,475
Spain	384	729	312
Italy	142	709	1,155
Austria	37	62	75
Hungary	10	81	23
Yugoslavia	31	1,859	1,158
Greece	308	578	538
Turkey	947	871	117
Indonesia	1,454	2,678	759
Netherlands Antilles	350	1,601	347
Belgian Congo	28	103	227
Angola	109	486	380
Portuguese East Africa	516	430	299
Canary Islands	309	156	95
Syria	65	18	358
Lebanon	4,065	905	1,070
Israel	1,193	1,856	1,981
Egypt	5,684	5,372	3,905
Morocco	21	26	1,124
Saudi Arabia	655	202	39
Iraq	3,899	3,271	2,413
Iran	11,989	11,595	5,264
Burma	1,649	689	1,136
Thailand	457	679	519
China	528	270	1,523
Philippine Islands	138	1,671	911
USA	898	449	17,915
Cuba	66	185	677
Colombia	629	422	1,054
Venezuela	6,320	4,817	2,862
Ecuador	344	364	61
Peru	322	888	1,265
Chile	919	2,112	1,523
Brazil	1,577	3,857	2,666
Uruguay	703	965	3,838
Argentine	7,275	7,592	6,237
Other foreign	1,348	2,608	2,254
TOTAL	191,166	232,120	264,101

Total Imports of Iron and Steel

From	1949.	1950.	1951.
	Tons.	Tons.	Tons.
India	—	10,498	—
Canada	4,557	3,411	4,514
Other Commonwealth & Irish Republic	244	452	65
Sweden	2,196	943	1,890
Norway	4,386	2,470	4,179
Germany	238	7,679	1,282
Netherlands	6,721	3,232	6,169
Belgium	21,526	4,671	10,220
Luxemburg	1,447	345	8,152
France	15,275	29,012	23,257
Austria	1,068	—	14
USA	4,819	4,735	4,090
Other foreign	130	1,141	165
TOTAL	62,607	68,589	63,997
Iron ore and concentrates—			
Manganiferous	5,750	—	—
Other sorts	548,039	675,751	591,092
Iron and steel scrap and waste, fit only for the recovery of metal	88,416	167,593	85,560

Exports of Iron and Steel by Product

Product.	Month ended January 31.		
	1949.	1950.	1951.
	Tons.	Tons.	Tons.
Pig-iron	266	2,266	3,535
Ferro-alloys, etc.—			
Ferro-tungsten	142	79	100
Spiegeleisen & ferro-manganese	604	366	195
All other descriptions	47	324	165
Ingots, blooms, billets, and slabs	60	358	1,438
Iron bars and rods	633	516	1,013
Sheet and tinplate bars, wire rods	378	302	2,093
Bright steel bars	2,844	4,158	5,670
Alloy steel bars and rods	1,516	1,412	1,646
Other steel bars and rods	14,442	25,298	24,789
Angles, shapes, and sections	9,983	9,889	17,052
Castings and forgings	655	1,089	975
Girders, beams, joists, and pillars	2,325	3,518	3,799
Hoop and strip	5,699	4,597	7,547
Iron plate	184	428	88
Tinplate	16,122	17,992	25,528
Tinned sheets	554	205	277
Terneplates, decor. tinplates	10	27	103
Other steel plate (min. ⅛ in. thick)	15,071	23,013	20,878
Galvanised sheets	7,345	11,243	9,033
Black sheets	12,952	10,990	12,894
Other coated plate	422	938	885
Cast-iron pipes up to 6 in. dia.	6,231	7,495	5,979
Do., over 6 in. dia.	5,504	7,449	5,387
Wrought-iron tubes	27,856	29,625	30,708
Railway material	13,818	16,968	22,217
Wire	4,194	5,615	7,458
Cable and rope	2,148	3,189	2,433
Netting, fencing, and mesh	2,190	1,958	2,201
Other wire manufactures, incl. nails	1,495	1,869	3,208
Other nails, tacks, etc.	807	391	1,038
Rivets and washers	908	721	633
Wood screws	321	338	341
Bolts, nuts, and metal screws	2,516	2,898	2,383
Stoves, grates, etc.	1,643	1,547	1,264
Baths	673	1,232	1,007
Anchors, etc.	737	611	622
Chains, etc.	908	872	945
Springs	717	864	575
Hollow-ware	6,860	7,302	4,206
All other manufactures	19,149	21,892	31,555
TOTAL	191,166	232,120	264,101



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Stanton Machine-cast Pig Irons are clean-melting, and economical in cupola fuel.

All types of castings are covered by the Stanton brands of pig iron, including gas and electric fires, stoves, radiators, baths, pipes, and enamelled products generally; repetition castings requiring a free-running iron, builders' hardware and other thin castings.

