FOUNDRY TRADE JOURNAL

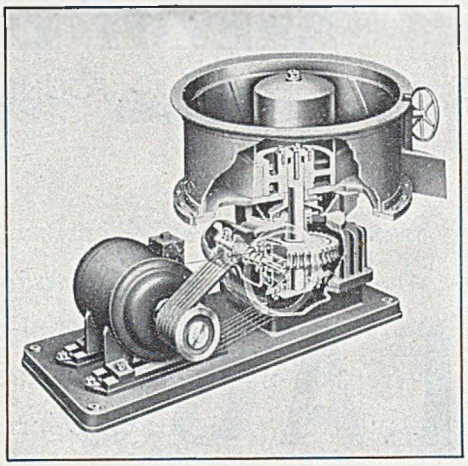
EST. 1902

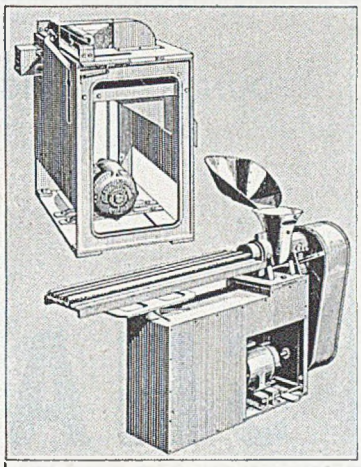
VOL. 94
No. 1901
Registered at the G.P.O. as a Newspaper

WITH WHICH IS INCORPORATED THE IRON AND STEEL TRADES JOURNAL
FEBRUARY 5, 1953
Offices: 49, Wellington Street, Strand, London, W.C.2

Single Copy, 9d. By Post 11d. Annual Subscription, Home 40/-, Abroad 45/- (Prepaid)

FORDATH MACHINES IN THE FOUNDRY





(ABOVE LEFT) FORDATH 'NEW TYPE' MIXING MACHINES *use the well known Fordath principle of rubbing and folding without crushing in each of the seven models in the range.*

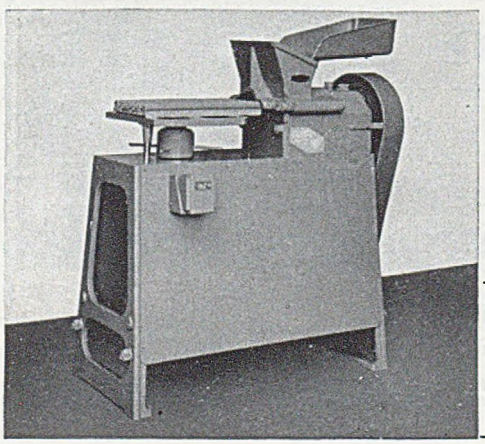
(ABOVE RIGHT) FORDATH CUT-OFF MACHINES *have many years of satisfactory service built into them.*

The FORDATH MULTIPLE ROTARY CORE MACHINE *has an enviable reputation for accurate extrusions in foundries everywhere.*

—*lower costings in the office*

Fordath 'New Type' Mixers, one for everybody, seven sizes to cope with batch capacities from 20 lbs. to 1 ton. To mix foundry silica sands with core bonding compounds *without crushing*. Stiff compounds as low as 1% can be completely dispersed through the sand, coating each grain with a film of binder. Mixing blades rotate in a horizontal plane, conveying the sand from the centre of the pan, rubbing it thoroughly against rubbing plates and tumbling it back to the centre. Two to three minutes is enough and the batch is discharged in a well aerated homogeneous mix. Gears and bearings totally enclosed.

The Fordath Multiplunger Core Machine is going to town, to the country, to export markets, wherever there are foundries. The thrust of the core sand through the multiple die is provided by plunger action instead of a rotating worm. Quality and consistency of the core sand mixture are not critical factors. Dimensionally accurate extrusions are satisfactory with sands of poor quality and even facing sand or plain red moulding sand can be extruded. With all sands, the core mix is at its best when Glyso is the bonding agent.



The FORDATH MULTIPLUNGER CORE MACHINE *admirably exemplifies the success of equipment designed by foundrymen for foundrymen.*

The Fordath Multiple Rotary Core Machine extrudes cores from $\frac{1}{8}$ inch to 6 inches. Multiple extrusion of up to ten (smallest diameter) cores simultaneously and accurately. All dies have venting device. Senior model (power driven) and Junior (power or hand operated bench model).

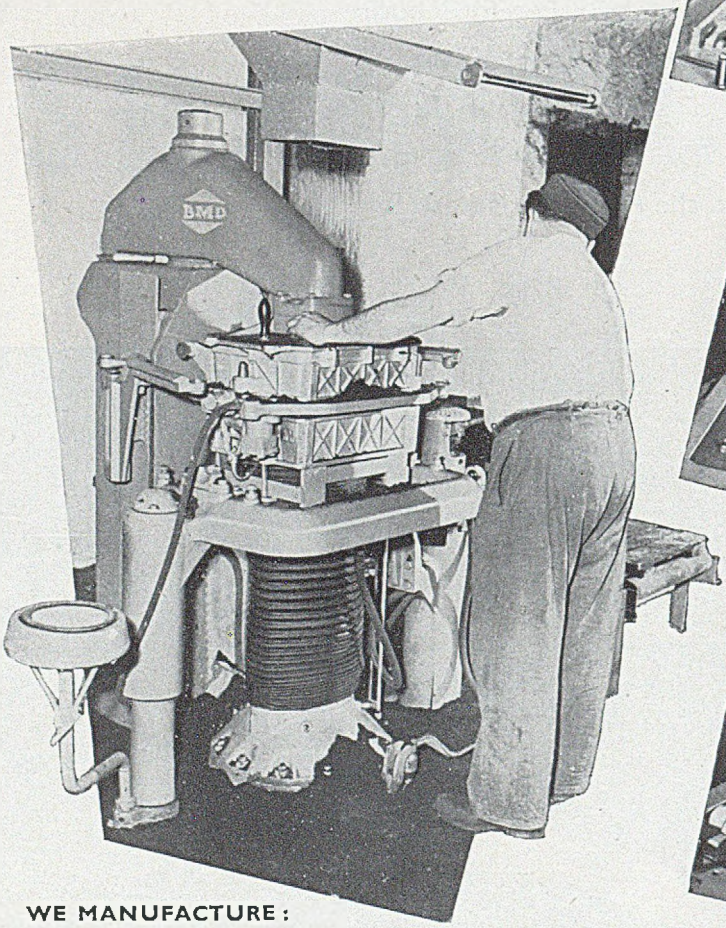
Fordath Core Cut-off Machine cuts cores up to 3 inches diameter accurately to lengths required. Motor and roller bearings totally enclosed.

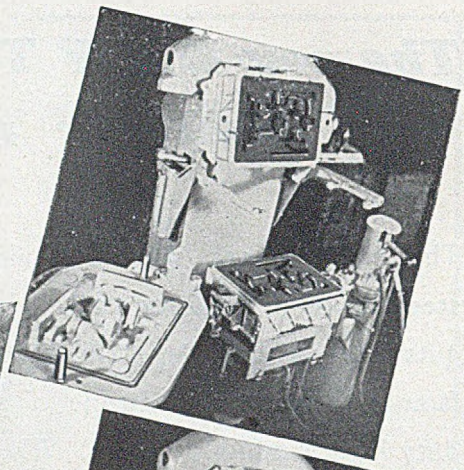
Time-Saving and Economical

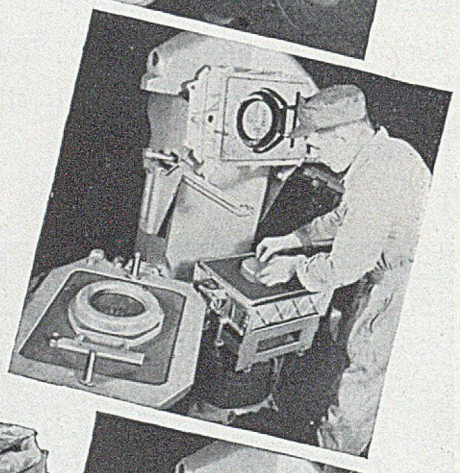
also for patterns of a different type by alternatively applying the two moulding practices:
For lower patterns apply the squeezing practice
For higher patterns apply the turnover practice

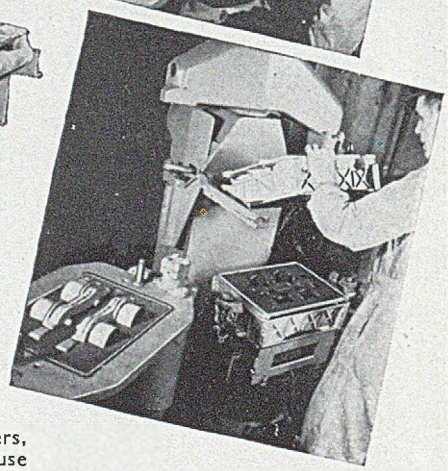
Flaskless Moulding Machine

Type KLW









WE MANUFACTURE:

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

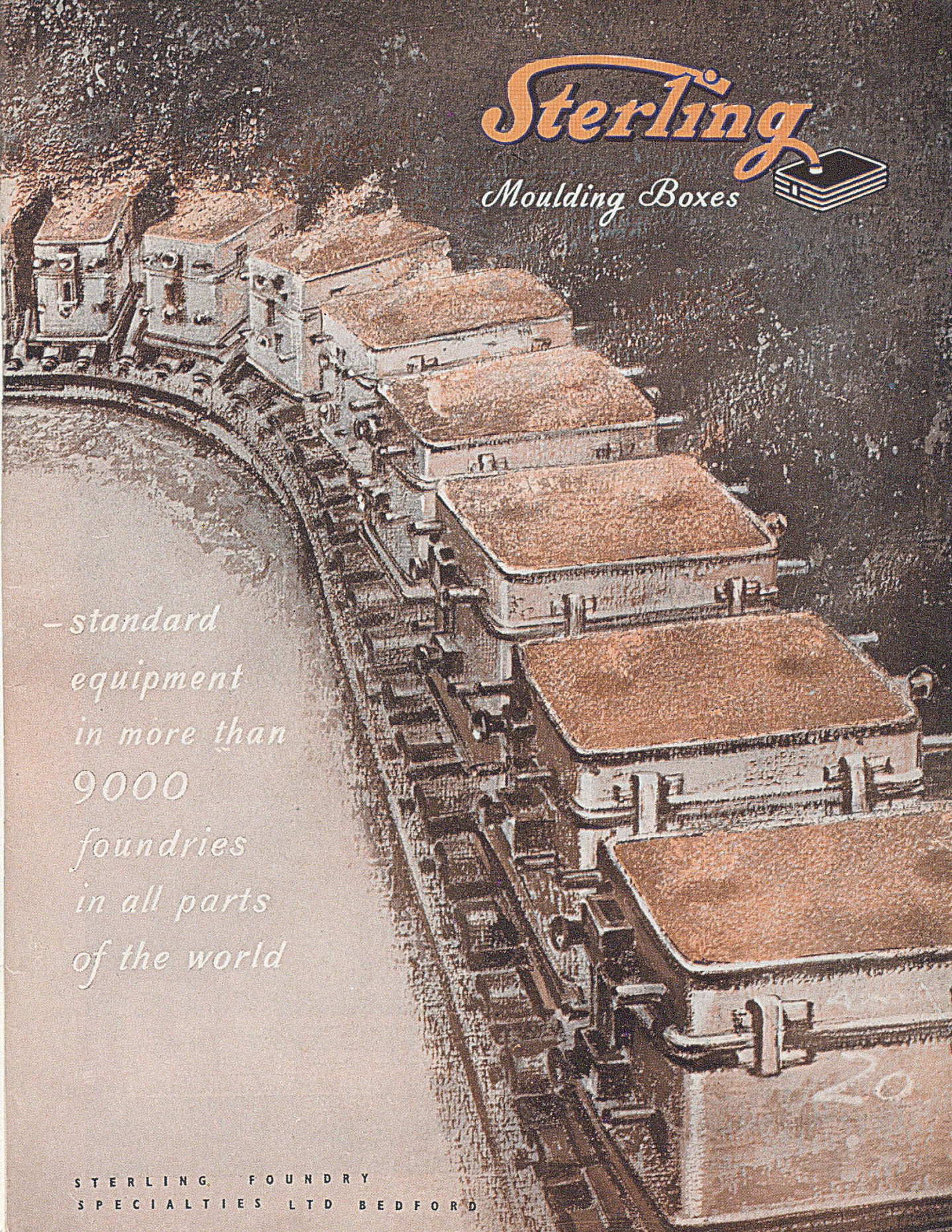
Please write for leaflets, quotations and technical advice, free of charge.

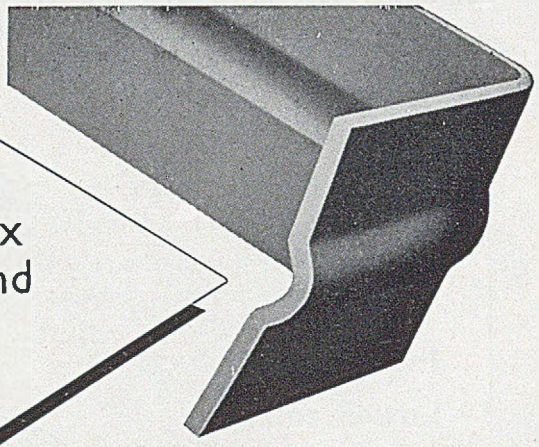
BMD

BADISCHE MASCHINENFABRIK A.-G.
Jeboldwerk
KARLSRUHE-DURLACH

Representative:

Ernes Fairbairn, Ltd., 9 Drapers Gardens, Throgmorton Avenue, London, E.C.2.


Sterling
Moulding Boxes
– standard
equipment
in more than
9000
foundries
in all parts
of the world
STERLING FOUNDRY
SPECIALTIES LTD BEDFORD

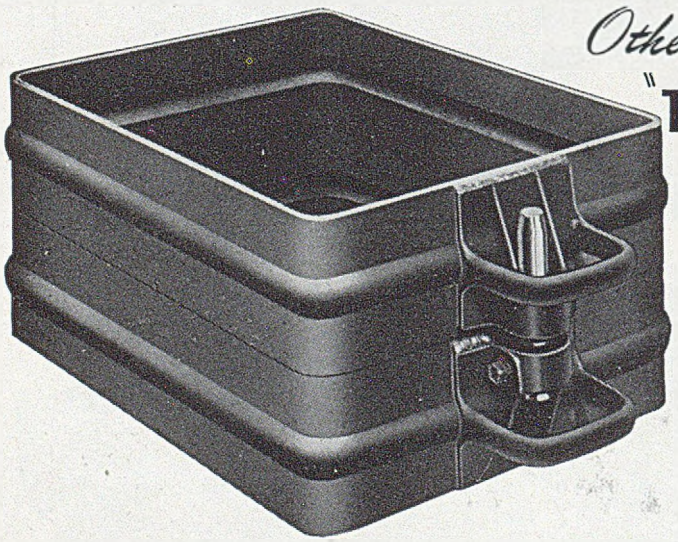


This special corrugated section of the "Talbard" Moulding Box affords strength, lightness and rigidity *with*

MAXIMUM SAND RETENTION

Talbard Moulding Boxes are precision manufactured from rolled steel of special analysis and are available in a full range of sizes from 8in. by 6in. to 48in. by 30in.

These boxes are standardised for interchangeability of moulding-box equipment but special boxes can be made for individual requirements.



Other special features of

"TALBARD" Moulding Boxes

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

E. TALLIS & SONS LIMITED

TALBARD WORKS, CHARLES HENRY STREET, BIRMINGHAM 12

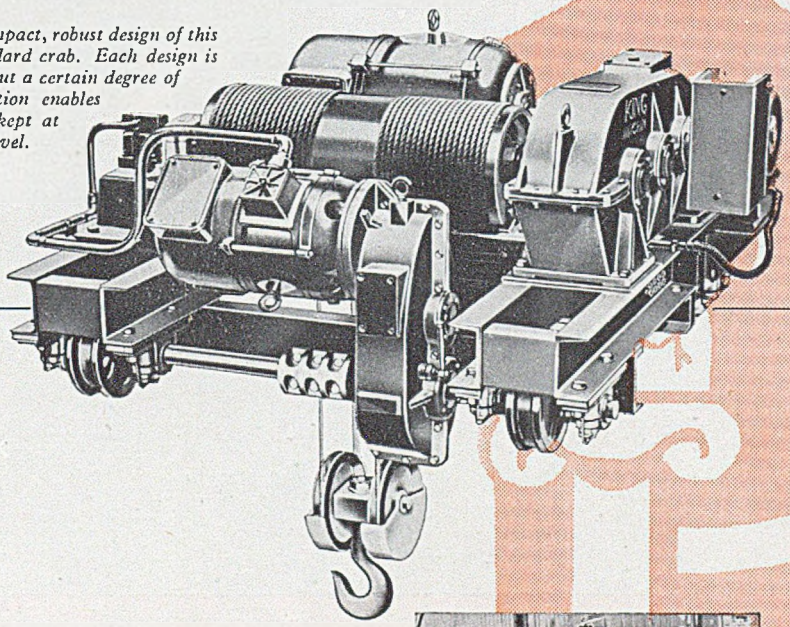
(Phone : MIDland 4387 and VICtoria 2072)

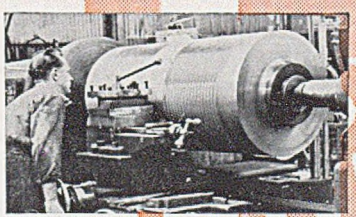
London Office : 47, WHITEHALL, S.W.1 *Phone :* WHITEHALL 7740

KING CRANE CLOSE-UP

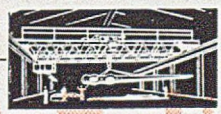
Look for the significant details in a KING Crane, the less obvious 'pluses' that add up to smoother, safer working, better load control, easy maintenance, long trouble-free life. Your crane problem is different; KING'S answer will be different, but all KING Cranes offer you basic advantages like those illustrated here.

Note the compact, robust design of this 20 ton standard crab. Each design is individual but a certain degree of standardization enables costs to be kept at the lowest level.



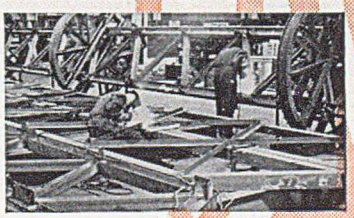


Machining rope drum on heavy duty lathe. Good design, good materials, good workmanship put stamina into every KING *Crane.*



KING

REGISTERED TRADE MARK



Welding lattice girders. Internal members are first tack-welded as shown in foreground and afterwards finished in revolving jigs.

CRANES *Write for Crane Booklet* KC49 *to:* GEO. W. KING LTD., C6 WORKS, HITCHIN, HERTS. TEL: HITCHIN 960. *And at Stevenage*

D

How an industrial organisation found

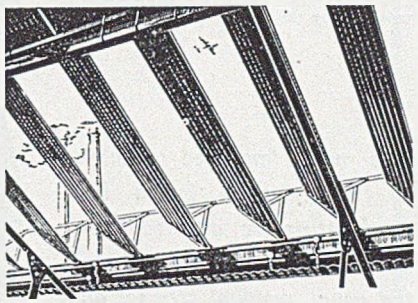
a clear answer

to the problem of falling output

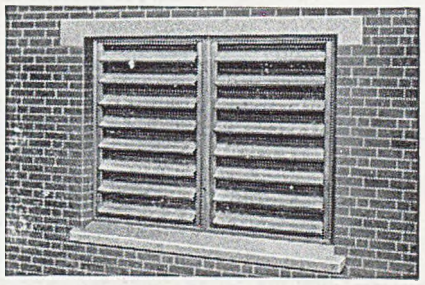
When a certain nationally-known industrial organisation found production falling behind schedule, the responsible executives soon pin-pointed the cause. Fumes, smoke and excessive heat in one building were having a detrimental effect on the workers employed there. Fatigue, absenteeism and loss of production were resulting from inefficient ventilation. The need was for a system of ventilation which would ensure the *rapid* clearance of fumes, steam, dust and over-heated air.

Hills Patent Roof Ventilating Shutters were installed without delay. Providing what was virtually a movable roof to the building, the shutters incorporated steel louvres which in themselves formed extraction vanes and created an effective extraction draught. At the touch of a button, they could be opened up to an angle of 65 degrees in 60 seconds, completely clearing the air and admitting natural daylight (with a consequent saving in artificial lighting). The installation of the shutters was simplicity itself, entailing neither structural alterations nor any interference with production. The effect on the workers was immediate. Improved working conditions soon led to improved output.