Other grades of Stanton Foundry Pig Iron possess the necessary physical properties and strength ideal for the production of fly-wheels, textile machinery, etc.

Stanton Foundry Pig Iron in all grades is also available in sand cast form.

We welcome enquiries on foundry problems and offer free technical advice.

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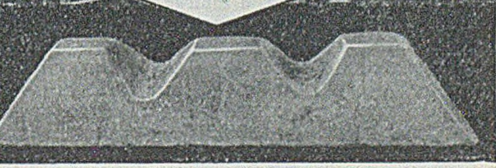

THE STANTON IRONWORKS COMPANY LIMITED - NEAR NOTTINGHAM

Raw Material Markets

Iron and Steel

Blast-furnace production is on a reduced scale and, despite the utmost care in the distribution of available supplies, foundries are running into a crop of difficulties. The new rule is that supplies are withheld from establishments with more than four weeks' stock in hand. It is not an unreasonable regulation under existing circumstances, but the stringency is emphasised by the fact that foundrymen are experiencing difficulty in placing orders against current licences. This applies to both low- and high-phosphorus grades, while the output of hematite is also restricted owing to the scarcity of high-grade imported ores.

Imports of foreign semis are now negligible. Deliveries from France, Belgium, and Luxemburg are well below contractural proportions, and, moreover, prices are now prohibitive. Hence re-rollers are almost exclusively dependent on home-produced material, deliveries of which are often uncertain and at times inadequate. Maximum outputs of sheet bars, slabs, and billets are eagerly absorbed, and re-rollers are eking out their supplies by the use of scrap wherever possible.

The period of restricted exports of finished steel expired at the end of the month and there is plenty of oversea business on offer. The home market is certainly capable of absorbing more steel, and a condition of world shortage ensures the prompt disposal of any balances available for shipment.

Non-ferrous Metals

At question time in the House of Commons on Monday, Mr. G. R. Strauss, Minister of Supply, announced that he intended to make an Order controlling acquisition of scrap copper, lead, and zinc. The Minister was replying to Mr. Maurice Edelman, who asked what action the Minister was taking to prevent the hoarding of scarce metals.

It is certainly disappointing that scrap is hanging fire so badly, but it would be wrong to jump to the conclusion that the introduction of controlled prices has weakened the trade. Prior to February 3 sellers of secondary brass and copper, and, indeed, of remelted zinc also, were able to secure prices much in excess of the equivalent value of the material in terms of virgin metals. This was obviously all wrong, but it was symptomatic of a condition of affairs in which the flow of copper and zinc to industry had been seriously reduced. Had no action been taken by the Ministry of Supply to hold down secondary metal values, it is impossible to say to what level prices might have climbed, for supplies of virgin lead are now cut as well as copper and zinc.

Following further discussions with representatives of trade and industry, it is understood that there is likely to be an increase in the permitted price of bright H.C. copper-wire scrap. The charge for bags will also be raised, and there is even a possibility that the merchants' commission may be fixed at a higher rate than the 2 per cent. permitted under the Order. But these changes are not yet confirmed and it may be some time before the necessary changes can be made effective and binding on the industry. In the meanwhile it is understandable that business hangs fire rather seriously. In due course licensing will be introduced and provision made for the return of stocks held by consumers, merchants, etc.

The usual U.S. copper statistics have been issued by the American Copper Institute. Production of crude copper in January was 87,109 short tons, compared with 91,218 tons in December, while the output of refined moved up from 109,464 tons in December to 110,144 tons in January. Stocks of refined copper in producers' hands advanced by nearly 5,000 tons to 54,883 tons. Domestic deliveries suffered a setback from 121,954 tons in December (an exceptionally good figure) to 108,128 tons in January.

Business in the United States is certainly very active in copper, and it is not surprising to learn that the Munitions Board has cut the rate of its stockpiling by about one-half. This should, of course, release more copper for consumption in industrial uses.

Official tin quotations were as follow:—

Cash—Thursday, £1,480 to £1,490; Friday, £1,485 to £1,490; Monday, £1,495 to £1,500; Tuesday, £1,460 to £1,465; Wednesday, £1,440 to £1,450.

Three Months—Thursday, £1,415 to £1,420; Friday, £1,425 to £1,430; Monday, £1,430 to £1,435; Tuesday, £1,395 to £1,400; Wednesday, £1,375 to £1,380.

Contracts Open

The dates given are the latest on which tenders will be accepted. The addresses are those from which forms of tender may be obtained. Details of tenders with the reference E.P.D. or C.R.E. can be obtained from the Commercial Relations and Exports Department, Board of Trade, Thames House North, Millbank, London, S.W.1.

DUBLIN, March 28—Manganese forgings and castings, for the Port and Docks Board. The Engineer's Office, East Wall Road, Dublin.

HASLINGDEN, March 12—Iron castings, for the Borough Council. Mr. J. Mason, borough surveyor, Municipal Offices, Haslingden, Rossendale.

KIDSGROVE, March 12—Iron castings, for the Urban District Council. Mr. O. L. Hurst, clerk of the council, Town Hall, Kidsgrove.

MELBOURNE, March 21—Rock crushing and screening plant, for the State Electricity Commission of Victoria. The Agent-General for Victoria, Victoria House, Melbourne Place, London, W.C.2.

PORT TALBOT, March 9—Pipes, valves, and castings, for the Town Council. The Borough Engineer's Department, Municipal Buildings, Port Talbot.

Board Changes

STEETLEY COMPANY, LIMITED—Mr. C. F. Penruddock has been appointed to the board.

AMBER CHEMICAL INDUSTRIES, LIMITED—Mr. J. Russell has resigned from the board.

H. J. BALDWIN & COMPANY, LIMITED—Mr. J. S. Addyman has been elected a director.

DERBYSHIRE STONE, LIMITED—Mr. P. W. Farley has been appointed a director to fill the vacancy caused by the death of Major Owen Hart.

SIEMENS BROS. & COMPANY, LIMITED—General Sir Hubert de la Poer Gough has been appointed chairman in succession to the late Dr. Henry Robert Wright. The Earl of Gowrie has been appointed vice-chairman and Mr. Francis A. Lawson has been appointed managing director.

Llanelly Steelworks Record

Last year's output of the Llanelly Steel Company (1927), Limited—200,000 tons—was the highest for the past 25 years and an increase of over 7 per cent. on the 1949 total. The bar-mill output of more than 184,000 tons was the highest since 1928 and was due largely to the working of one extra weekly shift for more than six months.

The rebuilding of furnaces, started some years before the war, was completed last year, while modern soaking pits are now being constructed for the bar mill. A site is being prepared for the bar and billet mill which is to replace the existing No. 2 mill.

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New

CHELFORD
Processed Washed Sand

A modern plant has been installed for the washing and grading of Chelford Sand. This plant is of the latest and most efficient type and Chelford Processed Sand can now be supplied thoroughly washed and in two grades, coarse and fine. The chief features are as follows :—

COARSE GRADE

Grading mainly between 30 and 85 mesh B.S.S. and practically free from fines below 85.

Uniform grading gives closer control of mixtures.

Increased permeability.

Negligible clay content.

Superior to natural sand for special purposes e.g. synthetic moulding mixtures, cement moulding process, etc.

FINE GRADE

Practically all passing 60 mesh B.S.S. with main grain size between 72 and 150.

Uniform grading.

Low clay content with increased refractoriness.

Excellent for fine cores and for addition to facing sand mixtures where smooth finish is desired.

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GENERAL REFRACTORIES LTD.

GENEFAX HOUSE · SHEFFIELD 10 · Telephone SHEFFIELD 31113

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

(Delivered, unless otherwise stated)

February 28, 1951

PIG-IRON

Foundry Iron.—No. 3 Iron, Class 2:—Middlesbrough, £10 17s. 9d.; Birmingham, £10 13s.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent P, £12 9s. 0d., 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 16s. 6d.; South Zone, £12 19s.

Scotch Iron.—No. 3 foundry, £12 7s. 9d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £13 7s. 6d.; South Zone, £13 10s.

Refined Malleable.—P, 0.10 per cent. max.—North Zone, £13 17s. 6d.; South Zone, £14.

Cold Blast.—South Staffs, £16 10s. 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, £12 7s. 6d.; Scotland, £12 14s.; Sheffield, £13 2s. 6d.; Birmingham, £13 9s.; Wales (Welsh iron), £12 7s. 6d.

Spiegeleisen.—20 per cent. Mn, £18 3s.

Basic Pig-iron.—£10 19s. all districts.

FERRO-ALLOYS

(Per ton unless otherwise stated, delivered.)

Ferro-silicon (6-ton lots).—40/55 per cent., £37 15s., basis 45% Si, scale 14s. per unit; 70/84 per cent., £52, basis 75% Si, scale 14s. 6d. per unit.

Ferro-vanadium.—50/60 per cent., 15s. per lb. of V.

Ferro-molybdenum.—65/75 per cent., carbon-free, 8s. 9d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., carbon free, £120; ditto, copper free, £142.