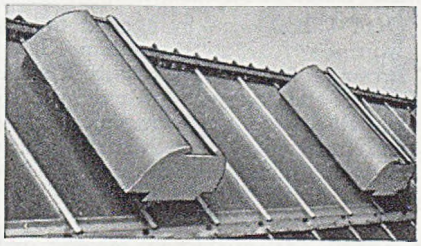
Maybe you have a ventilation problem to which Hills Ventilating Shutters could offer an equally successful solution. For really expert advice on installing efficient ventilation in a new or existing building, write to our Technical Advisory Department. Literature gladly sent on request.



HILLS VENTILATING SHUTTERS
Designed to provide the simplest, most effective system of ventilation for foundries, moulding shops, rolling mills, and in any factory where ventilation is a problem.



HILLS WALL-TYPE AIR INLET VENTILATORS
Scientifically designed standard units for easy installation into an opening 8ft. wide by 6ft. deep. Sturdy welded all-steel Ventilators operated from a single handle.



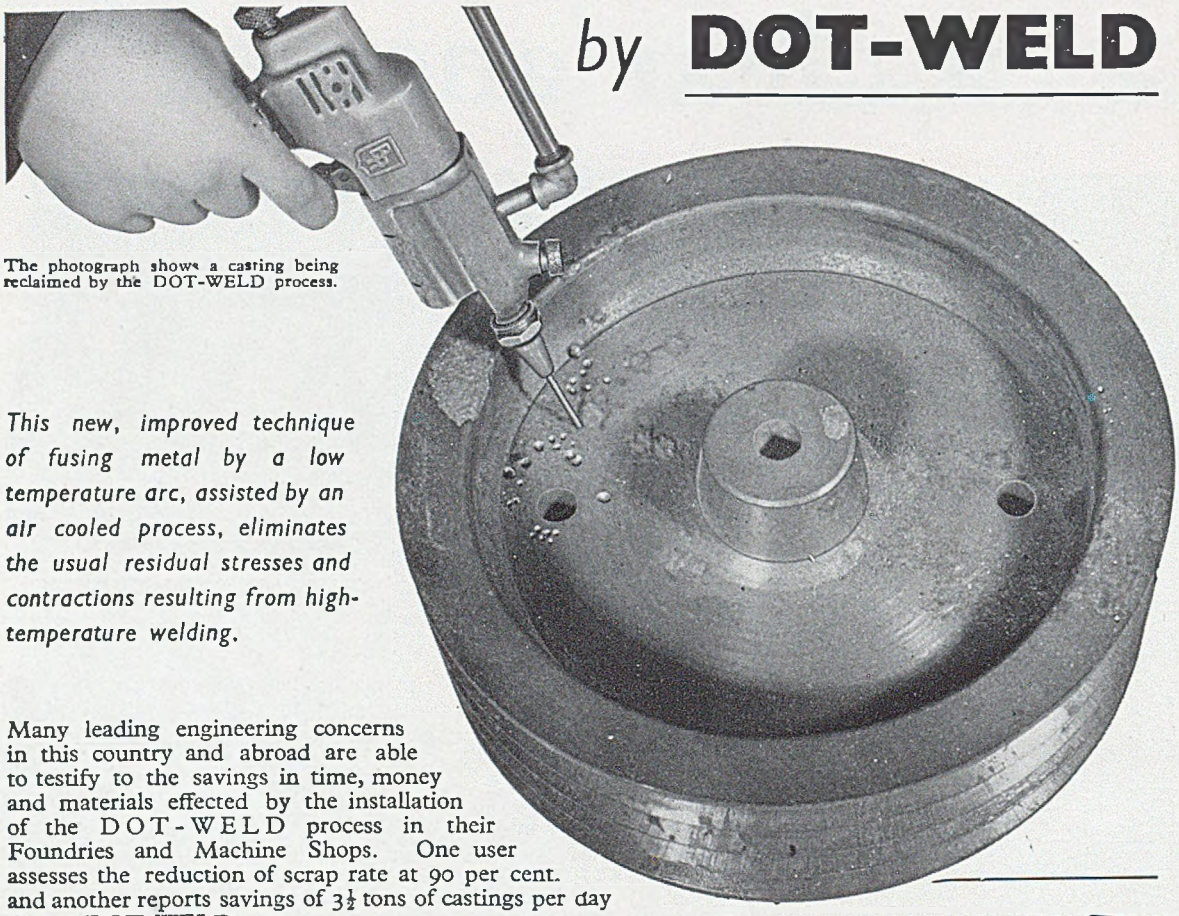
HILLS STATIC ROOF VENTILATORS
Easily installed into patent roof glazing bars or corrugated roof sheets to give positive extraction of fumes. In two sizes:—3ft. 2in. wide by 6ft. deep and 3ft. 2in. wide by 8ft. deep overall.

HILLS VENTILATING SHUTTERS

Hills (W. Bromwich) Ltd. Albion Rd., W. Bromwich, Staffs. Tel.: W. Bromwich 1025 (7 lines) · London: 125 High Holborn, W.C.1 Tel: HOLborn 8005/6
Branches at Birmingham, Bristol, Manchester, Newcastle-on-Tyne, Glasgow and Belfast.

E

RECLAIM your defective castings by DOT-WELD



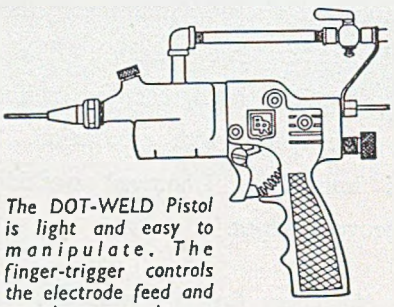
The photograph shows a casting being reclaimed by the DOT-WELD process.

This new, improved technique of fusing metal by a low temperature arc, assisted by an air cooled process, eliminates the usual residual stresses and contractions resulting from high-temperature welding.

Many leading engineering concerns in this country and abroad are able to testify to the savings in time, money and materials effected by the installation of the DOT-WELD process in their Foundries and Machine Shops. One user assesses the reduction of scrap rate at 90 per cent. and another reports savings of 3½ tons of castings per day due to DOT-WELD.

Holes, hair-lines and other surface faults are filled in without any burning or oxidation by this process and the parent body is not subject to the risk of distortion, cracking, or the formation of hard spots. The surface of the weld can be finished off where necessary by filing, grinding or machining on a light cut.

DOT-WELD can be applied to castings of Steel, Malleable Iron, Grey Iron, Aluminium (Sand and Die Castings) and Bronze. It does not require a skilled operator, is extremely mobile and costs very little to maintain. It offers to Foundries and allied trades an economical method of reclaiming castings and retrieving the high cost of machining, thereby reducing costs and increasing output.



The DOT-WELD Pistol is light and easy to manipulate. The finger-trigger controls the electrode feed and complete control over the air-supply is ensured by use of a needle valve screw on the gun itself. The complete equipment includes the DOT-WELD Pistol, the quench-arc machine encased in a trolley-cabinet, pneumatic peening hammer, earth clamp, goggles, files, etc.

Demonstration of the DOT-WELD process can be arranged in your own works. Write to-day for further particulars to

BRITISH RONCERAY LTD

ELECTRICAL DEPT., BENEFIT BUILDINGS, MOORHEAD, SHEFFIELD 1
Telephone: Sheffield 22015 *Telegrams: Bronceray Phone Sheffield 1*

U.K. Patent Numbers 612412 and 616338
Also patented in the U.S.A., CANADA and other countries.

INDEX TO ADVERTISERS

FOUNDRY TRADE JOURNAL

Established 1902

Vol. 94 Thursday, February 5, 1953 No. 1901

PRINCIPAL CONTENTS

PUBLISHED WEEKLY: Single Copy, 9d. By Post 11d. Annual Subscription, Home 40s., Abroad 45s. (Prepaid).

49 Wellington Street, London, W.C.2. 'Phone : Temple Bar 3951 (Private Branch Exchange) Grams : "Zacatecas, Rand, London"

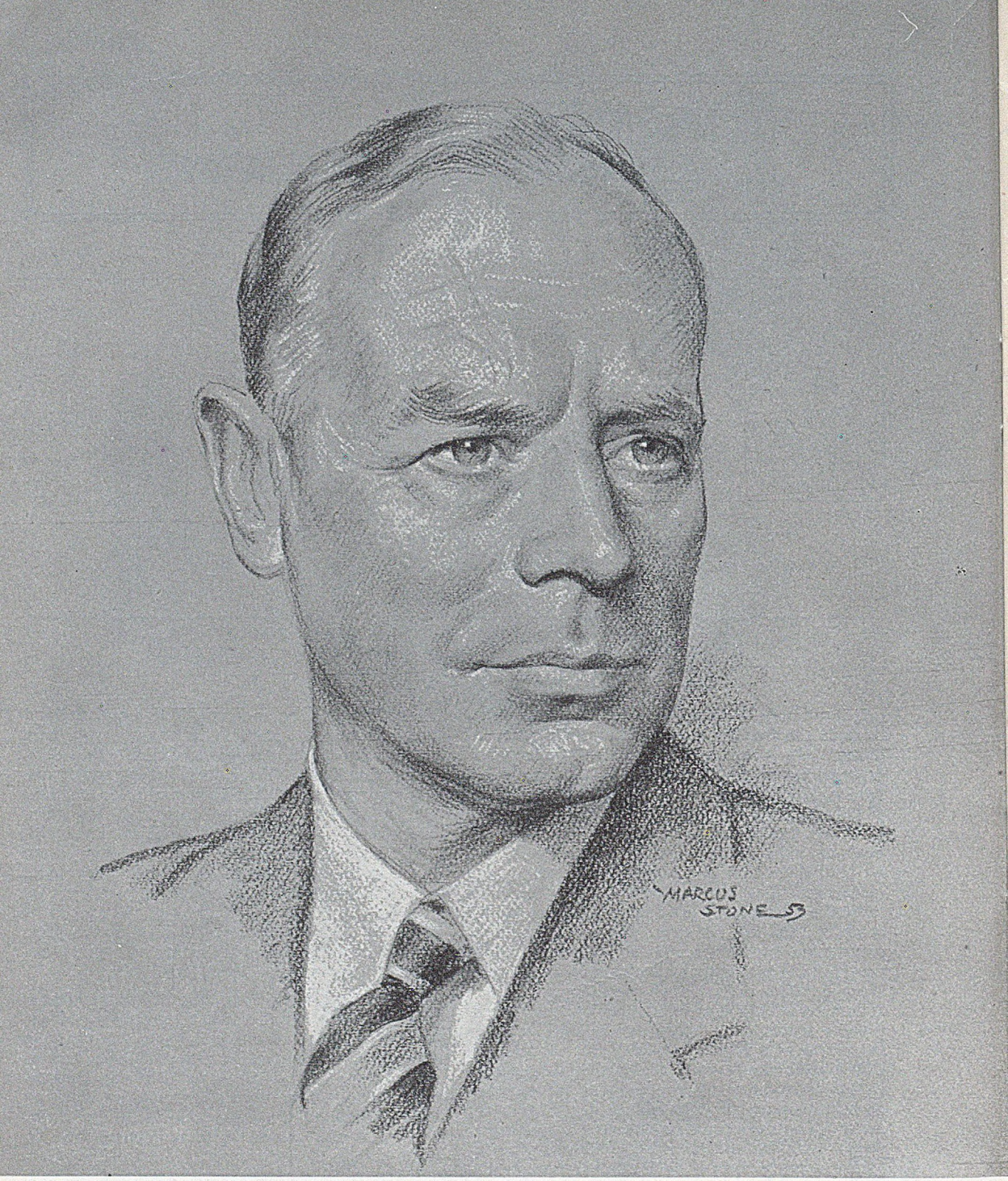
Foundry Accidents

It is not only in this country that the rate of accidents in the foundry is higher than in general industry. In America, where accident frequency is reported as the number of lost-time accidents per million man/hours worked, the rate for the whole of industry was 13.5, whilst that for the foundry was 26.9. Mr. Frank G. Steinebeck, commenting on the position in *Foundry*, rather picturesquely describes the position in the following terms: "Top management has not insisted that safety be given top billing among the production problems of the company, and has not developed a well-organized programme that carries zeal for plant safety down the line to every supervisor and worker. Until this is done, safety cannot show much improvement."

Only recently in this country, health and safety in foundry practice was "given top-billing" as it was the subject of a Private Member's Bill. It was well and sympathetically discussed, but the final outcome is that as many of the proposals as are generally deemed desirable are to be embodied in the Factory Acts.* This shows up a fundamental difference between American and British conditions, for in the former country there is no Federal legislation, but such matters are left to the individual States. Thus there is a constant urge to reduce accidents both from the humanitarian and economic angles, and this finds expression in very effective pictorial and loud-speaker propaganda. In this country, there are the Factory Acts designed to minimize the occurrence of accidents. Yet, if these are over-extensive, they may well defeat their objectives, as the creation of a feeling that a factory is "foolproof" engenders carelessness. An outstanding defect in our legislation is the omission to make compulsory the wearing of the protective clothing that has to be provided. Thus it is essential that "top management" or, as we prefer it, higher executives, should, like the American foundry owners, be zealous for plant safety, for no amount of legislation will remove the inherent risks associated with factory life.

There are still too many accidents due to crass ignorance, such as the use of unsuitable slings; taking a siesta in a mould-drying stove; disregarding the protection afforded by safety clothing, and so forth. There are a number of accidents reported which, though they happen in foundries, have no association with the manufacture of castings, as for instance deaths caused by being pinned down by motor-cars in the works yard. Much of the Garrett Report" is likely to become law and we hope that the outcome will be a lowering in the "accident rate" of the industry, yet we fear that complacency may replace alertness as a result of excessive legislation.

* See page 155 of this issue.



MR. EDWARD PLAYER.

Deputy Chairman and Managing Director of the Birmid Industries' Group of Companies.

Leaders of the Industry

MR. EDWARD PLAYER

MR. EDWARD PLAYER deserves a place in the history of British metallurgy as the man who pioneered the making of magnesium castings and, moreover, did it so successfully that one of the companies he directs—Sterling Metals, Limited—is the largest producer in this country. Mr. Player, who is a native of Coventry, received his early education at Bablake School and his technical training at Birmingham University. Thereafter, he spent some time on the design side of the electrical engineering industry, and this is, by the way, quite a good background for success in foundrywork. In his later career, Mr. Player has striven continuously to bridge the gaps existing between the drawing board and the finished casting. Though so well known and appreciated for his work on magnesium, he is equally interested, through his position as managing director of Birmid Industries Limited, in aluminium and iron castings for the automobile industry and in rolled products manufactured from light alloys. The word "interested" in the case of Mr. Player embraces both business matters and technology. In the former activity, it bears fruit in the councils of a number of trade associations, whilst in the latter, he has, as far as a busy life would permit, supported the Institute of British Foundrymen since 1919, especially during the all-too-short life of its Coventry branch. In 1928, he gave a paper of outstanding merit on the manufacture of magnesium castings before the Birmingham Metallurgical Association and his interest has never waned.

Mr. Player believes that the future will show increased requirements for light alloys apart from the demand for aircraft components, because of the advantages they show in handling and in the machine-shop. So far, insufficient attention has been paid to machine-tool design to achieve the best results with light alloys. Mr. Player is satisfied "without undue complacency" that the magnesium industry in this country is as advanced and progressive as that in the States. In fact, in one particular field, that of alloy development for high-temperature work, it is possible this country leads.

In Mr. Player's conception of desirable trends for the industry, he obviously would like to see some lowering in the prices of the raw materials, especially the provision of good-quality secondary magnesium ingots at competitive prices. Turning to iron castings, he deplores the inclusion of iron and steel foundries within the purview of the Board to be set up by the new iron and steel legislation. Among his views on other subjects, he contends that taxation could be reduced as there are too many non-producers and too few producers. Considering the plant available to founders, he is of the opinion that standard types of British equipment such as moulding machines, conveyors and the like are undoubtedly of good design and quality, but, too frequently, important new developments seem to originate abroad.

Mr. Player finds that his garden and family interests give the necessary balance to a busy commercial life. As an after-dinner speaker, however, he ranks amongst the best in the foundry industry and his well-phrased forthright opinions invariably merit the approbation of any company he graces.

New Development Area

THE Board of Trade has made an Order under the Distribution of Industry Act, 1945, creating a new development area embracing part of North-East Lancashire and a neighbouring area in the West Riding of Yorkshire. If the Order is approved by a resolution of each House of Parliament, the area will be known as the North-East Lancashire Development Area, and will include the following:—

In the Administrative County of Lancaster:—The municipal boroughs of Nelson and Colne; the urban districts of Barrowford, Brierfield, Padiham, and Trawden; within the rural district of Burnley, the parishes of Briercliffe, Foulridge, Hapton, and Simonstone; and the county borough of Burnley.

In the West Riding of Yorkshire:—The urban districts of Barnoldswick and Earby; and within the rural district of Skipton, the parish of Salterforth.

Forty Years Ago

In the FOUNDRY TRADE JOURNAL of February, 1913, the Editor, in quite a well-balanced leader, deprecated use being made of technical societies for commercial exploitation. At the fifth annual dinner of the Lancashire branch of the British Foundrymen's Association, the late Mr. Oliver Stubbs pleaded for higher productivity to combat the higher cost of raw material. There is a picture of a shot-blast cabinet and its features and operation would satisfy the most disgruntled of to-day's factory inspectors. There is also a long illustrated article on the "new" works of J. W. Jackman & Company, Limited, of Manchester. Amongst the Patents accepted was one by Victor Stobie, for the use of an oil and gas burner in combination with an electric furnace. Listed under the new companies registered is Patternmakers (Engineering) Company, Limited, and we congratulate the concern on the substantial progress they have made.

EFCO Agreement

The Electric Furnace Company, Limited, have recently concluded an agreement with Swindell-Dressler Corporation of Pittsburgh for close collaboration between the two companies, especially with regard to the manufacture and supply of large arc furnaces up to 100 tons capacity, both for this country and European and Empire countries. In view of the changing situation with regard to dollars available for purchase of equipment from the United States, this agreement should prove of value, in so far as it will enable this company to offer the best American design of furnace, based on the large number of equipments installed in the U.S.A., manufactured and supplied by British engineering capacity. An exchange of technical information on both small and large arc furnaces has been arranged and a satisfactory basis for the supply of all drawings and information to enable furnaces larger than hitherto built in this country has been agreed.

MIDLAND TAR DISTILLERS, LIMITED, Oldbury (Worcs), has concluded a new 15-year contract for the purchase of crude tar.

MR. HAROLD RIGGALL, managing director of Ruston & Hornsby, Limited, left earlier this week for a visit to South and East Africa.

Notes from the Branches

Sheffield

The annual dinner of the Sheffield branch of the Institute of British Foundrymen was held in the Royal Victoria Hotel on January 26, and was presided over by Mr. F. A. Martin, O.B.E., branch president. The chief guest was Dr. L. du Garde Peach. The Master Cutler (Sir Harold West) and the president of the Sheffield Chamber of Commerce (Mr. W. G. Ibberson) were also present, together with Dr. C. J. Dadswell, president of the Institute. The Master Cutler in responding to the toast "The Industries of Sheffield" pointed out that approximately half the insured workers in the Sheffield district were employed in the iron and steel and engineering industries, and referred to the necessity for personal touch and choice of those who have to deal with free enterprise in industry. Dr. C. J. Dadswell, said Sheffield iron and steel foundries made every conceivable form of casting and used as one example the 200 tons of liquid steel which had recently been poured for the biggest single casting ever made in Britain. The number attending was a record for the branch.

Factory Equipment Exhibition

The first National Factory Equipment Exhibition is to be opened at the Royal Horticultural Hall, London, on March 23 and will continue until March 27. Great interest has been aroused among manufacturers in Great Britain and abroad in the new venture, and one of England's leading industrialists, Sir Miles Thomas, will open the exhibition. His Royal Highness the Duke of Edinburgh has consented to pay an official visit on the second day.

Displayed will be Britain's most modern factory equipment, designed to increase production and reduce costs, thereby making a contribution to the export drive and so to raising the standard of living of the country. Exhibits will include mechanical-handling equipment, costing and accounting systems, safety equipment, protective clothing, automatic tools, dust-removal systems, and workers' welfare equipment. There will be a mannequin parade of protective clothing and a display of industrial films.

Institution of Metallurgists' Examinations.—The next examinations for the licentiateship and associateship of the Institution of Metallurgists will be held from August 24 to September 1, 1953. Candidates must submit their applications for permission to enter the examinations before May 1, 1953. Each application must be made on a form to be obtained from the Registrar-Secretary, Institution of Metallurgists, 4, Grosvenor Gardens, London, S.W.1, and must be accompanied by a registration fee of one guinea. The balance of the examination fee will be payable before August 1, 1953.

The Institute of British Foundrymen will celebrate its Golden Jubilee in April, 1954. It is desired to prepare a short history of the Institute's work, and the secretary would be glad if members who are in possession of documents, papers or reports covering the years 1904 to 1906 would be good enough to lend them for a short time. All such papers, which will be duly returned when finished with, should be forwarded as soon as possible. It is suggested that documents which are regarded as valuable should be sent by registered post.