Ferro-tungsten.—80/85 per cent., 38s. 3d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 40s. 3d. per lb. of W.

Ferro-chrome (6-ton lots).—4/6 per cent. C, £66, basis 60% Cr, scale 22s. per unit; 6/8 per cent. C, £61, basis 60% Cr, scale 21s. per unit; max. 2 per cent. C, 1s. 6¾d. per lb. Cr; max. 1 per cent. C, 1s. 7¼d. per lb. Cr; max. 0.15 per cent. C 1s. 8d. per lb. Cr; max. 0.10 per cent. C, 1s. 8¼d. per lb. Cr.

Cobalt.—98/99 per cent., 17s. 6d. per lb.

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

Ferro-manganese (blast-furnace). — 78 per cent., £32 3s. 7d.

Metallic Manganese.—96/98 per cent., carbon-free, £186 per ton.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—Basic: Soft, u.t., £17 4s.; tested, up to 0.25 per cent. C (100-ton lots), £17 9s.; hard (0.42 to 0.60 per cent. C), £19 4s.; silico-manganese, £24 6s. 6d.; free-cutting, £20 9s. Siemens Martin Acid: Up to 0.25 per cent. C, £22 11s. 6d.; case-hardening, £23 9s.; silico-manganese, £26 14s.

Billets, Blooms, and Slabs for Forging and Stamping.—Basic, soft, up to 0.25 per cent. C, £20 4s.; basic, hard, over 0.41 up to 0.60 per cent. C, £21 9s.; acid, up to 0.25 per cent. C, £23 9s.

Sheet and Tinplate Bars.—£17 6s. 6d.

FINISHED STEEL

Heavy Plates and Sections.—Ship plates (N.-E. Coast), £21 3s.; boiler plates (N.-E. Coast), £22 10s. 6d.; chequer plates (N.-E. Coast), £23 8s.; heavy joists, sections, and bars (angle basis), N.-E. Coast, £20 1s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., untested, £22 15s.; flats, 5 in. wide and under, £22 15s.; hoop and strip, £23 10s.; black sheets, 17/20 g., £29 13s. galvanised corrugated sheets, 17/20 g., £43 6s.

Alloy Steel Bars.—1-in. dia. and up: Nickel, £37 19s. 3d.; nickel-chrome, £56 6s.; nickel-chrome-molybdenum, £63 1s.

Tinplates.—I.C. cokes, 20 × 14, per box, 42s. 7½d., f.o.t. makers' works.

NON-FERROUS METALS

Copper.—Electrolytic, £202; high-grade fire-refined, £201 10s.; fire-refined of not less than 99.7 per cent., £201; ditto, 99.2 per cent., £200 10s.; black hot-rolled wire rods, £211 12s. 6d.

Tin.—Cash, £1,440 to £1,450; three months, £1,375 to £1,380; settlement, £1,445.

Zinc.—G.O.B. (foreign) (duty paid), £151; ditto (domestic), £151; "Prime Western." £151; electrolytic, £155; not less than 99.99 per cent., £157.

Lead.—Good soft pig-lead (foreign) (duty paid), £136; ditto (Empire and domestic), £136; "English," £137 10s.

Zinc Sheets, etc.—Sheets, 10g. and thicker, all English destinations, £170 17s. 6d.; rolled zinc (boiler plates), all English destinations, £168 17s. 6d.; zinc oxide (Red Seal), d/d buyers' premises, £170.

Other Metals.—Aluminium, ingots, £124; antimony, English, 99 per cent., £360; quicksilver, ex warehouse, £73 10s. to £74; nickel, £406.

Brass.—Solid-drawn tubes, 21¾d. per lb.; rods, drawn, 29½d.; sheets to 10 w.g., 26⅝d.; wire, 27½d.; rolled metal, 25⅛d.

Copper Tubes, etc.—Solid-drawn tubes, 23¼d. per lb. wire, 226s. 6d. per cwt. basis; 20 s.w.g., 254s. per cwt.

Gunmetal.—Ingots to BS. 1400—LG2—1 (85/5/5/5), £240; BS. 1400—LG3—1 (86/7/5/2), £255; BS. 1400—G1—1 (88/10/2), —; Admiralty GM (88/10/2), virgin quality, —, per ton, delivered.

Phosphor-bronze Ingots.—P.Bl, —; L.P.Bl, — per ton.

Phosphor Bronze.—Strip, 38¼d. per lb.; sheets to 10 w.g., 40⅝d.; wire, 41d.; rods, 38d.; tubes, 43½d.; chill cast bars: solids, —, cored, —. (C. Clifford & Son, Limited.)

Nickel Silver, etc.—Ingots for raising, 2s. 3½d. per lb. (7%) to 3s. 2½d. (30%); rolled metal, 3 in. to 9 in. wide × .056, 2s. 9½d. (7%) to 3s. 8½d. (30%); to 12 in. wide × .056, 2s. 9½d. to 3s. 8¾d.; to 25 in. wide × .056, 2s. 11½d. to 3s. 10¾d. Spoon and fork metal, unsheared, 2s. 6¼d. to 3s. 5½d. Wire, 10g., in coils, 3s. 3d. (10%) to 4s. 2½d. (30%). Special quality turning rod, 10%, 3s. 2d.; 15%, 3s. 6¼d.; 18%, 3s. 11d. All prices are net.

Forthcoming Events

MARCH 2

Junior Institution of Engineers.

" Films on Foundry Practice," introduced by A. S. Ladley, 6.30 p.m., at 39, Victoria Street, London, S.W.1.

MARCH 5

Institute of British Foundrymen

Sheffield Branch :—" The Assessment and Interpretation of Foundry Controls." by J. W. Colton, 7.30 p.m., at the Royal Victoria Station Hotel, Sheffield.

MARCH 7

Institution of Production Engineers

Wolverhampton Section :—" Industrial Maintenance of Machines," by R. M. Buckle, 7 p.m., at the West Midland Gas Board Demonstration Room, Darlington Street, Wolverhampton.

Institute of British Foundrymen

Birmingham Students' Section :—" Comparison of British and Foreign Foundry Practice," by H. T. Angus and W. B. Parkes, 7.15 p.m., at the Chance Technical College, Smethwick.

Lancashire Branch :—" Cylinder Moulding," by D. Redfern, 7 p.m., at the Engineers' Club, Albert Square, Manchester.

North Wales Metallurgical Society.

Meeting at County Primary School, Plymouth Street, Shotton, Chester, at 7.15 p.m. Paper, " Titanium, the Metal of the Future," by L. Hall.

MARCH 8.

Institute of British Foundrymen

Lincolnshire Branch :—Open discussion on Foundry Problems, 7.15 p.m., at the Technical College, Lincoln.

Burnley Section :—Annual General Meeting, followed by " Rammed Linings," by J. Jackson, 7.30 p.m., at the Municipal Technical College, Ormerod Road, Burnley.

Institution of Production Engineers

London Graduate Section :—Report from Materials Handling Study Group, 7.15 p.m., at the Institution, 36, Portman Square, London, W.1.

Liverpool Metallurgical Society.

Meeting at Electricity Service Centre, Whitechapel, Liverpool, at 7 p.m. Paper, " Atomic Structure and the Hardness of Metals," by Prof. Hugh O'Neill, D.Sc., M.Met., F.I.M.

MARCH 9

Institution of Mechanical Engineers

Meeting at Storey's Gate, St. James's Park, London, S.W.1, at 5.30 p.m. Paper, " Further Mechanical Aids for the Foundry," by A. S. Beech, M.I.Mech.E.

Association of Bronze and Brass Founders

Yorkshire Area :—Informal meeting commencing with luncheon at 12.30 p.m. in the Great Northern Station Hotel, Leeds.

Midland Industrial Designers' Association

Joint meeting with Birmingham Publicity Club. " Industrial Design and Publicity," by E. C. Mackenzie, 7.15 p.m., at the Imperial Hotel, Temple Street, Birmingham.

MARCH 10

Institution of Production Engineers

Yorkshire Graduate Section :—" Foundry Production Problems in Relation to Casting Designs," by A. E. McRae-Smith, 2.30 p.m., at the Great Northern Station Hotel, Leeds, 1.

Institute of British Foundrymen

Newcastle-upon-Tyne Branch :—Discussion of Report T.S.23, " Repair and Reclamation of Grey-iron Castings by Welding and Allied Methods," 6 p.m., at Neville Hall, Westgate Road, Newcastle-upon-Tyne.

Scottish Branch :—" Patternmaking as an Aid to Production Moulding and Core-making," by S. A. Horton, and Annual Business Meeting, 3 p.m., at the Royal Technical College, George Street, Glasgow, followed by the Annual Dinner at the Grosvenor Restaurant.

West Riding of Yorkshire Branch :—" Some Notable Aluminium-alloy Castings," by A. R. Martin, 6.30 p.m., at the Technical College, Bradford.