Mould Reaction*

By R. W. Ruddle, M.A., A.I.M.

The subject of mould reaction is one of considerable importance to the foundryman, for its occurrence in sand-casting of some non-ferrous alloys frequently leads to unsoundness, surface attack and consequent rejection of the casting. Furthermore, as is shown below, the occurrence of mould reaction may, in certain circumstances, lead to an improvement in the soundness of the casting and thus be of value to the foundryman. In the last ten years or so a large amount of experimental work on mould reaction has been carried out in the laboratories of the British Non-Ferrous Metals Research Association. The present Paper is a survey in broad outlines of the results of this work.

Occurrence

When a molten metal is poured into a sand mould it is immediately confronted with a steam atmosphere, which in general is oxidizing to the metal. A reaction, therefore, occurs between the metal and the atmosphere of the mould. $2M + O_2 \rightarrow 2MO$. Usually this reaction leads immediately to the production of a tough impermeable oxide skin on the surface of the casting, which effectively stifles further reaction. However, with certain metals, for reasons which are discussed later, reaction is not stifled but is able to continue apace. Alloys in which this happens are said to be subject to " mould reaction."

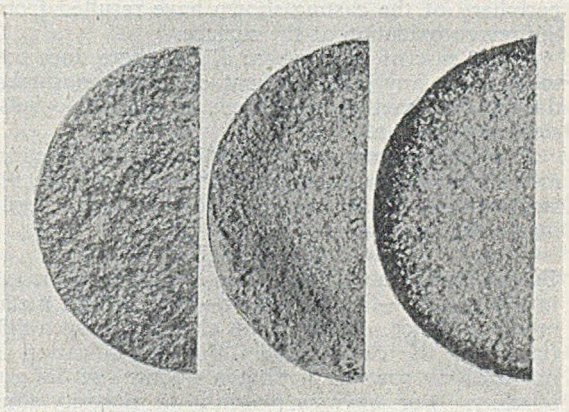
It might be thought that mould reaction only occurs in green sand moulds, but in fact the reaction proceeds equally well in dry sand moulds; presumably the reason is that in dry moulds reaction takes place between the metal and moisture combined with the bonding clay, which is, of course, not removed during low temperature drying. Indeed Baker[1] and Lees[2] have shown that if the reaction is to be prevented by removing the moisture present, it is necessary to bake the mould at over 900 deg. C.

The occurrence of mould reaction depends on the presence in the alloy of certain highly reactive elements and, in general, the violence of the reaction increases with the amount of reactive element. The most important of the elements which cause mould reaction in non-ferrous alloys are magnesium and phosphorus. Thus it is found that magnesium alloys, aluminium alloys containing more than about 0.5 per cent. magnesium, and copper-base alloys containing more than small amounts of phosphorus, are all subject to mould reaction. As little as 0.03 per cent. phosphorus promotes mould reaction in gunmetals, but rather greater quantities—up to about 0.3 per cent.—may be present in straight bronzes before the amount of reaction becomes substantial. Certain other easily oxidizable metals also provoke mould reaction, for example, mould reaction occurs in both aluminium-base and copper-base alloys containing small amounts of boron. The presence of alkali or alkaline earth elements produces some mould reaction in most aluminium alloys. Substantial mould reaction is produced in copper-base alloys by the co-presence of lead and silicon.

A rather curious form of the reaction occurs in aluminium-silicon alloys of eutectic composition. In commercial practice boric acid is often added to the sand to prevent mould reaction in aluminum-magnesium alloys. If modified eutectic aluminium-silicon alloy is poured into sand containing boric acid, violent mould reaction occurs, although no such reaction is produced in the absence of boric acid, or when the alloy is unmodified. Some reaction occurs when a plain aluminium-sodium alloy is poured into a mould containing boric acid, but the degree of reaction is much less than is the case with the modified aluminium-silicon alloy.

Effects

The effects of mould reaction are in general two-fold. In the first place some of the metal of the casting may be consumed during the reaction. This effect is present in extreme degree in magnesium-base castings where, if the reaction is allowed to proceed unchecked, the entire casting catches fire and is consumed. In the case of LM 10, the aluminium-10 per cent. magnesium casting alloy, the reaction is less extreme. Here, in severe cases, mould reaction results in the production of patches of oxide on the surface of the casting—this is sometimes known as " sand attack." These patches are



(*a*) (*b*) (*c*)

FIG. 1.—*Photographs showing Sub-surface Oxidation in Fractured Bars* (2-*in. dia.*) *of Aluminium*/10 *per cent. Magnesium Alloy. Mould Reaction* (*a*) *inhibited,* (*b*) *partially inhibited, and* (*c*) *uninhibited.* (*Approximately* $\times \frac{1}{2}$.)

* A Paper read before a joint meeting of the London branch of the Institute of British Foundrymen and the Institute of Metals. The Author is head of the melting and casting section, British Non-Ferrous Metals Research Association.

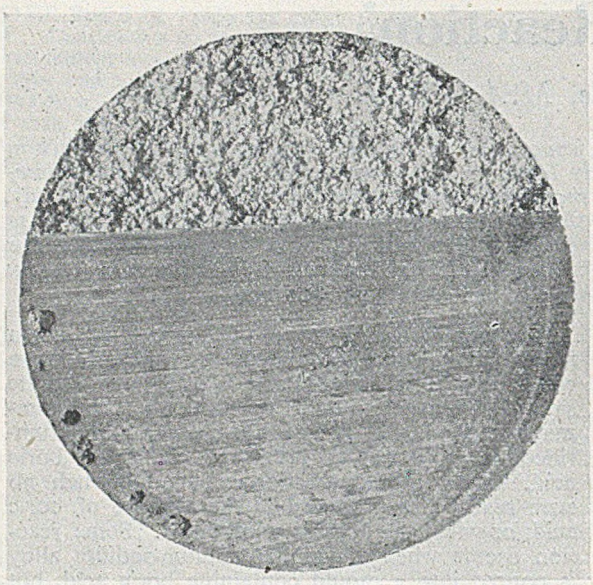


FIG. 2.—*Sub-surface Oxidation and Cavitation in a Fractured 3-in. dia. Bar of Aluminium/10 per cent. Magnesium Alloy.*

generally about the size of a sixpence or a shilling and may extend ¼ in. or more into the casting. It is obvious that these patches, besides being unsightly, render the casting useless unless the machining allowances are very heavy. Apart from these patches of localized severe oxidation, the reaction results in more general partial oxidation for some distance below the surface of the casting. This is illustrated in Fig. 1 which shows the fractured sections of three castings in which the reaction was allowed to proceed to different extents. Another example is given in Fig. 2; the cavities around the periphery of the casting shown have resulted from the severe oxidation at the surface.

In the case of copper-base alloys, there does not seem to be any large amount of metal consumed during the reaction, and there is no visible sub-surface oxidation.

The second important effect of mould reaction arises from the fact that reaction of the metal with steam results in the liberation of hydrogen according to the reaction:—

$$Me + H_2O \rightleftharpoons MeO + H_2$$

Furthermore, the hydrogen is probably liberated in the nascent—that is, atomic—form, at the metal mould interface. Some of this atomic hydrogen diffuses into the casting and during solidification is liberated as gaseous hydrogen giving rise to gas porosity. For obvious reasons, the porosity thus produced tends to be greatest near the surface of the casting, as is shown in Fig. 3; the lower pair of lines in this figure compare the distribution of porosity in a normal mould (full line) with that in an unreactive mould (dashed line) produced by bonding sillimanite with ethyl silicate. The upper pair of curves show the same effect in the case of a casting made from metal which contained some dissolved hydrogen before the casting was poured. Fig. 4 is a photomicrograph showing the concentration of porosity towards the outside of the casting. The introduction of hydrogen gas and the consequent porosity occurs in all cases of mould reaction. Quite obviously this is most undesirable where a really sound casting is to be produced. As is explained below, however, there are occasions when gas porosity produced by mould reaction is useful rather than harmful.

Incidentally, this gas absorption is helpful to the investigator in providing a quantitative measure of the extent of the reaction. For example, the density of a particular casting can be compared with that of a similar casting made in an unreactive mould; in this way it has been found that the presence of more than about 1.5 per cent. porosity in D.T.D. bars made from degassed melts of bronzes and gunmetals, indicates that mould reaction has occurred. In the case of aluminium alloys anything in excess of about 0.5 per cent. porosity in a D.T.D. bar would be taken as evidence of mould reaction. Alternatively, if it is desired to avoid the difficulties of making a blank in an unreactive mould, the procedure illustrated in Fig. 5 can be employed. This figure shows a cylindrical test-casting much used in work at the British Non-Ferrous Metals Research Association; the diameter varies between 2 and 5 in. The casting is first of all part sectioned and then fractured and the fracture examined for visual evidence of mould reaction. A slice is then cut from the casting and this slice is bored out in two steps, the density being measured before and after each step. It is thus possible to measure the variation in density from the outside to the inside of the slice. If the density is greatest at the outside and least in

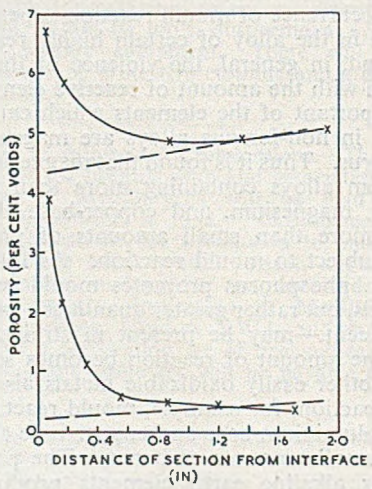


FIG. 3.—*Distribution of Porosity in 2-in. dia. Bars of Aluminium/10 per cent. Magnesium Alloy cast in Unreactive Mould (broken lines) and in a Mansfield-sand Mould without Inhibition of Mould Reaction (full lines). The Lower Pair of Record Lines were obtained from Castings made from Degassed Metal and the Upper Pair from Castings made from Gassy Metal.*

the inside it is safe to assume that little or no reaction has occurred. If, on the other hand, the density increases from outside to inside it is clear, bearing in mind Fig. 3, that substantial reaction has, in fact, been produced.

For example, in the case of a particular 2-in. dia. casting in aluminium-10 per cent. magnesium alloy in which mould reaction had been fairly well inhibited by means described presently, the porosities were: Outer ring 0.2, mid-ring 0.3, centre cylinder 0.6, and whole casting 0.4 per cent. respectively, indicating that little reaction had occurred. The following figures were obtained from another similar casting in which, however, the reaction was not inhibited—outer ring 4.4, mid-ring 2.0, centre cylinder 1.4, and whole casting 2.7 per cent. In this case, the large amount of porosity in the outer ring compared with the centre cylinder, shows that substantial reaction occurred. This is also shown by the overall porosity—0.4 per cent. in the first example, and 2.7 per cent. in the second.

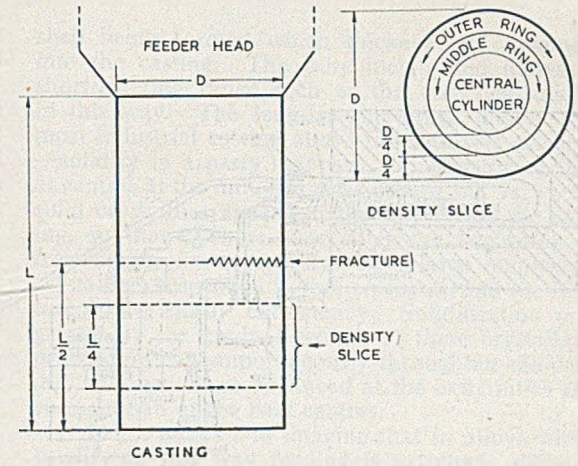


FIG. 5.—*Cylindrical Test Casting, showing the Method of Cutting and Density Determination.*

Mechanism of the Reaction

It must, at the outset, be admitted that there is still a great deal which is not known about mould reaction, so that the views expressed below are still very tentative. It is clear from the foregoing that for mould reaction to occur, two conditions must be fulfilled. First, there must be present in the alloy an element whose affinity for oxygen is high enough to cause dissociation of steam. Secondly, the reaction product—generally an oxide film—must be incapable of stifling the reaction. On this basis it is fairly easy to see why mould reaction occurs in the three main groups of alloys which are dealt with—magnesium-base alloys, the aluminium-magnesium alloys and the copper-base alloys containing phosphorus. In the case of magnesium alloys, the oxide produced has a smaller volume than the volume of the metal from which it was made, *i.e.*, its Pilling-Bedworth ratio is less than 1. The result is that the oxide film does not cover the surface completely and reaction proceeds at gaps in the film.

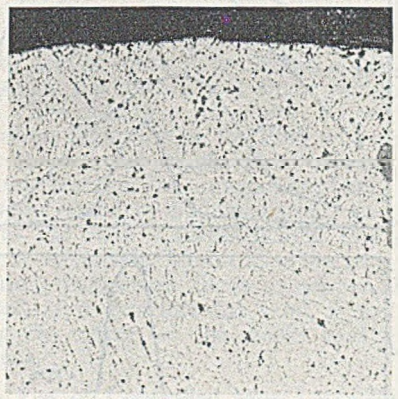


FIG. 4.—*Photomicrograph showing Concentration of Porosity near the Surface of a Partially Inhibited Casting. The Outer Region of this Casting contained 4.5 per cent. Porosity.* (×7.5.)

Matters are rather more complicated in the case of aluminium-base alloys containing magnesium, but here also the oxide film consists largely of magnesium oxide and the explanation of why the reaction occurs is no doubt similar. In copper-base alloys which contain phosphorus, the reaction product is not an oxide but, in all probability, a phosphate which is liquid at temperatures near the solidification temperature of the alloy. It is easy to understand that a liquid reaction product of this nature would not stifle the reaction, when it is also known that this liquid dewets on the surface of the alloy. The explanation of mould reaction in phosphorus-free, copper-base alloys containing lead and silicon is similar, oxidation of these two elements at the surface of the casting producing a liquid lead silicate.

There are, therefore, good reasons for the occurrence of the reaction in the main groups of alloys under consideration. However, when the subject is studied in more detail, especially as to the influence of minor alloying additions and of substances present in the mould, the picture becomes much more complicated and there is as yet no good explanation for many of the effects observed. The B.N.F.M.R.A. has recently carried out an extensive laboratory study, as opposed to a foundry investigation, of the reaction of the aluminium-10 per cent. magnesium alloy LM 10. The results of part of this study were recently published by Swain.[3]

Experimental Technique

The technique he used in this investigation is illustrated in Fig. 6. A small specimen of the alloy was placed in the reaction chamber and purified argon was passed through the chamber until the specimen had acquired the required temperature; at this point steam was admitted and hydrogen produced during the reaction was collected in the burette, a measure of the amount of reaction thus being obtained.

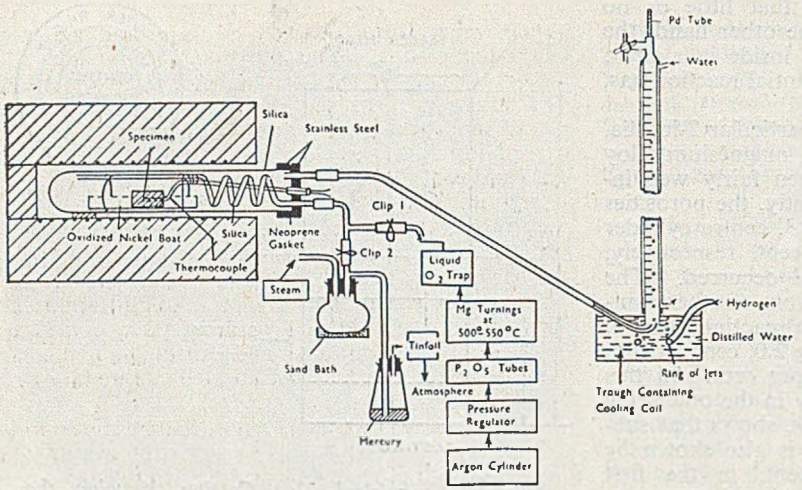


FIG. 6.—*Laboratory Apparatus used by Swain for Investigating the Reaction of the Aluminium/Magnesium Alloy, L.M.*10.

Although some hydrogen was absorbed by the specimen the bulk of that produced by the reaction was swept away and collected. Fig. 7 shows the amount of reaction which had occurred in 15 minutes, measured by the volume of hydrogen collected in that period as a function of temperature for alloys of several different magnesium contents. The arrows on the illustration indicate the positions of the liquidus and solidus for each alloy composition. The remarkable fact which emerges from this illustration is that the reactivity-temperature curves show maxima which depend on the composition of the alloy but which are somewhere near the solidification temperature. In the case of the aluminium-10 per cent. magnesium alloy, the maximum actually occurs between the liquidus and solidus temperatures and this may account for the fact that gas porosity in these alloys is found mainly near the surface of the casting. As yet we have no good theoretical explanation for these effects.

A somewhat similar investigation has been made by Whitaker,[4] who used a slightly different technique. One way of minimizing the reaction in the aluminium-10 per cent. magnesium alloy is to add a small quantity of beryllium metal to the alloy and Whitaker has been able to show that the maximum inhibition is produced by the addition of 0.004 per cent. beryllium. Using the same technique Whitaker also examined the effects of a number of other elements which were suspected of aggravating the reaction in this alloy when beryllium inhibition was employed. The results of this study are being described in a forthcoming paper.[4]

An investigation of the influence of a number of mould and metal composition variables on mould reaction in 10 per cent. tin bronzes and in gunmetals has recently been made by Rutherford.[5] This work was foundry work as opposed to laboratory studies of the kind carried out by Swain and Whitaker, and the degree of mould reaction was assessed by the amount of porosity in a test casting. Fig. 8 illustrates the influence of a number of additional elements on the reaction of 10 per cent. tin bronze containing 0.5 per cent. phosphorus. This illustration shows that several elements such as vanadium, chromium and aluminium reduce the amount of reaction, while others, in particular magnesium and iron, increase it.

Mould Variables

Unfortunately, the beneficial elements are generally those which are undesirable for other reasons; in most instances they form tenacious oxide skins which completely spoil the casting properties of the alloy. Fig. 9 shows the effect of a number of mould variables. It will be seen that the reactivity of different sands varies quite considerably, synthetic sands on the whole being less reactive than naturally-bonded sands. This is presumably due to the fact that synthetic sands normally contain less clay and hence smaller amounts of combined moisture. The core sands investigated also show considerable variation in reactivity, and this is probably due to similar causes. It will be observed that the use of certain blackings made from plumbago and water apparently intensifies the reaction to some extent. On the other hand, painting the mould with

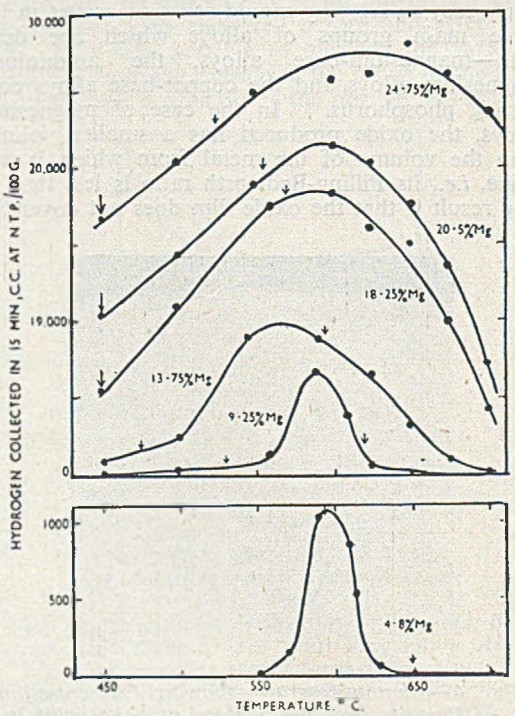


FIG. 7.—*Reaction occurring in* 15 *min. shown as a Function of Temperature for Aluminium Alloys containing various amounts of Magnesium.*

aluminium, and in particular aluminium-magnesium alloy paint suppresses the reaction to a marked degree. In fact coating the mould with aluminium-magnesium paint is a practical method of inhibition where this is desired. The inhibition afforded by these paints presumably results from sacrificial action, the metal in the paint reacting with the steam and thus preventing it from reaching the casting. An incidental point is that when it is desired to cast a D.T.D. bar or other casting, in order to assess the quality of a melt by measurement of the density, it is imperative that the mould be inhibited with aluminium-magnesium paint if the alloy contains more than about 0.02 per cent. phosphorus in the case of gunmetals or 0.2 per cent. in phosphor-bronzes. Fig. 10 also shows the effect on the reactivity of certain additions made to the sand. It can be seen that the addition of 5 per cent. ammonium bifluoride has markedly reduced the amount of reaction; on the other hand the addition of the same amount of sulphur has substantially increased the reaction.

Inhibition of the Reaction

The previous section shows that the reaction in the aluminium-10 per cent. magnesium alloy is inhibited to a considerable extent by the addition of 0.004 per cent. beryllium. This has been confirmed by foundry experiments. Complete inhibition is not obtained in heavy sections, however, and if further inhibition is needed, it is necessary to add a few per cent. of some inhibitor to the sand. Various substances have been suggested, the two most important of which are boric acid and ammonium bifluoride. There is probably little to choose between these two inhibitors, but boric acid produces a less objectionable smell and appears to be slightly superior. The joint use of beryllium and boric acid is discussed in detail in a Paper to be published shortly.[4] Since the reaction is affected by time, it is quite likely that anything which speeds up the solidification of the casting, for example, chilling, would help to reduce the reaction, and this may be a partial solution to the problem of inhibition in really heavy sections.

In the case of bronzes, protection is easily secured by spraying the mould with aluminium-magnesium paint. The addition of about 5 per cent. of ammonium bifluoride to the sand will also largely inhibit the reaction in phosphor bronze.

Mould reaction in magnesium-base alloys is readily prevented by adding about 5 per cent. sulphur to the sand. Paradoxically, this substance does not effectively inhibit the reaction in either aluminium-magnesium alloys or copper-base alloys —indeed, if it gets into the sand, it will partially destroy the effect of the boric acid and other inhibitors.

Use of Controlled Mould Reaction

Generally speaking, foundry alloys may be divided into two types: those which solidify by skin formation and those which solidify in a pasty manner. As its name implies, skin formation means that solidification begins at the mould wall, a thin shell being formed which thickens and advances into the casting. The pure metals and alloys of short-freezing range such as the eutectics solidify in this way. The long-freezing-range alloys—and most industrial casting alloys fall into this category —solidify in a pasty manner. Solidification begins at centres at the mould wall as before, but very soon solid crystallites appear in the interior of the casting, so that a short time after the beginning of freezing the casting consists of a large number of crystallites suspended in molten metal, and the mixture has a slushy consistency. Solidification progresses by the gradual growth of these crystallites, proceeding contemporaneously throughout the casting, although more advanced at the extremities and surface than at the heat centres.

It is not difficult to imagine that in alloys which solidify in this way feeding is extremely difficult, since all parts of the casting are competing at the same time for feeding liquid. Unless solidification is rapid and highly directional, as for example in a D.T.D. bar, no part of the casting gets fed com-

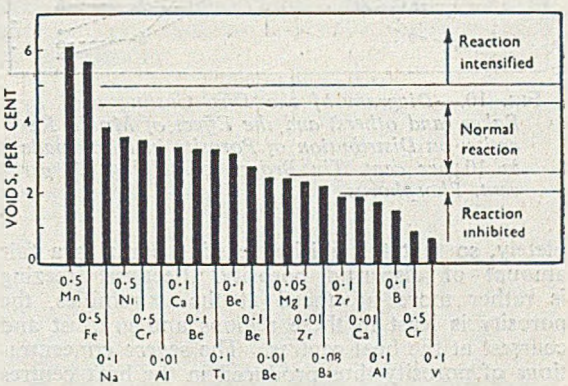


FIG. 8.—*Influence of Addition Elements on Mould Reaction in* 10 *per cent. Tin Bronze containing* 0.5 *per cent. Phosphorus.*

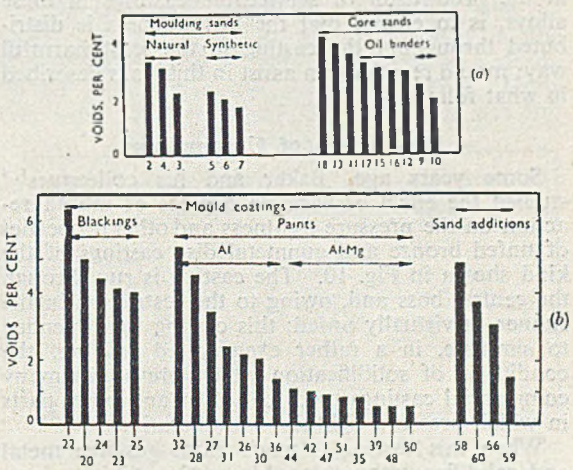


FIG. 9.—*Influence of* (*a*) *Moulding Sand and* (*b*) *Mould Coating and Additions made to Sand on Mould Reaction in* 10 *per cent. Tin Bronze containing* 0.5 *per cent. Phosphorus.*

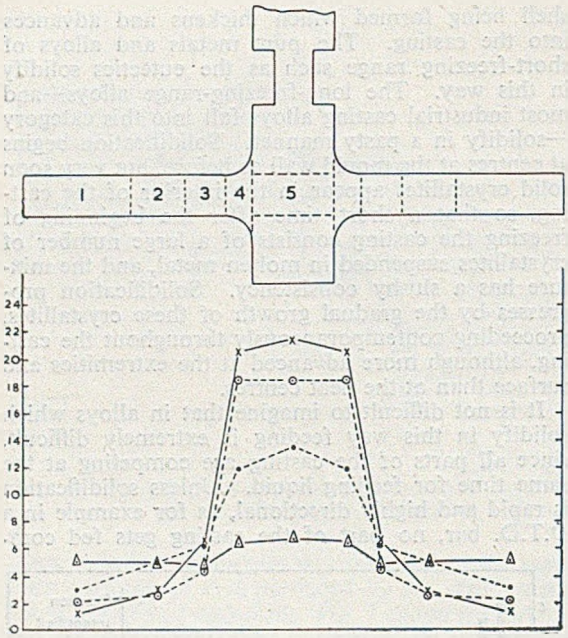


FIG. 10.—*Diagram of the Disc Casting used by Baker (and others) and the Effect of Mould Reaction on Distribution of Porosity in Discs made in 10 per cent. Tin Bronze containing 0.7 per cent. Phosphorus.*

pletely, so that the finished casting contains a fair amount of dispersed porosity. Because freezing is rather more advanced at the extremities, the porosity is least in these regions and greatest and coarsest at the heat centres. The severe concentrations of porosity thus produced in the heat centres of poorly-fed castings are often extremely damaging to the strength and pressure tightness of the casting. It frequently happens, therefore, that the problem in the production of serviceable castings in these alloys, is to ensure that the unsoundness is distributed throughout the casting in the least harmful way; mould reaction can assist in this, as is described in what follows.

Distribution of Unsoundness

Some years ago, Baker and his colleagues[1, 6] studied the effect of variable degrees of mould reaction on the pressure tightness and other properties of unfed bronze and gunmetal disc castings of the kind shown in Fig. 10. The casting is run through the central boss and, owing to the restriction in the runner, is virtually unfed; this casting was intended to simulate, in a rather exaggerated fashion, the conditions of solidification which prevail in many commercial castings used for valves and other parts in which pressure tightness is imperative.

When this casting is made from gas-free metal and solidifies without mould reaction taking place, the thinner disc part freezes rather more rapidly than the boss, which forms a heat centre. The solidification shrinkage of the disc is, therefore, partially fed by liquid metal which is drawn from the boss. Since the boss is unfed, at the end of solidification it is unsound to the extent of (*a*) its own solidification shrinkage, and (*b*) the volume of metal supplied to feed the thinner parts of the casting. Hence, the casting finally contains a small amount of porosity in the disc, but a large amount in the boss; this is shown in the illustration (full line with crosses). Owing to the interconnecting nature of the porosity in the boss the casting almost invariably leaks under pressure.

Suppose now that, before pouring, the metal contains a little dissolved gas—sufficient to give rise to a small amount of porosity in the casting. Some of this gas will be rejected from solution during solidification of the disc part of the casting and will cause gas porosity in that part. It is said that nature abhors a vacuum, but provided a vacuum is not formed, it is quite immaterial to nature whether the solidification shrinkage is compensated by gas or feeding metal. As the result the central boss has to supply less feeding metal and is less unsound than is the case when no gas is present. This is indicated by the broken lines in Fig. 10. This method of reducing severe local shrinkage will, no doubt, be familiar to die-casters.

Unfortunately, this method of dealing with local unsoundness is open to two objections. First, it is difficult to control the gas content of the metal—too much gas would make the casting very porous and would be worse than none at all. Secondly, the gas has a strong tendency to concentrate in the liquid metal in the heat centre as the result of diffusion. Whether or not this happens depends on the time available for diffusion but in some castings a considerable degree of concentration occurs. When this happens a good deal of gas porosity is produced in

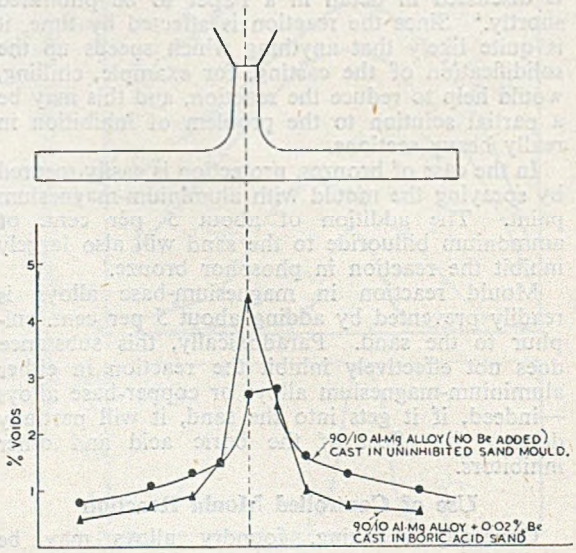


FIG. 11.—*Diagram showing Effect of Mould Reaction on Distribution of Porosity in Ribbed Disc Castings made in Aluminium/10 per cent. Magnesium Alloy.*

the heat centre, the soundness of which will, therefore, be little improved or even made worse; Fig. 10 (broken lines) shows that in this particular casting the amount of porosity in the boss, although reduced, is still large.

Now if freezing is already in progress when the gas enters the casting—as is the case when mould reaction occurs—there will be much less opportunity for concentration of the gas to take place, because less time is available for diffusion. Consequently most of the gas is rejected from solution close to the surface of the casting (see Fig. 3, depicting the variation of porosity with distance from the surface). The result of this is that the demand of the disc part for feeding metal is greatly reduced and the soundness of the boss is markedly improved as Fig. 10 (full line with trjangles) shows. Naturally this presupposes that the amount of mould reaction is controlled so as to provide just about sufficient gas porosity to compensate for the freezing shrinkage of the disc, but, as is shown below, this is not difficult. Lees[2] has shown that a similar effect, though of smaller magnitude, is found with aluminium-10 per cent. magnesium alloy (see Fig. 11).

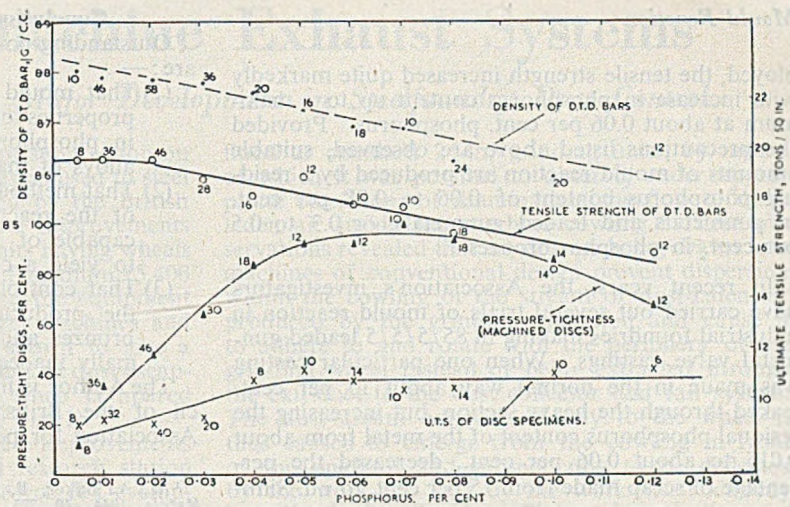


FIG. 12.—*Effect of Phosphorus on Pressure Tightness and Strength of Gunmetal Disc Castings.*

Control

The amount of mould reaction which occurs in bronzes and gunmetals is governed by (*a*) the residual phosphorus content after de-oxidation and (*b*) the pouring temperature, and by adjusting these two variables any desired degree of mould reaction can be produced. Fig. 12 shows the pressure tightness of gunmetal disc castings plotted against phosphorus content.[6] The pressure tightness is measured by the number of pressure-tight castings in a batch expressed as a percentage. Fig. 12 also shows the density of the D.T.D. bars made from the same melts—this is a measure of the amount of reaction which has occurred—and the strengths of both discs and D.T.D. bars. As can be seen, a high percentage of the discs leak when the phosphorus content is low, but the percentage of leakers falls rapidly as the phosphorus content is increased until at 0.06 per cent. phosphorus nearly all the discs are pressure tight. On the other hand, as the phosphorus content increases the density and tensile strength of the D.T.D. bars go steadily down. The improvement in the pressure tightness of the discs found with phosphorus content 0.06 per cent was reflected in the tensile strength as Fig. 12 shows.

Mould reaction can thus be applied to all small and medium-size castings in phosphor-bronze, gunmetal and leaded gunmetal which are inadequately fed. Least advantage is perhaps obtained with leaded gunmetal since this alloy has, in any case, good pressure tightness when sand cast, but even here the advantages of controlled mould reaction are considerable.

Precautions

Certain precautions must be taken in applying mould reaction: first, the metal must be substantially gas-free when cast—this may necessitate degassing with nitrogen—and, secondly, the lowest reasonably practicable pouring temperature must be used. If these precautions are neglected, too much gas may be introduced into the casting, with the result that the potential improvement in pressure tightness is lost. The effect of pouring temperature is indicated in Fig. 13, which shows the influence of phosphorus content on the strength of specimens cut from a plate casting in 85/5/5/5 leaded gunmetal which contained an unfed rib section. The gauge lengths of the tensile specimens passed through the point of attachment of the unfed rib.

It will be seen from this illustration that, with the higher pouring temperatures, an increase in the phosphorus content of the alloy resulted in a steady decline in the tensile strength of the casting. However, when the lowest pouring temperature was em-

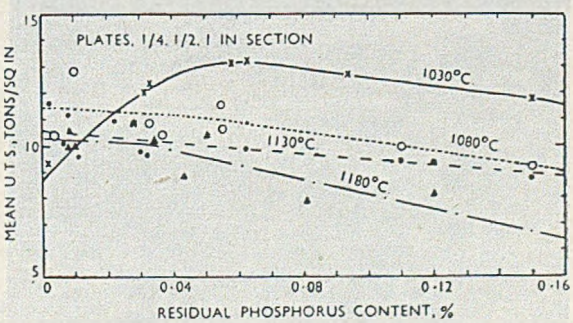


FIG. 13.—*Effect of Phosphorus and Pouring Temperature on Strength of Ribbed Plate Castings in 85/5/5/5 Leaded Gunmetal.*

Mould Reaction

ployed, the tensile strength increased quite markedly with increase in phosphorus content up to a maximum at about 0.06 per cent. phosphorus. Provided the precautions listed above are observed, suitable amounts of mould reaction are produced by a residual phosphorus content of 0.06 to 0.08 per cent. in gunmetals and leaded gunmetals, or 0.3 to 0.5 per cent. in phosphor-bronzes.

In recent years, the Association's investigators have carried out several trials of mould reaction in industrial foundries making in 85/5/5/5 leaded gunmetal valve castings. When one particular casting was made in the normal way about 15 per cent. leaked through the heavy section, but increasing the residual phosphorus content of the metal from about 0.015 to about 0.06 per cent., decreased the percentage of scrap made from 15 per cent. to nil. Similar results have been obtained with other castings, and it is thought the beneficial effect of controlled mould reaction on inadequately fed gunmetal castings which have to be pressure tight must now be regarded as fully established.

Conclusions and Acknowledgments

Outstanding points which emerge from the survey are:—

(1) That mould reaction can seriously affect the properties of many castings, especially those in phosphorus-containing copper alloys, and alloys of magnesium.

(2) That methods are available for the suppression of the reaction which are in most instances capable of inhibiting the reaction sufficiently to yield a commercially-acceptable casting.

(3) That controlled mould reaction may assist in the production of pressure-tight castings in bronzes and gunmetals when these are normally inadequately fed.

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

REFERENCES

[1] W. A. Baker, F. C. Child and W. H. Glaisher, *J. Inst. Metals*, 1944, **70** 373.
[2] D. C. G. Lees, B.N.F.M.R.A. Res. Rep. No. 724, 1946.
[3] A. J. Swain, *J. Inst. Metals*, 1951, **80**, 125.
[4] M. E. Whitaker, Papers submitted to Institute of Metals and Institute of British Foundrymen.
[5] N. B. Rutherford, *J. Inst. Metals*, 1951, **79**, 189.
[6] W. H. Glaisher, *J. Inst. Metals*, 1949, **76**, 377.
[7] N. B. Rutherford, *J. Inst. Metals*, 1951-2, **80**, 555.

Strickling of Cylindrical Cores

By "J. B. M."

The horizontal strickling of cylindrical loam cores on a core-bar mounted on trestles is as old as the craft of founding. Basically, the process consists of winding the bar with straw or wood-wool rope, coating with loam and "sweeping" to size. Although the operation is akin to that of lathe turning, except that material is deposited and not removed, it is not uncommon to see the rotary power for turning the bar being supplied by a labourer or labourers struggling with crank handles fastened to the squared ends of the core-bar trunnions. Mechanical transmission through an electrically-driven, low-speed Radicon gear-box, or by means of the back-gear of a lathe headstock, can be very effective, but both means lack portability and versatility.

The alternative method illustrated in Figs. 1 and 2 is simple to rig up, economical, and very efficient in use, and requires very little maintenance except occasional lubrication (which, in a foundry, is usually given very occasionally. The well-oiled appearance in the photograph was for the benefit of the photographer, as the unit generally operates under a thick crust of dried loam spillage). The compressed-air motor which drives the gadget was taken from an old low-speed air-drill. It is coupled to drive cast gear-wheels, the large gear being located on the trunnion of the bar and held in place with four set-screws. Speed of turning is controlled by adjustment of the compressed-air valve. The driving unit being readily mounted on to one of the trestles, gives maximum portability to the apparatus. Cores up to 3 ft. dia. by 32 ft. long have successfully been strickled with the set-up described.

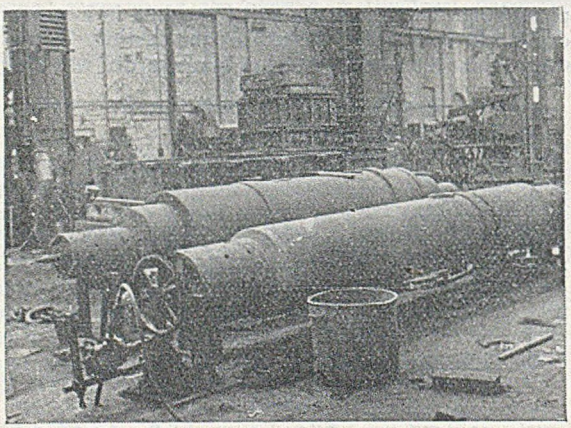


FIG. 1.—*Air-motor-driven Unit arranged for turning Large Cylindrical Cores during Strickling.*

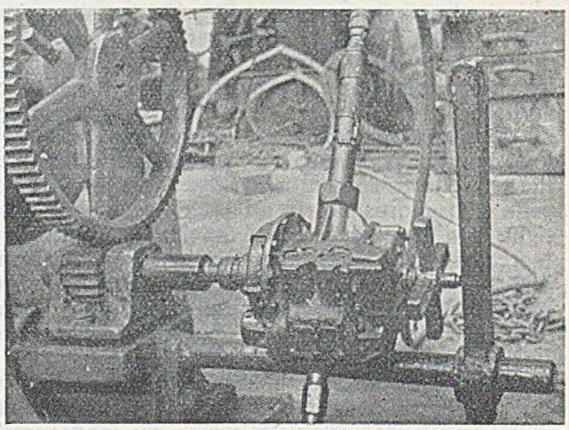


FIG. 2.—*Close-up of the Air-motor showing method of Coupling and Gear Drive.*

Grinding-machine Exhaust Systems

B.S.F.A. Announce Major Development in Steelfoundry Dust Control

Outstanding improvements in dust suppression on stand or pedestal grinding machines as used in steel and other foundries are announced by the British Steel Founders' Association. The improvements apply with equal effectiveness to units having wheels of high (9,000 ft. per min.) and of medium (5,400 ft. per min.) peripheral velocity and the equipment can be easily fitted both to existing machines and to new equipment. It has been shown to give a considerable reduction in the amount of dust escaping into the foundry atmosphere when compared with conventional hood design (see Fig. 1).