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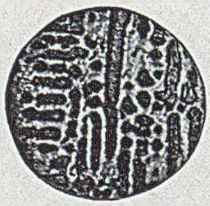

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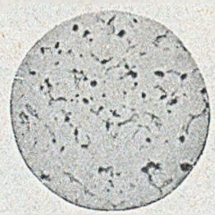

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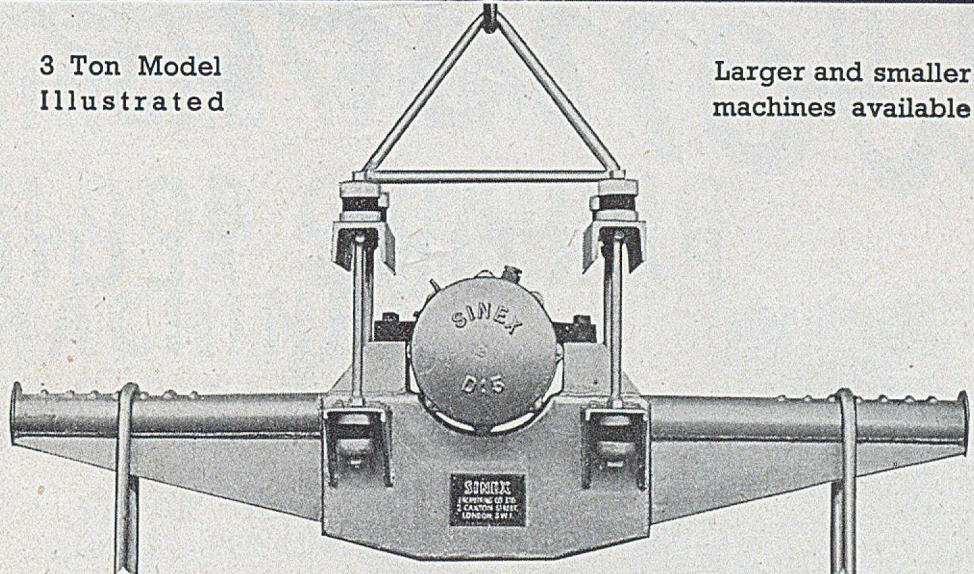

FIG. 7 SINEX VIBRATING BEAM

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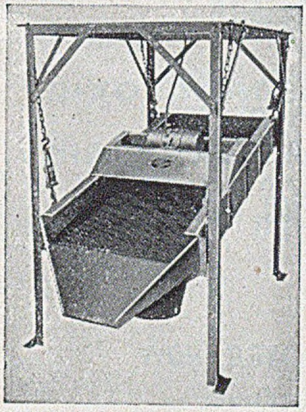

FIG. 10 (on left)

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

This screen is also manufactured in sizes to suit requirements

FIG. 8. (illustrated below)

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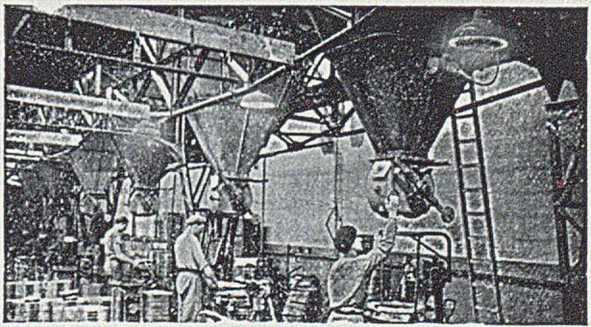

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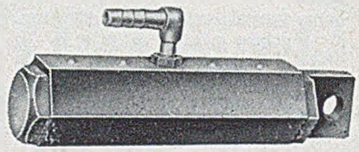

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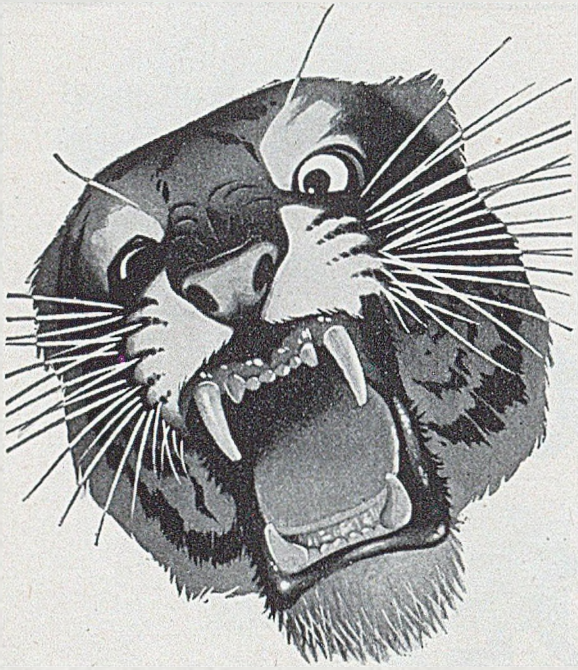