The research work leading to these improvements has been carried out at the dust research station established in Sheffield by the Research & Development Division of the B.S.F.A. during 1951, and has been sponsored by the Association's committee on industrial health. The work has been conducted with the co-operation of the Foundry Trades' Equipment & Supplies Association and of its ventilation committee, through which body a series of 24 in. stand grinding machines of different makes has been made available for experimental purposes. As the work has progressed, keen interest has been shown by H.M. Inspectorate of Factories and by the trade unions, the Iron, Steel & Metal Dressers' Trade Society in particular.

Preliminary Work

Preliminary observations at the dust research station were conducted using Perspex end-covers fitted to standard 24-in. grinding units, by means of which it was possible to observe, under appropriate conditions of illumination, the flow of dust-laden air inside the machine cowling. These observations revealed that air streams being drawn into machines of conventional design prevent dispersion within the cowling of the stream of dust-laden air produced by the grinding operation and cause it to adhere to and rotate with the periphery of the grinding wheel instead of being extracted through the exit-duct to the dust collector and fan system. The dust-stream adhering closely to the wheel is thus caused to emerge from the cowling in front of the operator and subsequently to be deflected by the work-rest and by the work itself directly into the breathing zone of the operator.

By controlling the ingress of air being drawn into the cowling by the extraction system, and by concentrating the effects of extraction solely upon the dust-stream, it has been shown that it is possible to reduce very substantially the amount of dust-laden air rotating with the wheel and thereafter emerging and reaching the operator. The measures adopted involve the design of a work-rest such that the effects of the extraction system are applied directly to the underside of the work-rest itself, thus bringing the extraction as near to the source of dust-generation as possible.

Further modifications include reducing to a minimum the gap between the casing and the sides or flanks of the grinding wheel, together with the fit-

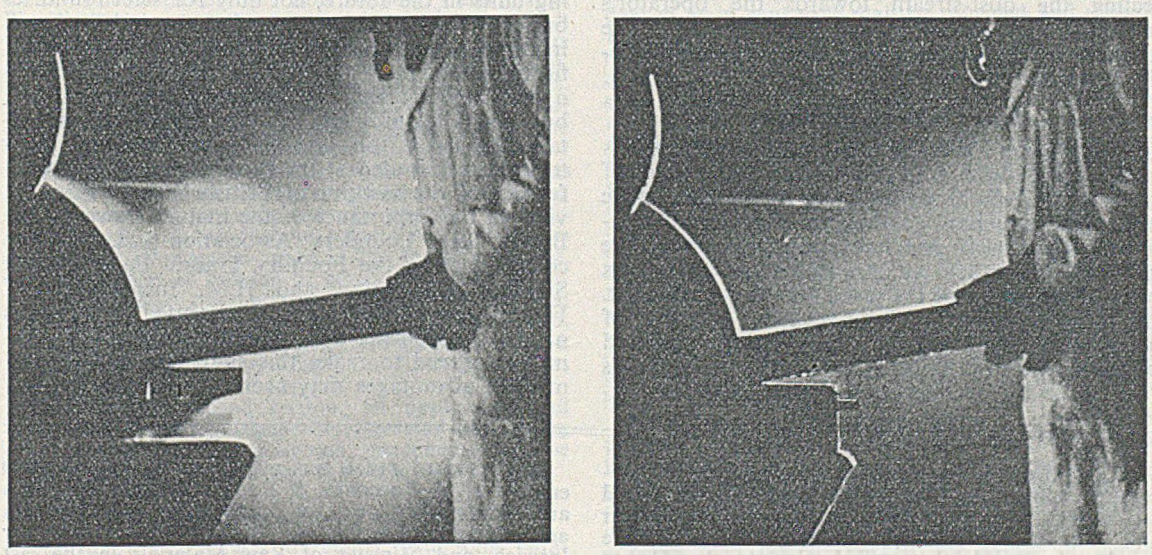


FIG. 1.—*(left) Smoke Cloud formed by the Grinding of Wood on a Standard Machine; (right) Same Grinding Operation after Adjustments in the Design of the Hood, showing the Reduction in Smoke Emission. The Slight Glare appearing above the Operator's Hands in the R.H. Illustration is caused by the Lighting employed and is Masked by the Smoke Cloud in the first Illustration.*

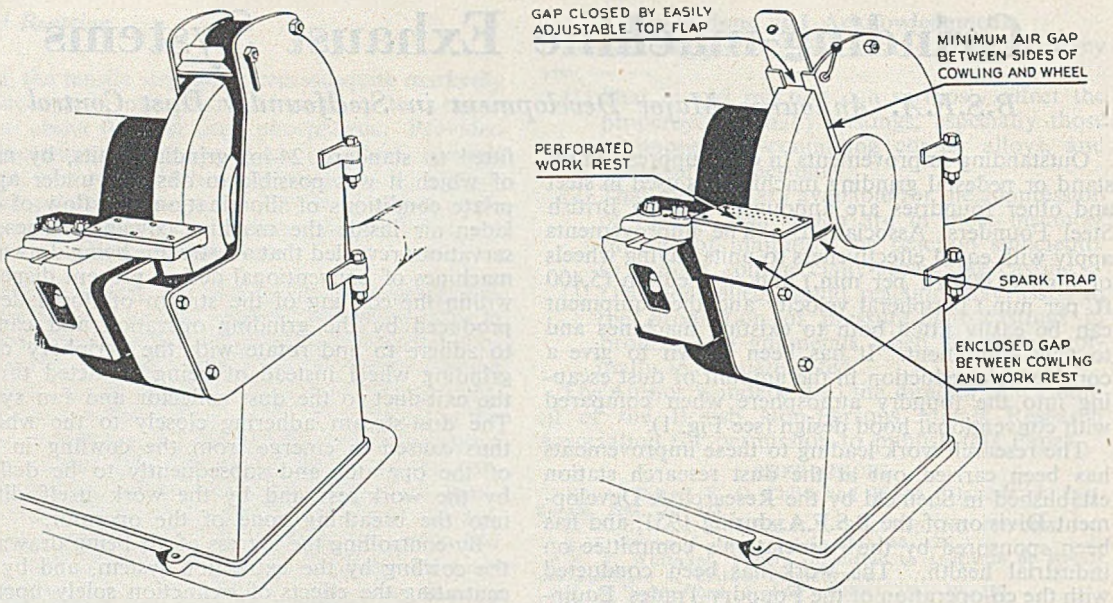


FIG. 2.—*(left) Conventional Hood Design for a Stand Grinder, and (right) Improved Hood showing the Points to which Attention has been directed.*

ting of an easily-adjustable "gap-closer" at the point where the wheel emerges from the cowling immediately in front of the operator's face. By this means, the gap can readily be closed by the operator as the wheel wears. At the same time, the work-rest has been altered to embody either slots or perforations which, together with the suction applied below the work-rest, effectively prevent the work-rest acting as a stripping mechanism for deflecting the dust-stream towards the operator's breathing zone before it enters the cowling. The complete recommendations are shown diagrammatically in Fig. 2.

Dust Control near Source

In achieving their objective, the modifications have been made in such a way that the control of the dust has been brought as near as possible to the dust origin; they have confined the dust-stream within the cowling itself; and, last but not least, they have involved no complicated innovations or alterations to the construction of the stand grinding equipment. The latter criterion has been regarded as being of prime importance, and has been rigidly observed throughout the B.S.F.A.'s dust research station's work in so far as only in this way could any design improvements evolved be applied retrospectively to existing machines at small expense and with the greatest possible expedition. Similarly, in relation to new equipment, the manufacturer is able to introduce a marked increase in inherent efficiency of his equipment with a minimum of departure from the basic design, and with a minimum increase in cost of production.

It is more than likely that stand or pedestal grinding units in the future, not only for steel foundries but for other sections of the foundry industry, will incorporate as a standard feature the sort of modifications that have arisen from this example of co-operative effort and applied research to a practical but very vital problem. A film, recording the detailed stages of this research since its inception, is to be demonstrated at the forthcoming annual conference of the Institute of British Foundrymen. In view of the importance of the matter, however, the British Steel Founders' Association has, with the concurrence of the Foundry Trades' Equipment & Supplies Association and H.M. Inspectorate of Factories (which has been represented at meetings of the Equipment Association's ventilation committee) agreed to make this statement so that immediate advantages may accrue.

AN OUTSTANDING FEATURE of the sixth annual presentation supper for long-service employees of Evered & Company, Smethwick, was the showing of a colour film, "The Brass Trail," supplementing the Report of the brassfoundry productivity team's visit to the United States. One of the stars in the film was one of the firm's directors, Mr. Charles Wilson. At the same assembly a portrait of the firm's chairman, Mr. J. Howard Wilson, was presented to Mrs. Wilson, on behalf of the company.

A PERSONAL APPEAL was made recently to the 1,300 employees of Ransomes & Rapier, Limited, engineers and ironfounders, etc., of Ipswich, by the chairman and managing director, Mr. Richard Stokes, M.P. for Ipswich, and Minister of Raw Materials in the last Government, for a 20 per cent. increase in output. The message, received by each employee stated: "We can maintain the social services only so long as we can pay for them ourselves, which we have never done in full since the Welfare State started in 1945."

Health and Safety in Foundries

Draft Regulations for the Casting of Iron and Steel

The Minister of Labour and National Service has announced that he proposes to make under sections 46 and 60 of the Factories Act, 1937, special regulations applying to iron and steel foundries. These draft regulations, which are called the Iron and Steel Foundries Regulations, 1953,* contain requirements concerning the safety, health and welfare of foundry workers and include provisions as to gangways, the removal of dust and fumes, protective clothing, bathing facilities, clothing accommodation and the stacking and storage of equipment, tools, etc.

Towards the end of last year a Private Members' Bill entitled the Foundry Workers (Health and Safety) Bill was introduced into Parliament with a view to the improvement of working conditions in iron foundries on the lines of the "Garrett Report." The Bill received a Second Reading on December 12 last, but was subsequently withdrawn. In the light of discussions with representatives of interested industrial organizations which arose out of the circumstances attending the introduction and withdrawal of the Bill, the Minister of Labour and National Service has decided to initiate forthwith the statutory procedure for introducing special regulations under the Factories Acts in regard to the subject matters of the Bill, and to extend the scope of the proposals to steel as well as iron foundries. It is clear from the draft that, despite the inclusion of almost "legal" phraseology, there are many matters where discretion still has to be exercised by someone—presumably by the Factory Inspectorate.

The draft regulations, following the usual precedent, first record several definitions regarding operations and locations to be mentioned in the body of the document. For instance, by "iron foundry" and "steel foundry" are meant those parts of a factory in which iron castings or, as the case may be, steel castings are produced by casting in moulds made of sand, loam, moulding composition or other mixtures of materials, or by shell moulding, or by centrifugal casting in metal moulds (not being the production of pig-iron or the production of steel in the form of ingots, and *not* including die-casting)† together with any workrooms in which any of the following processes are carried on as incidental or supplemental processes in connection with such production, namely the preparation and mixing of materials used in the foundry process, the preparation of moulds or cores, knock-out operations, the heat treatment or welding of castings, dressing operations and fettling operations. Also, "pouring aisle" means an aisle leading from a main gangway or directly from a cupola or furnace to where metal is poured into moulds.

Then in the second section, on application and operation of the regulations, it is pointed out among other things that the proposed enactments will be additional to other requirements of the Factory Acts.

Arrangement of Plant

The following abstracts are culled (with some paraphrasing to make for clarity) from the body of the pamphlet:—

For the purposes of promoting cleanliness and safety in connection with the work the following requirements shall be observed:—(*a*) moulding boxes, loam plates, ladles, patterns, pattern-plates, frames, boards, box weights, and other heavy articles kept inside the foundry shall, whether or not in constant use, be stacked in a safe and orderly manner; (*b*) suitable and conveniently situated racks, bins or other receptacles shall be provided and used for the storage of other gear and tools; and (*c*) where there is bulk storage of sand, fuel, metal scrap or other materials or residues, suitable and conveniently situated bins, bunkers or other receptacles shall be provided for the purpose of such storage.

No person shall carry out any work within a distance of twelve feet from a vertical line passing through the delivery end of any spout of a cupola or furnace, being a spout used for delivering molten metal, or within a distance of eight feet from a vertical line passing through the nearest part of any ladle which is in position at the end of such a spout, except, in either case, where it is necessary for the proper maintenance or use of the cupola or furnace that that work should be carried out within that distance or that work is being carried out at such time and under such conditions that there is no danger to the person from molten metal which is being obtained from the cupola or furnace or is in a ladle in position at the end of the spout.

Gangways and Pouring Aisles

In every workroom to which this regulation applies constructed, reconstructed or converted for use as such after the making of these regulations and, so far as reasonably practicable, in every other workroom to which this regulation applies, sufficient and clearly-defined main gangways shall be provided and properly maintained which:—(*a*) shall have an even surface of hard material and shall, in particular, not be of sand or have on them any substantial layer of sand; (*b*) shall be kept *so far as reasonably practicable*† free from obstruction, and shall not be used for pouring molten metal except where and when pouring is being done by means of an overhead crane and assistance in the pouring operation by a person on the gangway is not reasonably avoidable; (*c*) if not used for carrying molten metal, shall be at least 3 ft. in width; (*d*) if used for carrying molten metal shall be:—(i) where truck ladles are used exclusively, at least 2 ft. wider than the overall width of the ladle; (ii) where hand shanks are carried by not more than two men, at least 3 ft. wide; (iii) where hand shanks are carried by more than two men, at least 4 ft. wide; and (iv) where used for simultaneous travel in both directions by men carrying hand shanks, at least 6 ft. wide.

In the same circumstances, pouring aisles shall be provided and properly maintained which:—(*a*) shall have an even surface of hard material and shall, in particular, not be of sand or have on them any substantial layer of sand; (*b*) shall be kept *so far as reasonably practicable* free from obstruction; and (*c*) shall be wide enough not to imperil the safety of persons carrying or pouring molten metal and shall in no case be of less than 18 in. wide. (*Provided* that this paragraph shall not apply to any workroom or part of a workroom if, by reason of the nature of the work

* Obtainable from H.M. Stationery Office, York House, Kingsway, London, W.C.2, or any branch of H.M. Stationery Office, or through any bookseller, price 4d. net. (5½d. post free).

† The italics are used by the Editor to indicate phraseology where discretionary powers are given.

done therein, the floor of that workroom or, as the case may be, that part of a workroom *has* to be of sand.) "Workroom" in this regulation means a part of an iron foundry or steel foundry in which molten metal is transported or used, and one constructed, reconstructed or converted for use as such *after* the making of these regulations if the work on it was begun afterwards.

Dust and Fumes

Open coal, coke or wood fires of a portable nature shall not be used for the purpose of heating workrooms, or for heating or drying ladles inside a workroom, unless adequate measures are taken to prevent *so far as practicable,* fumes or other impurities from entering into or remaining in the atmosphere of the workroom. No such fires shall be used for drying moulds except in circumstances in which the use of such fires is *unavoidable.* Mould stoves and core-stoves shall be designed, constructed, maintained and worked as to prevent, so far as practicable, offensive or injurious fumes from entering into any workroom during any period when a person is employed therein.

All knock-out operations shall be carried out:—(*a*) in a separate room or part of the foundry suitably partitioned off, in which, *so far as practicable,* effective and suitable local exhaust ventilation and a high standard of general ventilation are provided; or, where this is not practicable, (*b*) in an area of the foundry in which, so far as practicable, effective and suitable local exhaust ventilation is provided. Similarly, all dressing and fettling operations shall be carried out in a separate room or in a separate part of the foundry suitably partitioned off, or in an area of the foundry set apart for the purpose. In either case, they shall, where practicable, be carried out with *effective and suitable* local exhaust ventilation or other *equally effective* means of suppressing dust, operating as near as possible to the point of origin of the dust.

Protective Clothing and Equipment

The occupier shall provide and maintain suitable protective equipment for the protection of workers engaged in any such process, that is to say:—

(*a*) suitable leggings with spats or other covering for the feet, where such equipment is a necessary supplement to the clothing of the worker so as to afford adequate protection against burns or scalds for the legs and feet of any worker while he is engaged in carrying or pouring molten metal;

(*b*) non-inflammable overalls for any worker engaged in carrying or pouring molten metal or attending at the cast;

(*c*) suitable gloves or hand-leathers for any worker engaged in handling hot metal, hot plates, moulding boxes, cores, pig-iron or other material likely to cause damage to his hand by burn or scald;

(*d*) *approved* respirators for any worker engaged on easing castings, or on carrying out operations inside a cupola, furnace or ladle, or on knock-out operations creating a heavy dust concentration which cannot be dispelled quickly and effectively by the existing ventilation arrangements;

(*e*) suitable goggles for any worker engaged in (i) working at a cupola spout or furnace spout or attending to a cupola or furnace where there is risk to the eyes from molten metal, (ii) carrying or transporting molten metal, (iii) pouring molten metal, or (iv) work involving risk to the eyes from hot sand being thrown off.

Bathing Facilities and Clothing Accommodation

The occupier shall provide and maintain, for the use of persons employed in the foundry:—(*a*) adequate and *suitable* facilities for taking shower or other baths, with *suitable* arrangements for privacy, and including *suitable* accommodation for dressing, undressing or changing clothes in a changing room or changing rooms adjoining each room in which such baths are situated, and (*b*) an adequate number of lockers or other suitable arrangements, in or conveniently near to such changing rooms, for the accommodation of clothing belonging to persons using the baths.

If in the case of any foundry the Chief Inspector of Factories is satisfied that, by reason of lack of space or by reason of difficulty of having structural alterations carried out or of obtaining equipment or adequate supplies of water, the full application of the requirements of this regulation is for the time being *not reasonably practicable,* he may by certificate in writing (which he may in his discretion revoke at any time) exempt the foundry from any of the requirements to such extent and subject to such conditions as he may specify in the certificate, and where such an exemption is granted a legible copy of the certificate shall be kept posted up in the foundry in a position where it may conveniently be read by the persons employed therein.

Grinding-wheel Fatality

The Borough Coroner (Mr. J. H. S. Addison) told the jury at an inquest at the Guildhall, Walsall, on Monday of last week, that it was quite clear the cause of an accident in which Mr. Leonard Arthur Steele lost his life as a result of a grinding wheel bursting would never be known. Steele, a grinder, was struck in the abdomen by fragments of the wheel while working on a machine at the foundry of Malleable, Limited, Littleton Street, Walsall, on December 16.

Mr. Ellis Jones, who shared Steele's machine, said he stopped the machine while Steele altered the speed from first to second, a change which should not have been made in view of the size the grinding wheel was later found to be. The chief works engineer, Mr. Roy Smith, said he thought Jones must have been confused by the accident in making that statement, as the speed could not be altered unless the rest, which served as a safety device, was moved. He examined the machine after the accident and found that, although the rest was broken, it had not been moved and neither he nor the factory inspector could find any reason for the accident. On being recalled, Mr. Jones said the rest was not attached to the safety rod and in consequence the speed could be altered without moving the rest. Pressed further by Mr. Smith, he insisted that that was so. Returning a verdict of "Accidental death," the jury added a rider that they felt there should be greater control of the distribution of grinding wheels from the stores and that there should be greater application of the safety devices fitted to the machines.

AN ALUMINIUM-ALLOY PLAQUE incorporating the borough arms of Stourbridge, designed and produced by Mr. S. G. Bishop, chairman of Stourbridge Arts Society, is to be presented to the aircraft carrier *Perseus,* which ship has been adopted by the town.

Sand Burn-on in Steel Castings

Report of Work in Progress in the University of Cambridge

In a recent paper* to the West of Scotland Iron and Steel Institute, Dr. T. P. Hoar, M.A., B.Sc., F.I.M., described some of the work being carried on in the University of Cambridge on the penetration of steel into sand moulds, and burn-on of sand on steel castings.

Dr. Hoar pointed out that, as steel does not "wet" moulding sands, pressure is required to force the molten metal into the pores of the compacted sand. A first essential is to determine the minimum pressure necessary for metal penetration to occur. In the apparatus, devised to simulate the physical conditions obtaining at the steel/mould interface, a quantity of metal is melted on top of a compact of moulding sand contained within a silica crucible. The silica crucible has a sintered base so permitting relatively free passage of gases. The sample of steel is melted by using a high-frequency coil, mounted outside the apparatus. A pressure of inert gas (usually hydrogen, nitrogen or argon) is applied on top of the molten metal surface, or suction is produced underneath the sintered base of the silica crucible. In either case, a pressure differential is established and arrangements are made to measure the exact value required to cause metal penetration into the compact of moulded sand. Metal penetration is detected very rapidly by contact wires embedded just below the surface of the sand compact so that the penetrating metal completes an electrical circuit. The minimum pressure necessary to cause the metal to penetrate the sand is known as the "penetrating pressure."

Dr. Hoar stated that penetration of the steel into the moulding sand is the fundamental cause of sand burn-on in steel castings. Once the minimum penetrating pressure has been attained, the molten steel, with its low viscosity, will flow easily into the pores of the casting before solidification occurs. Penetrating pressure, determined by the apparatus, is of the order of 20 to 60 cm. of mercury, or 35 to 110 cm. of iron. In the majority of large steel castings, these limits will be exceeded so that it is very desirable to study methods by which metal penetration may be prevented or minimized.

Influence of Pressure

The pressure required to force any liquid into a capillary is directly proportional to: the surface tension of the liquid and the cosine of the contact angle between the liquid and the solid. It is inversely proportional to the radius of the capillary. Dr. Hoar said that the surface tension of metal falls slightly with increase in temperature, but that the ultimate relationship betwen penetrating pressure and temperature is complicated by changes in the physical characteristics of the surface layers of compacted sand. Quite extensive experiments have been carried out, using tin, and it has been shown that at a certain critical temperature there is a sharp fall in penetrating pressure. A minimum point is reached and is immediately followed by a sharp rise in the penetrating pressure. Dr. Hoar interprets the abnormal fall in penetrating pressure as being caused by an increase in the pore radius due to the sintering of the sand and the clay bond in the compacted sand. The sudden, sharp rise is attributed to a general sintering at the surface of the compacted sand into a viscous non-porous layer.

The degree of ramming and changes in the sand grain-size exert roughly parallel influences. Increased ramming and smaller grain-size both result in notable increases in the measured values for penetrating pressure, the values for fine sand being almost double those for coarse sands. Oxidation of the metal, produced by maintaining an oxygen pressure over the metal tends to increase the penetrating pressure and it is suggested that the iron oxide reacts with the silica grains to give a viscous impervious surface layer. Attention was also directed to the use of mould paints, many of which tend to crack, thus allowing metal to penetrate through the cracks and thence into the mould. Cracking has been shown to be due to the differential expansion of the wash layer and silica sands. Washes composed of more-easily sinterable materials, such as iron or calcium silicates, may prove useful.

Depth of penetration of metal into the mould is determined by a complex of several variables, one of these being thermal diffusivity. This is a property of the compacted sand and appears to be closely related to the heat transparency of the sand grains. As a result, it is highly probable that silica and zircon sand moulds will heat up more deeply than olivine sand moulds and thus allow deeper penetration of the metal into the mould. Experiments with an unsheathed platinum/platinum-rhodium thermocouple have shown that the metal at the mould wall is molten for about 1 minute after pouring a 280-lb. casting. This period when molten metal is in contact with the surface of the mould is critical for metal penetration.

Dr. Hoar concluded with a short account of a prototype of a simple apparatus designed to determine the penetrating pressure required for any given compacted sand mould.

Discussion

In the discussion following the Paper, considerable attention was directed to the problem of sand size grading. It was emphasized that the pressure required for metal penetration was inversely proportional to the radius of the capillary. In the case of a mould, this dimension must obviously be related to the size grading of the sand and the degree of ramming. In fact, so far as the fundamental equation was concerned, this was the only factor which might be controlled in ordinary practice.

* "Metal Penetration and Sand Burn-on in Steel Castings: their Causes and Prevention." December, 1952.

Sand Burn-on in Steel Castings

Notable differences were found in size grading of sands in this country and in the United States. In Britain, the tendency was to use moulding sands of a relatively narrow size range, three sieve sizes being specified. In the United States and Sweden, however, a wider size grading of sand was common, five sieves being employed. There was evidence that the wider size grading appeared to give better results. One speaker stated that there was a lower size limit for the sand, metal penetration occurring very easily with sand finer than 72 mesh.

With reference to the effect of iron oxide in increasing the penetrating pressure, it was reported that the 18/8 austenitic stainless steels gave very little trouble with penetration, forming at the worst a skin only about $\frac{1}{16}$ in. thick which could be knocked off easily. On the other hand, some of the worst examples of metal penetration had been found in the 12 to 14 per cent. chromium steels. Neither of the latter two groups of steels would be expected to form iron oxide easily but they showed completely different behaviour in regard to metal penetration.

Mould Dressings

The question of suitable mould-washes was vigorously discussed, one speaker suggesting that there was a decided tendency to move away from the refractory paints, such as silica flour, to more elastic or slaggy paints. It was suggested that a high viscosity was required for a mould paint otherwise the material might be washed off the surface by the steel. Reference was made to the use of pelleted pitch, which formed a glassy surface, and to the possibilities of using a mixture of ceramic materials which would suddenly form appreciable quantities of liquid about 1,580 deg. C.—for example a ternary eutectic with a melting point of 1,580 deg. C. Such a mixture might prove to be self-healing so far as cracking was concerned and so eliminate the worst defects of the refractory paints.

Reference was made in the Paper to the U.S. practice of adding 1 to 2 per cent. of ferric oxide to core mixtures to prevent cracking. One speaker stated that from practical experience he could confirm that the addition of 2 per cent. of ferric oxide did increase the green-strength of the core and appeared to offset the tendency of the surface layers to break away from the interior of the core. There was also some evidence that the ferric oxide should be chemically uncombined. In non-ferrous casting, metal penetration was rather more serious; the sands all contained a higher proportion of ferric oxide than steel moulding sands, but this oxide was almost certainly chemically combined.

NEW LABORATORIES have recently been opened at the factory at Merthyr Tydfil of Hoover (Washing Machines), Limited. They have been equipped with modern apparatus for metallurgical and chemical research and process investigation. This move is part of an extensive building and development programme nearing completion at the factory.

Publications Received

Stone's Bronzes. Tables of Properties and Applications. Published by J. Stone & Company (Charlton) Limited, Woolwich Road, Charlton, London, S.E.7.

Long before standardization was in fashion, many public authorities and large engineering concerns stipulated in their buying specifications "Stone's so-and-so bronze." The times have changed and it is the object of this publication (of foolscap size, with double page folded leaves for the actual tables) to associate—where possible—their various brands of alloys with B.S.I. and other standard specifications. Whilst not a particularly decorative publication it is of the essentially useful type and should be included in all buyers' bookcases.

Instructions for the Installation, Operation and Maintenance of Type B.T.1. Published by British Moulding Machine Company, Limited, Weston Works, Faversham, Kent.

This instructional manual for their type B.T.1 moulding machine has just been released. It has been printed and produced, says a covering letter, entirely in the Kent works. This being the case, the reviewer's esteem for the manual is better deserved than if the work had been put out to contract. The grey binding, however, has been bought in open market. Very sensibly, it has washable plastic covers and a well-made spiral binding. After giving a picture of the machine, there is an illustration of the name-plate and the main reference for enquiries. Then there is a line-drawing of the foundation plan with the dimensions given in both inches and millimetres—a policy followed throughout. Then follow pages devoted to installation, lubrication, operation, adjustments, operation maintenance and fault diagnosis. Finally all the spare parts needed are illustrated and numbered for easy reference. At the end are a few blank pages upon which can be kept notes of the performance of the machine. This book should be of material help in getting the best out of the machine, and can be obtained from Faversham.

Quarterly Bulletin of Steel Statistics for Europe. Published by the United Nations Economic Commission for Europe. Available from H.M. Stationery Office, P.O. Box No. 569, London, S.E.1. Price 3s. 9d.

The book carries over 100 pages of bald statistics completely devoid of comment. The tables cover the European production of iron ore, coke, pig-iron, and crude steel, followed by the output figures of all the various countries. From a study of the book, it is revealed that a record tonnage (73.8 million metric tons) of steel—a 9 per cent. increase over 1951—was produced. Less scrap was being charged into the blast furnaces, leaving additional quantities for the better purpose of steel-making. The United Kingdom is for the time being a net importer of steel, with Western Germany moving in the same direction. Steel production was last year over 10 per cent. lower than 1951 owing to the prolonged steel strike, in the United States, but current production is higher.

Pig-iron production was also increased, that of the United Kingdom being of the order of 9 per cent. The coke output in this country also increased by 8 per cent.—not particularly high when compared with other countries. The exports of iron ore from Sierra Leone are showing a remarkable growth.

Iron and Steel Bill

Discussions at the Committee Stage

Last week, Parliament in committee on the Iron and Steel Bill, gave detailed consideration to a number of matters affecting ironfounders. On the question that the Schedule, as amended, be agreed to:

MAJOR P. ROBERTS (Sheffield, Heeley, C. and L.) said he felt that the whole scheme would work so effectually that if and when the Labour Party came into power again they would not be able to persuade the electors to renationalize the industry in the old way. There would now be a general form of supervision over the whole range of the iron and steel industry, which went far beyond the bounds of the particular firms nationalized under the existing Act.

MR. NABARRO (Kidderminster, C.) said he still believed there would be difficulty in administering very small foundries, and if a formula could be found to exclude them, it would be in the interests of the industry and the public.

MR. J. H. JONES (Rotherham, Lab.) congratulated the Minister on the solution which had been achieved, but added that it would be imperative to keep an eye on small foundries, which could not only use a lot of material in the aggregate, but also waste a lot.

MR. BROOMAN-WHITE (Rutherglen, C.) thought that the misapprehensions of the iron founders were, from the beginning, ill-founded.

MR. ALPORT (Colchester, C.) said that from the earliest stages of the negotiations with the industry the Minister was able to give the assurance that a majority of those concerned with this particular aspect of the industry were in favour of his proposal. It seemed curious that, at a later stage, it turned out that there was a large number of firms directly affected by the proposal who were apparently strongly against it. There was a great deal of strength in the comment made at the time in a leading article in *The Times*, to the effect that this would perhaps be a lesson to industry in particular, but also to Government departments negotiating with industry, to make certain, before reaching a conclusion, that those who had been appointed to speak for the industry in question had, in fact, ensured that they were voicing the sentiments of the section of the industry for which they wished to speak. Having read, in conjunction with that leading article, a letter from Sir Norman Kipping on the attitude, presumably, of the F.B.I. to this matter one could not but feel it was high time that those who would place themselves in a position of reaching important negotiations with Government departments or Ministers should take the elementary precaution of knowing what those whom they represented were thinking, before trying to act as their spokesmen.

Minister's Assurance

MR. SANDYS said that he realized, understood, and sympathized with the strong feeling which had been expressed among the founders. He thought that if the text of the Bill and the White Paper, and perhaps some explanatory memorandum, had gone to them earlier, some of those anxieties might not have been felt so acutely. He was grateful to all in the industry for the understanding which they had shown in this last stage, and for the broad-minded sense of statesmanship which the leaders of the industry had exhibited in the matter.

In answer to the charge against the Conservative Party that in bringing in the founders they were doing something contrary to their declared policy, he recalled that in their election manifesto they had said: "We shall revive, if necessary with added powers, the former Iron and Steel Board." That former board included the ironfounders. The main reason for their inclusion was that they consumed the same raw materials as the steelmakers; they consumed a quarter of the total requirements of pig-iron and scrap for the whole iron and steel industry.

He claimed to have limited the powers of the Board over the founders to what was strictly necessary for its duties. The basic principle of comprehensive supervision had been preserved. The industry was deeply divided on this matter, and no solution that he or anyone else could find could satisfy everybody. He hoped that on reflection most would agree that the solution resulting from the many discussions he had had with the industry represented a fair and reasonable compromise, and that they would co-operate to make the settlement a success.

The schedule, as amended, was agreed to.

Last Wednesday, after Mr. George Strauss, who was Minister of Supply in the Labour Government, had made a plea that the appointed day for the coming into operation of the Bill should be not less than 12 months from its passing into law, Mr. Duncan Sandys (the present Minister of Supply), announced that there would be no delay in the changeover, which would be a matter of "weeks and not months."

Considerable debate followed on the composition of the Iron and Steel Board, which the Minister said should consist of a full-time and independent chairman, with a nucleus of full-time members, including, if possible, men drawn from both sides of the industry, a consumer, and, possibly also an independent. A Tory back-bench amendment to increase the Board's membership to a maximum of 15, including the chairman, and to raise the minimum from eight to 10, was accepted. The Minister denied that any discussion had taken place with Steel House on the name of anyone who might be on the board.

Membership of Board

MAJOR PETER ROBERTS (Sheffield, Heeley, C. and L.) moved an amendment to increase the minimum number of members on the Board from seven to nine, and the maximum number from 11 to 14.

The MINISTER said he would accept the amendment, but could not commit himself as to the composition of the Board. The amendment was agreed to.

Resisting an Opposition amendment requiring that the chairman and no less than half the members of the Board should give whole-time service, MR. SANDYS said it was the Government's intention that some members, including the chairman, should be full-time, and some part-time. He was not prepared to commit himself to any precise proportion of whole-time members. The Minister should have the widest possible latitude in making his selection of the members.

The amendment was negatived by 250 votes to 235.

MR. J. H. JONES (Rotherham, Lab.) moved an amendment to ensure that the chairman and full-time members of the Board should not have a substantial financial interest in the industry, and that no part-time member should have any financial or other interest in the industry that would prejudice the exercise or performance of his functions on the Board.

SIR REGINALD MANNINGHAM-BULLER, Solicitor-General (Northamptonshire, South, C.), said that the Government agreed that the chairman and whole-time

Iron and Steel Bill

members should not have any substantial financial interest in the iron and steel industry, but there was difficulty about defining exactly what was meant by "substantial." The Government regarded it as essential that there should be full disclosure to the Board and to the Minister by full-time and part-time members of such interests as they had in the industry before their appointment, and of any interest acquired in the industry after appointment. That meant that this part of the clause would have to be redrafted.

The amendment was, by leave, withdrawn.

On the motion that the clause stand part, MR. SANDYS, replying to MR. STRAUSS, said that the only reason why he had not given details of the Board was because it had not been fixed in advance. In the Government's view the Board should be composed of a number of elements. There should be a full-time independent chairman. Then there should be a nucleus of full-time members, to include if possible men drawn from both sides of the industry, and a consumer, and possibly an independent.

A third element would be part-time members, some drawn from within the industry and from both sides of industry. In addition, there should be some persons altogether outside industry, men with experience of administration, business, science, and so forth. Steel producers on the board should not number more than three, and there should be equal representation from the trade-union side in the industry. The Board must not be a cockpit in which divergent interests would fight for their respective interests. It must be a body of persons with wide experience, entrusted with important public responsibility which they would discharge jointly and collectively. A Board of this kind would provide the public supervision which the Government considered desirable.

Clause 2, as amended, was ordered to stand part of the Bill by 265 votes to 240—Government majority, 25.

Further consideration of the Bill was adjourned.

I.V.E. Section Notes

Successful Midlands "Stag Party"

A record attendance of 90 members and guests attended the annual "men only" dinner of the Midlands section of the Institute of Vitreous Enamellers on Friday of last week. It was held in the Imperial Hotel, Birmingham, and presided over by Mr. W. Ball, chairman of the section. Following the loyal toast, the chief guest, Mr. R. E. G. Evers, director of E. J. & J. Pearson, Limited (and representing the Society of Glass Technology), in a short, witty speech, proposed the toast of the Institute, to which Mr. E. Biddulph responded. "The Visitors" was proposed by Mr. Ball and the reply in this case was made by Dr. W. E. Fisher, O.B.E., who said: "It is a craft which remains an art though invoking all the resources of science," when describing the activities of the vitreous enamelling industry. The evening concluded with light entertainment.

THE BRITISH ALUMINIUM COMPANY, LIMITED, have vacated their branch office and warehouse at 66, Kirkstall Road, Leeds, 3, and transferred the office to Martins Bank Chambers, Vicar Lane, Leeds, 1, to handle sales of unwrought and fabricated aluminium and aluminium alloys in the counties of Yorkshire and Lincolnshire. Mr. A. E. Heeley continues as branch manager and the telephone number and telegraphic address are retained.

Tax Liability in Business Sale

The First Division of the Court of Session in January heard an appeal by the Commissioners of Inland Revenue in a case which was governed by a previous decision of the court, but which the Lord Advocate indicated it was intended to take to the House of Lords because of its universal importance in principle in both Scotland and England. The case related to a "balancing charge" of £1,405 made in the assessment to income tax upon John Barr, trading as Henry & Galt, ironfounders, of New Sneddon Street, Paisley. The charge, made under the Income Tax Act, 1945, arose from the sale of the business, of which Barr had become the sole proprietor, to Thomas Reid, managing director of Thomas Reid & Sons (Paisley), Limited, engineers. The transfer of the business as a going concern was completed in July, 1946, when Mr. Reid paid the purchase price of £14,000 by cheque. The balancing charge was based on a figure of £4,000, which was the portion of the purchase price allocated to the plant and fittings.

The Lord Advocate described the appeal as a formal one. The General Commissioners of Income Tax had held that there was no liability to the balancing charge, following a decision of the Court of Session in 1950, which the commissioners held to be binding upon them, The Crown were proposing to test the matter in the hope of having that decision brought under review. The 1950 case arose from the sale of a fishing boat, and there it was held that as the taxpayer's trade had been permanently discontinued when the sale took place, there was no liability to pay the balancing charge. The Lord Advocate said he was not agreeing with that decision but he understood that the court could not avoid reaching the same conclusion in this case. Lord Carmont, presiding, said the court had no alternative but to hold that no liability to a balancing charge arose.

Anodized Dies

In a paper read in Glasgow on January 27 to the Institution of Engineers & Shipbuilders in Scotland, the author, Mr. C. A. Parlanti, of Carron-Parlanti, dealt with the production of sound castings by controlled rate of heat transfer. After a brief survey of the various methods of casting and shaping metals to the pattern, it was pointed out that because of mechanical properties and uniformity obtained, forging was being increasingly developed. However, manufacture in this sphere took time, and if a large quantity was required at short notice capacity was never immediately available. Therefore a system of casting giving qualities approaching those obtained in forgings was a necessity. It was pointed out that metal cast in a chilled mould had better physical properties than that in an ordinary mould, and, by controlling the rate of heat-transfer, a more even cooling was possible throughout the casting. It was found that casting in anodized aluminium moulds achieved this and that physical qualities of the castings were very high, the casting being comparatively free from stress. Whatever the number required, there was no dependence on the availability of skilled labour to maintain high quality.

APPLICATIONS have been made to the Shipbuilding Employers' Federation and the Engineering and Allied Employers' National Federation by the executive council of the Confederation of Shipbuilding and Engineering Unions for a day's holiday with pay on Coronation Day for all shipyard and engineering workers.

Production Methods in the Enamelling Shop

I.V.E. Discussion at London Meeting

This abstract of a lengthy discussion on the vitreous enamelling of cast iron reports an attempt to isolate factors which contributed in one works to the first processing success of 96 per cent. "good" as compared to a general level for the industry generally of very much lower. Points elucidated include putting the shop on its "honour" to produce only good work, a special addition to the shot used for blasting, an alloy content in the iron and "no skimping" of new sand and other raw materials. Contributory factors were mainly psychological—confining inspection to the production shop, having a cadre of employees of long-service with the company, and very close and harmonious liaison between foundry and enamelling shop.

At the annual meeting in London last Autumn of the Institute of Vitreous Enamellers it was disclosed that the Paper under the above title which had hitherto been scheduled anonymously was actually presented by Mr. H. M. Hibberd, of Belling & Company, Limited, Enfield, London, and related to methods used by that firm, where Mr. Hibberd is a director.

THE PRESIDENT (Dr. Harold Hartley), introducing Mr. Hibberd, recalled that on the previous day members had paid a visit to Belling's works and had seen some fine work there, and at the meeting that afternoon were anxious to know how it was done.

MR. HIBBERD, during the presentation of the Paper,* said that in cast-iron enamelling at his works, 96 per cent. of the one-coat products were "good," and he attributed those good results very largely to the team-work of all concerned.

MR. J. BERNSTEIN, opening the discussion, said he had cheered himself up by reading the Paper during his journey to London, but there were one or two things mentioned in it which he did not follow. One was the absence of any mention of phosphorus in the composition of the castings, and he asked what was the figure for this element. Referring to the use of nickel, he said that maybe it was used as a graphitizer and perhaps certain other castings made at the same time required a nickel addition. He asked if it was felt that the presence of 0.2 per cent. nickel in the metal composition quoted, influenced in any way the good results that were claimed. Thirdly, Mr. Bernstein asked for clarification of the statement, in the section of the Paper headed "Inspection," that, as regards cast-iron work, the only rejections were due to fractures and occasional distortion. Should that be interpreted as meaning that no trouble whatever occurred in the way of pinholes, porosity, etc ?

MR. HIBBERD replied that the phosphorus content was 1.2 per cent. Nickel was added when the firm had started to make their own boiling plates, as a stabilizer for the iron and as a heat-resisting addition element and it had improved the castings generally to such an extent that its use had been continued. Pinholing was exceedingly rare; "once in a blue moon" it occurred, but there were no epidemics. The figure of 96 per cent. good castings was quite correct.