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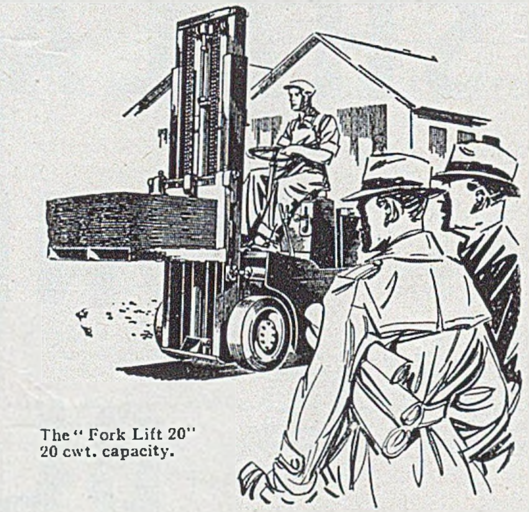

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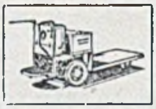

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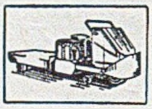

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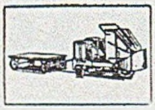

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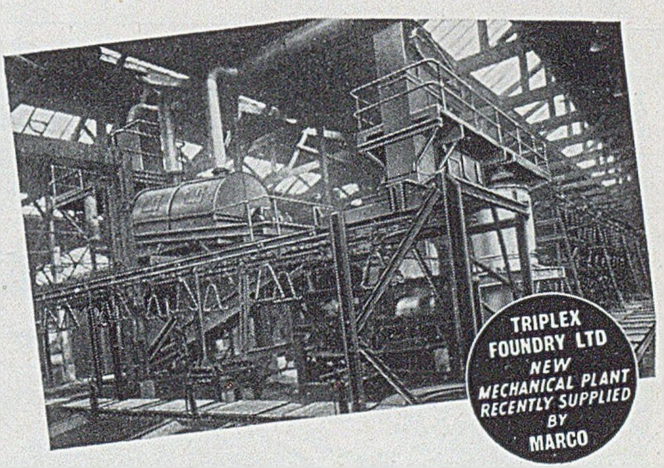

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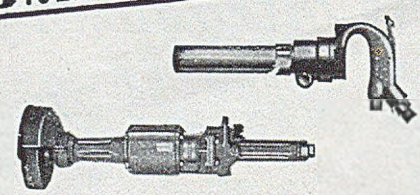

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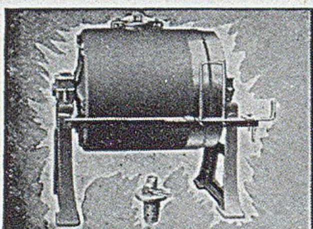

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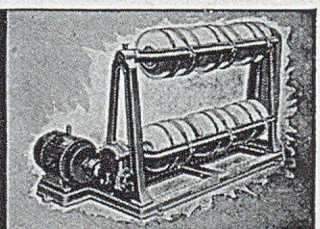

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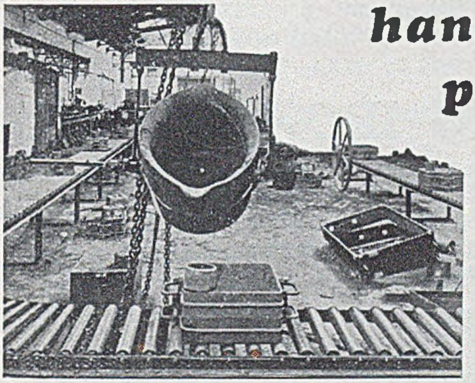

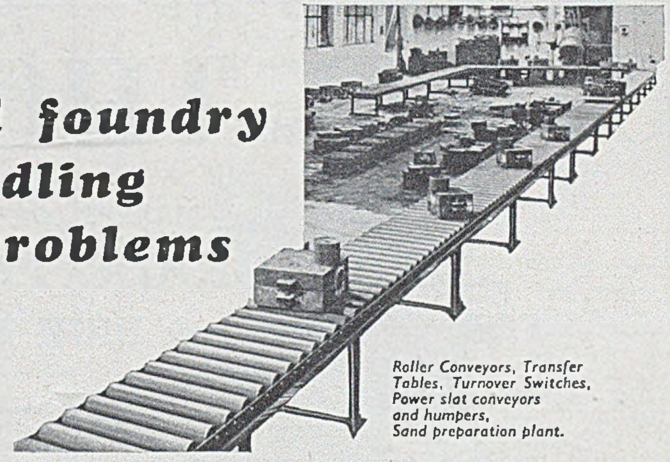

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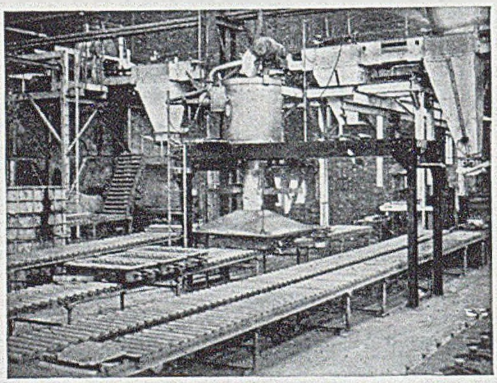