A MEMBER asked what was the method of payment at Mr. Hibberd's works and what incentives were applied; also could particulars be given of inspection methods and standards of finish required.

MR. HIBBERD said the operatives were paid on a piece-work basis. Going back for the moment, however, he said that, until about 2½ to 3 years ago, there was an inspection department outside the production shops; he was sorry to say that it was responsible for a great deal of unrest, and there were a great many rejections. He did not wish it to be assumed that by just wiping out that inspection department everything had gone smoothly; it hadn't. Nevertheless, with the inspection outside, the shop had acquired what he would call a defeatist complex owing to the enormous number of rejects. It was decided then to take the man in the shop into the confidence of the management, to say to the operatives that their job was to produce a perfectly good article, something which was fit to assemble straight away; they were put on their honour. The men were paid piece-work, but naturally the foreman and chargehands were on their toes and ready to intervene in any given process to ensure that things were going alright. Finally the work was inspected by one of the chargehands, who had been with the company for about 25 years. The men worked according to their conscience, as it were, and they were given the best possible equipment in the way of jigs, perrets, and the like.

That policy had paid dividends. Some three years ago the rejects were very high indeed—something like 60 per cent., and that factor actually interfered with the output of finished cookers. This report might appear to be a very "tall" story, but it must be borne in mind that most of the operatives had been with the company for some years, they knew what was wanted, and they felt they had a stake in the company. In addition to their piece-work earnings, they received an overriding bonus at the end of the year, but he did not think that was responsible for their good attitude. The shop well-being as an entity was brought into the picture.

Additions when Shot-blasting

MR. J. H. GRAY, as chairman of the Southern section of the Institute, first thanked Mr. Hibberd for his hospitality on the occasion of the visit to the works. With regard to the preparation of castings to be enamelled, he referred to a statement in the Paper that 20 per cent. silicon-free grit was used with the steel grit and asked what it was and

* Paper printed in the JOURNAL, November 6, 1952.

whether it was found to be of real advantage.

MR. HIBBERD replied that Zircosil was used. Chemically speaking, it was not silica-free, but for all practical purposes in relation to the factory regulations it was.

MR. W. BROWN (also of Belling & Company) added that their castings after blasting could be left to stand probably two or three days without discoloration; but with ordinary blasting methods castings would probably go discoloured within two or three hours, especially during winter, because of the humidity of the atmosphere.

MR. GRAY asked whether factory inspectors had any objection to the use of the 20 per cent. of silica-free grit.

MR. HIBBERD said the company had a letter from the suppliers, giving references to the Ministry of Labour department which dealt with such matters, and that department had approved its use. There was no doubt about its good effect on cast iron from the enamelling point of view.

DR. J. E. HURST (past-president) asked whether the Author attributed any part of his success (in achieving 96 per cent. good results) to the use of a proportion of silica-free grit in the blasting operation.

MR. BROWN replied that Zircosil had been used in admixture with the ordinary grit for approximately a year, and there was a definite improvement. Before it was used there was probably 45 per cent. of " boiling " whereas nowadays that defect was very rare, and he attributed that result to the use of the added material. Mr. Brown exhibited a sample casting, taken from the normal run, to show the results obtained with this shot-blasting method. It was not necessary to brush or blow off any surplus sludge after blasting, such as resulted from the use of steel shot alone; the Zircosil came off the casting as a deposit when one rubbed a finger over the cleaned surface, whereas if steel shot had been used the finger would go black.

DR. HURST said the Institute had a committee engaged in studying defects that arose in enamelling cast iron. The factors which had contributed at Mr. Hibberd's firm to the remarkable improvement which had been effected, from about 60 per cent. of rejects to the present day achievement of only 4 per cent. rejects, would interest members very much indeed. If there were anything of a positive character, such as the use of some material in the shot-blasting mixture, or the use of nickel in the iron mixture, which had contributed to this reduction, then the committee and others who had to deal with the enamelling of cast iron would like to have full details.

Management's Part

Referring to the point that the improvement effected was attributed in large measure to the attitude of the management and the employees, that the employees were put on their honour and that certain changes were made in the inspection routine, Mr. Hurst said it was difficult to follow exactly how those factors had affected the situation; but it was appreciated, of course, that the enamelling operation was one which required very great care at every stage, and one would expect that to be appreciated by all concerned. An Institute sub-committee on cast iron for vitreous enamelling had had the opportunity of examining figures from a cross-section of the industry, and the reported rejects were vastly different from those which Mr. Hibberd had recorded. Dr. Hurst could not feel that the whole of the improvement effected in Belling's works was due merely to the better attitude on the part of the employees; there must be something of a very fundamental character which had assisted the achievement of so remarkable a result.

MR. HIBBERD said there seemed to be some confusion regarding percentages. When Mr. Brown had referred to the time when there were 60 per cent. of rejects, he was speaking of the enamelling of both castings and sheet, and not of castings only; but the figure of 96 per cent. success related to castings only. Quite definitely, the addition of nickel to the iron had made a lot of difference, as had the use of Zircosil, and so far as other cast-iron work was concerned, the fact that the spraying jig makers were in the shop also helped.

DR. HURST said he presumed that the shop was applying modern acid-resisting enamels.

MR. HIBBERD said this was so, and in reply to a further question as to whether the enamels were produced in pastel shades, said they were whites and creams.

MR. C. P. STONE assured the meeting, as one who had many years of association with Belling & Company, that commonsense controlled their enamelling processes, whether for sheet or cast iron. All castings were usually enamelled within one or two days of making, and if a defect developed, it was reported immediately, when the foundry dealt with the matter right away. The foundry worked very close on the heels of the enamelling shop, and it was this close co-operation between the two departments which made a handsome contribution to the success achieved. The main advantage of the recent use of Zircosil, was that it indicated clearly where the casting had been blasted, and this was most important for any enamelling operation.

MR. A. J. GRAINGER was very much impressed by the achievement of a 96 per cent. result on first passing and asked if that figure represented a general average over the whole of the production and whether a similar percentage applied to cream- and white-enamelled fronts.

Asking what type of shotblast plant was used with the Zircosil addition, he said that his works had used this material, but he understood that the percentage added was 10 and not 20. Also, his works had tried the specialization of labour and, whilst some success had been achieved thereby, it had not solved all their problems by any means, and he could only suggest that Mr. Hibberd's firm must have a similar condition existing in their foundries whereby they ensured very careful pretreatment of their castings before the enamelling stage was reached.

MR. HIBBERD assured Mr. Grainger that the 96 per cent. success was achieved with white or pastel

shade one-coat fronts for electric cookers. In the preparation of the castings a Spencer Halstead shot-blast machine was used, being normally fed with steel shot, two bags per day of Zircosil being added.

MR. GRAINGER asked if an impeller-type shot-blast plant was used.

MR. HIBBERD replied to the contrary. Only pressure blasting was employed. He added that he had no axe to grind in connection with Zircosil, but the change it had effected was really extraordinary. In a further reference to the results obtained by the addition of nickel to the iron mixture, he said that similar results were obtained when titanium was added instead.

Commenting on the reference to the specialization of labour, he said it was the team-work which had a great effect at his works. For instance, they were making drum-ring castings, ordinary sand castings, for friends in the electrical trade, and those castings were assembled un-machined, whereas castings from other sources had to be machined.

MR. W. F. TREVIS (Belling & Company) added that some 115,000 of these drum-ring castings had been supplied, and the number that had been returned was about 20 castings out of the whole.

Other Pre-treatment

MR. PETTIT commented that it was like taking a breath of fresh air to read of a factory which was working under such ideal conditions. It was interesting to learn from the Paper that none of the castings were annealed, even "hob tops" with a large area of plane surface were wet ground and the dampness was taken out of the casting in the dryers normally used for drying enamel ware. He would have thought that with castings which had the whole of the surface ground off (which would relieve surface strain) some annealing would have been necessary. To what did Mr. Hibberd attribute his success—the particular design of the casting or the particular composition of the metal ?

MR. HIBBERD said it had been found by accident that, by putting the castings in the dryer immediately after grinding they overcame the necessity for annealing. He felt that if Mr. Pettit saw more of the castings he would ask why it was the practice to grind them; but the company ground them to produce a still better surface than was obtained as-cast.

Limitations of Plant

MR. BROWN said a member of the Institute had tried to use Zircosil in an impeller-type shot-blast plant, but could not hold it there at all; it was drawn out immediately by the exhaust and passed into the separator; indeed, several people had confirmed this experience. The experience of Belling's was in a cabinet-type shot-blast, and he would advise against their attempting to use it in the other type unless the power of the dust exhausting plant were cut down.

MR. TIDDER asked what grade of shot was used for blasting.

MR. HIBBERD replied that it was grade 16 shot, plus the 20 per cent. Zircosil.

MR. WILLIAMS, dealing with the point that, if one attempted to use Zircosil in the impeller-type shot-blast it disappeared, said he had approached the suppliers of the material and had asked if they could supply a heavier grade; but they had said they could not do so because it was a natural product.

MR. FOX, as a supplier of Zircosil, said it was a natural product, an alluvial sand, and as such it had no edges such as were found in silica sand. Its use resulted in a battering effect, giving a much softer finish than did a silica sand. The average grade was about 80 mesh; they were slightly heavier grades of the sand, but they were rather difficult to get.

Speaking of the use of the material in the impeller-type plant, he said the grains were so small that they tended to pass into the flue when used alone, but when shot was added it tended to restrain the sand grains and prevent them being withdrawn. The material consisted chiefly of a chemical combination of zirconium (about 60 per cent.) and silica (about 35 per cent.), so that there was no free silica, and therefore its use had been approved by the Factory Department.

Whilst he had not a great deal of knowledge of its use for dressing cast iron, he said it was used in the Potteries for dealing with earthenware, and although its effect was rather slower than that of silica sand, which was previously used, *i.e.*, it had no cutting action, it produced a much softer and smoother and a more pleasant surface to work on.

Contributory Factors

MR. H. W. MERRITT said that presumably the 4 per cent. of rejections quoted by Mr. Hibberd included blistering, pinholing, and so on, and asked if the Author could give any reason for the comparative absence of cracking, which was the cause of quite a considerable proportion of the rejected castings in most works.

MR. HIBBERD said that rejects due to cracking were included in the 4 per cent. His firm had reduced cracking immensely by maintaining the nickel addition to the iron mixture.

MR. BROWN added that the success achieved from the enamelling point of view was due to a large extent to the organization within the foundry; immediately the enamellers ran into trouble they would inform the foundry staff, who would help them to overcome it.

MR. HIBBERD said that without the foundation work that was done in the foundry, the good results achieved in enamelling would not be possible; the practice followed was laid down by his predecessors.

MR. H. WHITAKER commented that very little had been said about the enamel frit used, and asked if the achievement of so large a percentage of good products was attributable largely to the kind of frit they were using.

MR. HIBBERD replied that they had tried to apply different kinds of enamel to their castings, with varying degrees of success. They used what they considered to be the best frits for their purpose. The castings were the foundation of success, but it was necessary for the frit to be chosen to suit.

Production Methods in the Enamelling Shop

Personnel

MR. WHITAKER was very much impressed by the inspection system at Belling's works; but at his own works, where there was a fairly big turnover of personnel, he did not think they could operate such a system. They had up-graded some of the sprayers to inspectors, and paid them extra, but he felt it would be very difficult to apply a system where every operator was also an inspector.

MR. HIBBERD replied that until about a year ago the turnover of labour in the works as a whole was very high indeed, but that was not so in either the enamelling department or the foundry. Most of the foundrymen were old hands and had served the company for from 27 to 30 years. Another matter which should be stressed was that parts left his enamelling department ready for assembly. In the old days, when castings were sent to the drilling department to have the holes made and cleared out, there was a lot of scrap; but nowadays the drilling and tapping machines were in the enamelling department.

MR. DIXON drew attention to the reference in the paper to the use of furnaces having Carbofrax combustion chambers, and asked why the preference was for silicon-carbide combustion chambers and not fused alumina, seeing that both materials were available at approximately the same price.

MR. HIBBERD said his first experience of the use of oil-fired furnaces was with the Carbofrax chamber. It was supplied by the furnace makers, and he could not say that it was better or worse than any other form.

A MEMBER asked on what percentage of the castings a groundcoat was used, and whether that had any bearing on the attainment of 96 per cent. good products.

MR. HIBBERD replied that a groundcoat was used on only two classes of castings—the hob plate and the "streamlined" front, and MR. BROWN added that the proportion of "streamlined" castings being processed at the moment was 10 to 15 per cent. In general, they tried to get a white or cream particularly with one coat.

DR. HURST asked whether any of the castings were re-processed; in other words, was the attainment of 96 per cent. good products the result of a single processing only?

MR. HIBBERD was sure he was right in saying that the percentage of items that were re-processed—presumably by reason of a faulty application of enamel or something of that sort—was exceedingly small. Broadly speaking, the figure of 96 per cent. related to the production of fronts. The works produced one type of cooker having one coat of enamel and a heavier type of cooker with two coats, and all the black hobs had two coats.

DR. HURST submitted that the matter was a very serious one, because his sub-committee had been fortunate enough to be able to make a study of the rejects of iron castings for enamelling. They had collected the returns from a large number of firms who were co-operating in the work, and it was found that the percentage of rejects that accrued in enamelling after first processing was very alarming. They had been very careful to say that, although the figure was so large, they were aware that it was common practice in the enamelling industry to send castings back for re-processing. There was no hole and corner business about it, and it was part and parcel of the ordinary routine. The figure they had arrived at for rejects, from returns (submitted by some 20 firms of which the sub-committee did not have details of their work or their standard of inspection) was 45 per cent. There was a vast difference between that figure and the 96 per cent. good products from Belling's works. It was very heartening to hear that one firm could achieve 96 per cent. good products, and he was concerned to try to find out what it was that enabled them to do so.

Overworked Sand

MR. HIBBERD said it was quite easy to overwork the sand in the foundry, and that had a tremendous effect on the surfaces of the castings, even though the materials used were the best that could be obtained in the first place. At his works, they did not try to skimp materials either in making the castings or in enamelling. He assured the meeting that the figure he had quoted actually was achieved, particularly in the case of fronts, which were in general of very thin-section metal and had some awkward corners. Every casting made was marked with the date of casting and there was a day-to-day check with the foundrymen, so that if anything went wrong in the processing it could be put right at an early stage.

THE PRESIDENT, proposing the thanks of the meeting to Mr. Hibberd for his Paper, drew attention to one of the castings which had been circulated at the meeting. He noticed that this had a pin-hole and he wondered whether it would in fact enamel without showing any defect. When visiting Belling's works on the previous day he had some opportunity of examining their products. Such cooker fronts as he had seen were enamelled cream, and they looked good.

It was a fact that in his own organization production trials in the shop generally gave better results than were subsequently achieved under ordinary production conditions. That experience supported Mr. Hibberd's argument as to the need for care in production to see that both in the making of the castings and in its subsequent processing there was adequate control at all stages of the process.

Mr. Hibberd, he concluded, had surprised everybody by his results. The meeting wished to thank him for his very interesting Paper, and especially for having given the members the opportunity on the previous day to see what he had discussed therein.

(The vote of thanks was accorded with acclamation.)

Lloyd's Shipbuilding Returns

December Quarter, 1952

Lloyd's Register shipbuilding returns relating to merchant ships of 100 tons gross and upwards, for the quarter ended December, 1952, show that in Great Britain and Northern Ireland at that date, steamships and motorships under construction totalled 336 ships of 2,146,402 tons gross, an increase of 83,920 tons as compared with the previous quarter. It includes 133 steamships of 974,621 tons and 202 motorships of 1,171,681 tons. In the remainder of the Commonwealth there were under construction 18 steamers of 125,602 tons and 16 motorships of 43,069 tons, making a total of 34 ships of 168,991 tons compared with 40 ships of 148,127 tons in the previous quarter. Oil tankers of 1,000 tons and upwards under construction totalled 103 ships of 1,214,864 tons, an increase of 65,388 tons compared with last quarter. World figures of ships being built totalled 341 steamers of 2,804,079 tons and 830 motorships of 3,313,317 tons, making a total of 1,179 ships of 6,118,585 tons, compared with 1,207 ships of 5,864,873 tons in the September quarter of last year.

Ships under construction in the principal districts in Great Britain and Northern Ireland are shown in Table I.

Table I.—Ships under Construction in Principal Districts of Great Britain and Northern Ireland.

District.	December 31, 1952		September 30, 1952.		December 31, 1951.	
	No.	Gross tonnage.	No.	Gross tonnage.	No.	Gross tonnage.
Aberdeen ..	17	29,791	20	31,471	15	13,641
Barrow ..	3	63,550	4	74,389	6	114,150
Belfast ..	20	209,153	22	228,900	20	203,820
Bristol ..	5	2,990	6	2,330	3	860
Clyde—						
Glasgow ..	78	538,152	76	504,972	90	574,760
Greenock ..	35	249,477	31	229,897	27	209,750
Dundee ..	7	50,460	7	52,160	7	45,017
Hartlepool ..	10	52,430	9	46,530	9	53,170
Hull	36	17,787	39	14,449	36	14,583
Leith	13	40,291	14	36,707	15	26,606
Liverpool ..	15	117,832	15	105,330	18	129,383
Middlesbrough	14	165,635	15	161,166	17	168,998
Newcastle-on-Tyne ..	41	389,668	39	360,363	44	442,597
Southampton	8	7,808	9	8,138	10	11,478
Sunderland ..	29	209,369	30	203,348	29	196,332

New Shipyard for Newport

A new shipbuilding yard at Newport (Mon), the construction of which the Government has approved "in principle," will be situated on a 50-acre site on the western side of the River Usk. The intention is to build oil tankers of between 26,000 and 32,000 tons and ore vessels. It will be the largest dry dock in South Wales.

The Welsh Board for Industry states that the Government will include the yard in its capital investment programme. No commencement date has yet been given. The board said that steel allocations were assured for construction of the yard and the subsequent ships. The scheme requires £1,500,000 capital.

Allied Ironfounders Limited last week gave a cocktail party to give the Press and others the opportunity of meeting Dr. Raistrick, the author of a new book dealing with the Coalbrookdale Company—one of their associated concerns. Mr. James Shaw received the guests amongst whom was Mr. Basil Darby, a direct descendant of Abraham Darby, the founder of the Coalbrookdale concern.

Application of Science to Industry

An appeal for the prompt application of scientific knowledge in industry was the principal theme of an address by Sir Ellis Hunter, president of the British Iron and Steel Federation, and chairman and managing director of Dorman, Long & Company, Limited, at a civic dinner in Middlesbrough Town Hall to celebrate the centenary of the incorporation of the borough.

"Nothing," he said, "is more impressive than the scientific advances we have made in the past 20 years. What is not so impressive is the application of these advances to industrial processes. There too often appears to be an undue lag between scientific advances and their application in industry. A great contribution can be made to improving our terms of trade and raising our standard of living if means can be found of eliminating this time-lag. We in industry must apply our energies to facilitating the rapid translation of scientific advance to actual production. This is essential if we are to maintain our international position as an industrial nation."

Sir Ellis described the return of international competition in world markets as "not a bad thing." It would be unworthy of our past, he said, to adopt a fearful attitude towards it. Rather should it be a stimulus to all of us to prove our ingenuity as manufacturers, our capacity for organization, and our resourcefulness as salesmen. "I see no reason," he concluded, "why we cannot accept such a challenge cheerfully, and in the confident belief that, as a nation and locally, we can not only hold our own, but move forward successfully into the new conditions which will mark the coming years.

Tees-side Industrial Outlook

Reporting that at the end of 1952 there were nearly 3,000 unemployed on Tees-side, an increase of 700 on the previous year, but lower than the figures in the intervening months, the annual report of the Tees-side Industrial Development Board expresses the view that the Board should adopt a cautious attitude about the future employment position and recognize the oft-expressed challenge that without greater productivity the industrial rewards for Tees-side may be less satisfying.

Mr. J. C. H. Booth, who was re-elected president of the Board at its annual meeting, said that between 1945 and 1949, when restrictions on capital expenditure were imposed, extensions had been carried out to 33 existing industries on Tees-side and 20 new industries had been established. The process of diversifying should not be allowed to stop, especially as it was in this direction they had to look to take up any slack in employment which might occur from time to time. Tees-side had a number of natural advantages which made industrial expansion easier than in other parts of the north-east.

Sir Alfred Herbert Paper, 1953.—Sir John Cockcroft, C.B.E., F.R.S., director of the Atomic Energy Research Establishment at Harwell, has accepted an invitation from the Institution of Production Engineers to present the Sir Alfred Herbert Paper in 1953. His subject is the "Industrial Applications of Atomic Energy." The Paper will be presented at a meeting of the Institution in the Sheldonian Theatre, Oxford, on July 24, 1953.