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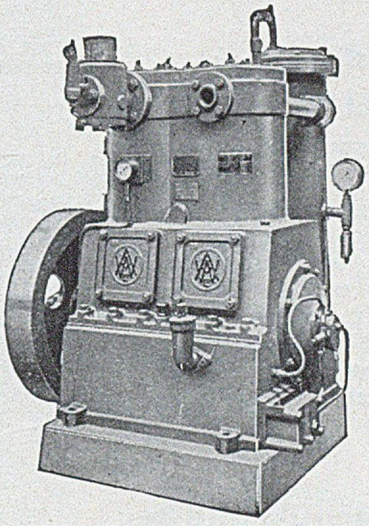

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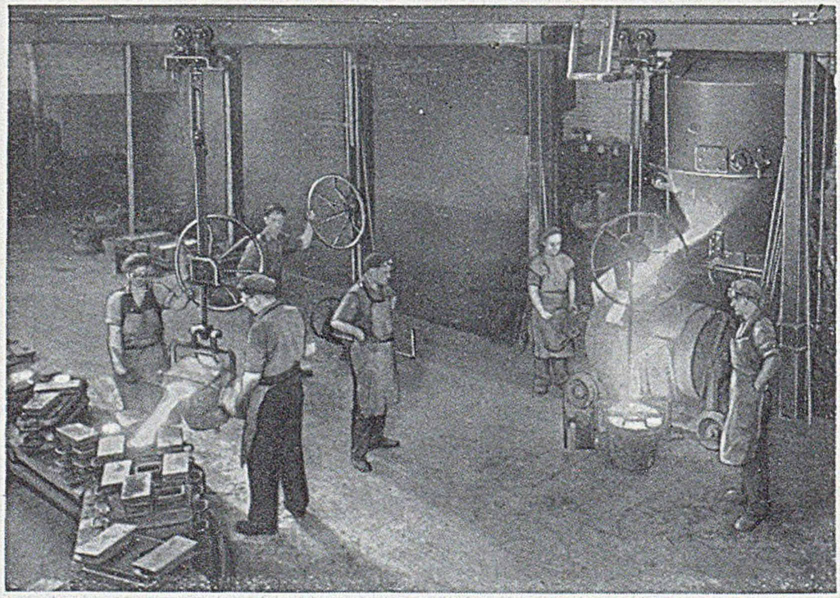

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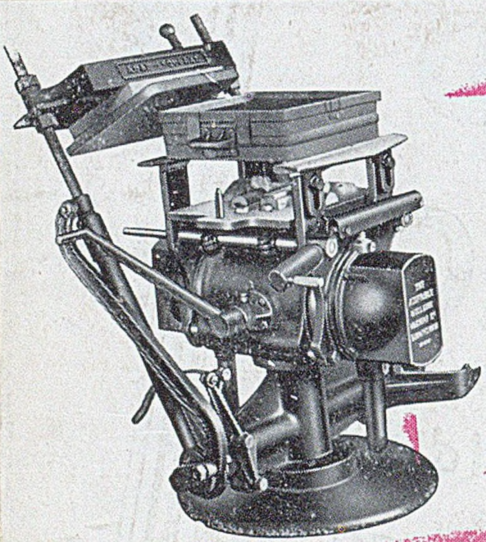

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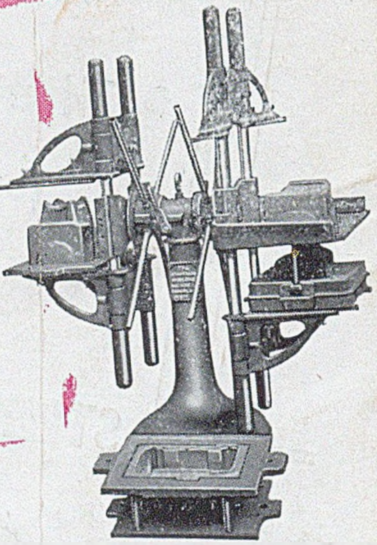

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