Imports and Exports of Iron and Steel in December

The following tables, based on Board of Trade returns, gives figures of imports and exports of iron and steel in December. Figures for the same month in 1951 are given for the purpose of comparison, and totals for 1952 and of 1951 are also included. (All figures in tons.)

Total Exports of Iron and Steel by Destination

Destination.	Month ended December 31.		Twelve months ended December 31.	
	1951.	1952.	1951.	1952.
Channel Islands	444	705	8,701	7,038
Gibraltar	32	122	822	1,710
Malta and Gozo	97	308	2,942	2,385
Cyprus	660	823	4,941	7,501
Sierra Leone	347	364	5,402	4,978
Gold Coast	4,894	3,118	22,601	39,221
Nigeria	3,416	4,103	51,921	50,184
Union of South Africa	10,708	12,364	128,526	136,757
Northern Rhodesia	1,576	1,942	16,596	29,288
Southern Rhodesia	3,445	3,236	37,747	53,513
Tanganyika	777	3,245	16,878	23,597
Kenya	3,106	6,738	48,099	49,060
Uganda	700	836	6,430	7,652
Mauritius	606	679	6,648	6,442
Bahrein, Qatar, and Trucial Oman	550	1,733	7,900	19,931
Kuwait		2,003		16,699
India	8,707	8,845	89,938	78,648
Pakistan	5,450	6,290	73,541	66,843
Malaya	5,178	6,643	73,295	79,048
Ceylon	2,733	2,837	26,777	23,172
North Borneo	202	419	4,612	3,846
Hongkong	1,456	2,490	47,436	27,106
Australia	21,507	23,186	317,910	297,384
New Zealand	8,747	13,704	108,399	150,655
Canada	13,564	9,262	268,893	185,147
Jamaica	2,780	2,683	22,751	27,888
Trinidad	4,278	5,957	39,085	48,828
British Guiana	606	471	5,521	5,717
Anglo-Egyptian Sudan	835	1,932	9,880	20,147
Other Commonwealth	2,034	3,503	24,279	37,735
Irish Republic	4,491	5,935	80,717	66,518
Soviet Union	18	1	2,276	2,042
Finland	4,026	4,286	44,192	51,270
Sweden	8,470	8,459	115,715	112,739
Norway	5,392	5,591	61,713	64,532
Iceland	154	428	2,619	3,006
Denmark	5,230	7,321	78,686	75,817
Poland	23	77	768	246
Germany	101	401	1,171	2,102
Netherlands	5,769	12,728	83,399	112,376
Belgium	886	1,749	11,663	10,144
France	141	656	5,117	5,114
Switzerland	768	1,602	10,714	10,612
Portugal	628	1,314	12,181	10,235
Spain	224	581	4,510	9,196
Italy	777	4,033	31,082	22,888
Austria	27	43	425	593
Yugoslavia	1,272	126	8,641	4,525
Greece	386	666	2,502	3,861
Turkey	704	1,201	6,365	9,496
Netherlands Antilles	2,118	474	10,272	15,301
Belgian Congo	140	245	2,043	3,034
Angola	788	629	2,610	4,485
Portuguese E. Africa	382	778	4,031	5,066
Canary Islands	977	10	2,830	696
Syria	46	113	4,568	2,070
Lebanon	2,777	309	17,326	9,810
Israel	814	1,602	29,771	15,465
Egypt	669	4,550	37,537	37,136
Morocco	59	41	1,450	273
Saudi Arabia	189	457	2,333	7,236
Iraq	223	4,101	23,552	50,832
Iran	16	569	58,656	9,827
Burma	1,278	1,459	14,240	12,673
Thailand	1,051	1,194	15,255	13,474
Indonesia	968	1,736	10,250	16,690
China	11	23	4,543	313
Philippine Republic	410	661	3,988	5,245
U.S.A.	4,598	2,165	135,982	46,492
Cuba	312	132	3,910	2,168
Colombia	265	1,133	8,423	5,397
Venezuela	5,456	3,779	43,468	49,579
Ecuador	379	270	2,621	4,022
Peru	792	984	11,804	8,767
Chile	369	765	8,708	3,745
Brazil	1,326	759	22,866	20,353
Uruguay	657	120	10,596	4,157
Argentina	8,884	2,366	47,878	35,295
Other foreign	1,198	1,169	18,196	23,659
TOTAL	186,074	220,392	2,602,634	2,498,842

Total Imports of Iron and Steel and Origin

From	Month ended December 31.		Twelve months ended December 31.	
	1951.	1952.	1951.	1952.
India	1	—	16	531
Canada	3,562	16,798	49,313	175,289
Other Commonwealth countries and the Irish Republic	161	8,678	2,020	18,690
Sweden	2,014	1,945	21,031	29,008
Norway	4,100	3,235	50,708	62,750
Germany	8,707	3,358	45,633	105,715
Netherlands	10,756	10,708	80,282	158,691
Belgium	16,187	33,201	187,740	311,372
Luxembourg	5,690	16,172	82,353	185,884
France	31,865	39,105	274,700	343,574
Austria	43	26,370	19,127	253,103
U.S.A.	8,293	34,043	53,105	578,718
Other foreign countries	2,088	21,642	15,921	237,075
TOTAL	94,067	215,261	882,855	2,460,490
Iron and steel scrap and waste, fit only for the recovery of metal	34,104	85,396	589,436	734,290

Total Exports of Iron and Steel by Group

Product.	Month ended December 31.		Twelve months ended December 31.	
	1951.	1952.	1951.	1952.
Pig-iron	362	758	15,967	4,725
Ferro-tungsten	7	—	394	92
Other ferro-alloys	76	265	2,466	3,205
Ingots, blooms, billets, and slabs	13	5	5,265	160
Iron bars and rods	404	245	8,285	3,318
Steel and tinplate bars and wire rods	15	464	11,216	1,834
Bright steel bars	1,180	1,841	28,842	16,586
Alloy steel bars and rods	1,280	1,591	15,655	16,260
Other steel bars and rods	8,882	9,192	164,809	116,176
Angles, shapes, and sections	9,900	10,285	153,619	127,560
Castings and forgings	1,062	587	12,728	10,959
Girders, beams, joists, and pillars (rolled)	1,563	1,256	36,379	32,685
Hoop and strip	2,867	3,915	72,620	54,922
Iron plates and sheets	135	3	1,874	387
Tinplate	26,007	31,625	239,655	300,756
Tinned sheets	115	137	2,278	2,019
Terneplates and decorated tinplates	73	15	1,569	831
Other steel plate (⅛ in. thick and over)	15,709	20,167	203,160	239,721
Galvanized sheets	3,594	8,449	53,884	68,076
Black sheets	8,484	19,532	144,497	148,550
Other coated plates and sheets	450	1,430	7,877	11,845
Cast-iron pipes up to 6 in. dia.	6,311	6,556	84,862	86,479
Do., over 6 in. dia.	4,189	6,428	70,701	67,914
Wrought-iron tubes	32,050	31,919	387,220	423,676
Railway material	15,760	17,589	211,225	204,325
Wire	4,345	4,372	58,676	51,541
Cable and rope	2,066	3,079	28,900	31,394
Wire nails, etc.	1,779	1,283	25,697	11,942
Other nails, tacks, etc.	654	420	9,775	5,540
Rivets and washers	664	733	7,622	6,917
Wood screws	436	393	4,307	3,870
Bolts, nuts, and metal screws	1,984	1,644	28,305	22,241
Baths	202	101	3,799	2,916
Anchors, etc.	641	765	9,115	9,642
Chains, etc.	714	653	11,118	9,972
Springs	487	436	6,674	5,440
Holloware	3,199	2,423	35,160	35,123
Doors and windows	1,998	1,825	21,123	21,283
TOTAL, including other manufactures not listed above	186,074	220,392	2,602,634	2,498,842

Personal

MR. F. M. HAWTHORN has been appointed a director of Shanks & Company, Limited, Barrhead.

MR. R. L. PACKER has taken up his duties as London branch manager of British Insulated Callender's Cables, Limited, in succession to MR. F. SAMUEL, who is retiring on March 8.

MR. JOHN ALCOCK, chairman and managing director of Hunslet Engine Company, Limited, Leeds, left last week-end on a six-week business tour of South Africa.

MR. R. L. BROWN, chairman and managing director of Hopkinsons, Limited, engineers and ironfounders, etc., of Huddersfield, has arrived in Johannesburg on a business visit to South Africa.

MR. PETER LESLIE OSBORN, great-grandson of the founder of Samuel Osborn & Company, Limited, Clyde Steel Works, Sheffield, has been appointed a director of the subsidiary firm, Osborn-Mushet Tools, Limited.

MR. G. S. HELME, T.D., A.M.I.E.E., manager in Scotland for Lancashire Dynamo & Crypto, Limited, has retired after 21 years' service in that capacity. The company will, however, continue to use his services as a consultant.

MR. JAMES PATERSON and MR. C. R. D. BROWN have resigned from the board of Vactric, Limited, Newhouse Industrial Estate, near Glasgow, and to fill the vacancies the Treasury have nominated Sir Lionel Lowe and Mr. E. J. Barnsley as directors.

THE NATIONAL COAL BOARD has appointed DR. R. J. MORLEY to be director-general of carbonization in succession to MR. L. O'CONNOR who has resigned. Dr. Morley is at present the ammonia technical manager with Imperial Chemical Industries at Billingham.

THE DIRECTORS of the American Institute of Mining and Metallurgical Engineers recently announced that the Robert W. Hunt award for 1953 would be given to Dr. J. H. Chesters, for his paper entitled "Flow Patterns in Open-hearth Furnaces," presented at the 1951 Conference at Cleveland, Ohio.

MR. HARRY CRIVAN, who is taking over the newly-created post of head of the department of metallurgy at Coatbridge Technical College, was instrumental in replacing Belgian by Scottish moulding sands during the war. Mr. Crivan was educated at Allan Glen's School and the Royal Technical College, Glasgow.

AT A PRESENTATION at which long service was recognized at the works of H. W. Lindop & Sons, Limited, malleable iron and steel alloy founders, two of the recipients had worked together for 47 years. They are MR. W. F. JONES and MISS MABEL EVENSON. For them it was a double celebration as they are shortly to be married.

MR. EDMUND SAYERS has retired after 20 years as manager of the British Thomson-Houston Company's aero and auto equipment sales department at Coventry. He has had 48 years' service with the firm. He is succeeded by MR. V. A. HIGGS, assistant manager of the department since March, 1951, and senior technical officer at the Ministry of Aircraft Production from 1941 to 1946.

MR. H. H. MARDON, B.SC.(ENG.), M.I.C.E., M.I.MECH.E., M.I.STRUCT.E., M.AM.S.C.E., head of the plant engineering division of the British Iron and Steel Research Association, is relinquishing his position to take up the appointment of chief project engineer, Ashmore, Benson, Pease & Company, Limited. DR. H. R. MILLS, PH.D., B.SC.(ENG.), M.I.MECH.E., who has been appointed acting head of the plant engineering division, will remain head of the division's mechanical engineering section.

PROMOTERS of the scheme for a new shipbuilding yard at Newport are the Bailey Shipbuilding Development Company, Limited, which was registered as a new company last July, and GROUP-CAPT. GEORGE BUCHANAN BAILEY, who has been largely responsible for initiating the negotiations. Group-Capt. Bailey is chairman and managing director of C. H. Bailey, Limited, the Newport dry dock owners and shiprepairers. He is, too, chairman and joint managing director of the Cardiff Junction Dry Dock & Engineering Company, Limited, a subsidiary of C. H. Bailey, Limited, and chairman of the Tubal Cain Foundry & Engineering Works, Limited, Cardiff. A prominent figure in South Wales industry, he has served as chairman of the joint ports committee of the Industrial Association of Wales and Monmouthshire.

Obituary

MR. WILLIAM H. BARKER, aged 67, managing director of the Rother Vale Manufacturing Company, Limited, died recently. The firm, *inter alia*, produce wood-flour for foundry use.

WITH THE DEATH of MR. WILLIAM HAROLD PRICE recently, at the age of 55, Walsall has lost one of its most popular and colourful foundry personalities. In his work he was a self-made and successful man, but he always found time for a wide range of other activities. Mr. Price first joined Mason & Burns, Limited, the Pleck Road ironfounders, as a patternmaker in 1916. In 1943, he was appointed works manager and became a director of the company three years later.

MR. H. PELHAM LEE, a pioneer in the manufacture of car engines, who has died at the age of 75, was founder and chairman of Coventry Climax Engines. Mr. Lee worked at a bench at the Daimler Company before founding the firm of Lee-Stroyer in 1903. Among the products of that company were the engines for the tractors for Sir Ernest Shackleton's South Pole expedition. Later the firm's name was changed to the Coventry Simplex Company. Coventry Climax Engines, Limited, was formed in 1917 and during the first world war their products were used in most leading light cars, including the Bayliss Thomas, Clyno, Albatross, Waverley, Horstman, Wiggan and Barlow. Later the firm turned to the making of Diesel engines and trailer fire pumps.

THE DEATH is announced of the doyen of the Belgian foundry industry, MR. JACQUES VARLET, who was one of the world's foremost exponents of loam moulding. It was in 1922, that he first lectured in this country on his favourite subject, when his outstanding contributions to foundry practice were recognized by awarding him honorary membership of the Institute of British Foundrymen. For over thirty years, he has been connected —either as manager or consultant—to Esperance Longdoz the well-known Liége foundry. He was never happier than when acting as host to his British friends, taking the opportunity to recall his experience as a footballer, his adventures under the German occupation and pride in the achievements of his firm. In recent years, he did not enjoy good health, but to the end he retained his interest in his profession. To his family and to the Belgian foundry industry sincere sympathy is extended in the irreplaceable loss they have sustained.

News in Brief

THE BUSINESS-EFFICIENCY EXHIBITION is to be held at Olympia from June 16 to 26.

THE THIRD NATIONAL POWER FARMING CONFERENCE, will be held from February 10 to 12 at Cheltenham.

RUSTON & HORNSBY, LIMITED, recently were hosts to 145 long-service employees and ex-employees. Mr. Crossby and Mr. Pollard from the Australian company were also present.

MR. D. G. R. COMPORT, director of William Green & Company (Ecclesfield), Limited, ironfounders of Sheffield and Ecclesfield, reports immediate large orders and a new market, following a 20,000-mile trip covering South Africa and Rhodesia.

THE ANNUAL SOCIAL GATHERING of Qualcast, Limited, grey iron foundry division, Derby, was held at the King's Hall, Derby, on January 30. Mr. V. Jobson, chairman and managing director of Qualcast, Limited, presented long-service awards to many employees.

A NORTHERN OFFICE of Hadley Sound Equipments, Limited, of Smethwick, Staffs, was opened at Deansgate House, 274, Deansgate, Manchester, as from February 2. The manager is Mr. A. E. Stocker, who has been the company's northern representative for some time.

OAKENGATES AND DISTRICT EMPLOYMENT COMMITTEE were told last week by Mr. J. Kirkham, of Allied Ironfounders, Limited, that he was drafting a training scheme for the ironfoundry industry. He was seeking permission to call a meeting of employers to discuss the matter.

THE SIXTH ANNUAL CONFERENCE of Incorporated Plant Engineers will be held at the Palace Hotel, Southport, from May 20 to 22, for which the theme will be Management and the Plant Engineer. Details may be obtained from the secretaries at 48, Drury Lane, Solihull, Birmingham.

"I SOMETIMES THINK that Anglo-American productivity team reports do more harm than good because they tend to underrate what we are doing in this country," Sir Arthur Smout said when he presented awards to the students of Dudley and Staffordshire Technical College at the annual distribution of prizes on January 26.

RUBERY OWEN & COMPANY, LIMITED, of Darlington, the parent firm of the Owen Organization, have closed down their small office at 55, Mitchell Street, and opened a new suite of offices at 11, Royal Crescent, Glasgow. Mr. A. G. B. Owen, chairman of the Organization, travelled north on January 28 for the official opening of the new premises.

MONSANTO CHEMICAL COMPANY, U.S.A., announce the creation of a new division, the Overseas Division, which will co-ordinate the operations of all of Monsanto's interests outside the United States, including the export sales of Monsanto Chemical Company. Mr. Edward A. O'Neal, junr., is to be head of the new division. He is chairman of Monsanto Chemicals, Limited.

THE MIDLAND SECTION of the Institute of Vitreous Enamellers have organized a dinner/dance, to be held at the Star and Garter Hotel, Wolverhampton, on Friday, March 20, at 7 p.m. for 7.30 p.m. (informal dress). Accommodation is limited and applications for tickets (19s. each) will be taken in strict rotation. They should be made to the honorary secretary, Mr. D. Sleath, Borax Consolidated, Limited, 87/89, Edmund Street, Birmingham, 3.

APPROXIMATELY 1,500 employees at the Banbury factory of the Northern Aluminium Company, Limited, started short time working from February 1. With the exception of sheet-metal workers, for whom there is sufficient work, the men will not work a Sunday evening or Monday morning shift. The decision to work the new hours was made by the management in consultation with the joint production committee and the unions, as representing the best way of sharing the available work between the firm's 3,000 operatives.

ENTRY TO the university from school might produce good "slide-rule" technicians or research workers but was unlikely to produce the executive engineers or those able to direct research, said Mr. C. L. Old, principal of Wolverhampton and Staffordshire Technical College, at the college annual prize distribution on January 28. Mr. Old said that the passage through a technical college, involving part-time study and training in one of the many industrial schemes available to-day, was the finest preparation for a career in engineering or applied science.

A CUMBERSOME WOODEN LATHE for general industry, made and used by Matthew Boulton at the Soho Foundry, probably, it is thought, for experimental purposes, is one of the historic relics on show at the "150 Years of Machine Tools" exhibition which opened at the Birmingham Museum of Science and Industry on January 23 and which will remain open until April 26. Another of the unusual exhibits is a treadle-operated rose turning engine, dated 1760, which was once in the private workshop of Louis XVI of France. It was used for producing decorative designs on jewellery.

THERE WAS a serious outbreak of fire in an inspection department at the Bradford foundry and engineering works of Hepworth & Grandage, Limited, recently. The fire started at 8.20 p.m. in a brick and timber building, with a corrugated roof, where piston rings are heat-treated, and spread to a cloakroom, destroying clothing belonging to night-shift workers, and by the time the fire brigade arrived the shed was ablaze almost from one end to the other. Damage, estimated at £30,000, included a certain amount of expensive equipment, but it is not expected that production will be much affected.

THE INSTITUTE OF METAL FINISHING has rejected the productivity team's suggestions that the cost of machine tools should be cut by reducing the quality of their finish. It should be realized, the Institute comments, that it is essential for machine tools to be well finished; the recommendation that a return should be made to wartime finish—that is, a coat of grey paint on an unfilled casting—would be likely to have serious repercussions on the industry's export trade in particular. It is further pointed out by the Institute of Metal Finishing that it would adversely affect the useful life of the machine and probably its productive power.

THE NATIONAL RESEARCH CORPORATION of Cambridge, Massachusetts, announce that at a recent meeting of the directors of British American Research, Limited, manufacturers of high-vacuum equipment, resignations were accepted from the EARL OF SELKIRK, chairman, and RICHARD S. MORSE, director. The agreement, under the terms of which British American Research, Limited, acquired certain rights, patents, technique, and know-how from National Research Corporation, has been terminated, and the American concern has recently disposed of its entire holdings in this company. It has been further agreed that neither British American Research, Limited, nor its associate, Daniel Varney, Limited, will have, or refer to, any relationship with National Research Corporation and that the use of the name, British American Research, Limited, will be discontinued.

Raw Material Markets

Iron and Steel

With 104 blast furnaces in operation and another due to be started up very shortly, a steady rise in pig-iron production is assured. Coke supplies are reasonably adequate and deliveries of iron ore abundant. Total imports last year reached 9,693,864 tons, a figure nearly 1,000,000 tons in excess of the 1951 tonnage, and stock-piles at blast furnaces are substantial. Against this background a more confident note is developing in the iron trade.

Foundrymen are receiving their allocated tonnages with greater regularity, and if the demand for light castings is less active at present, the foundry trade as a whole has still in hand a volume of orders sufficient to ensure regular employment over the next two or three months.

So heavy are the demands made upon the British steel plants that it has not yet been possible to increase to any material extent the flow of home-produced steel semis to the re-rolling plants. In time, no doubt, this position will be adjusted, but up to date it has not been possible to cut down the heavy imports of material from the Continent. The total intake of foreign iron and steel last month exceeded 215,000 tons and the figure for the year was 2,460,000 tons—nearly three times the tonnage imported in 1951. There is still a very active demand for small-sized billets, while the high activity of the sheet mills involves a heavy consumption of sheet bars and slabs.

Steelmakers are not yet in a position to report any easement of the pressure for deliveries of rolled steel products. Current outputs are being promptly cleared and there have also been some withdrawals from works' stocks, but the demand is positively overwhelming. Add to this a moderate revival of activity in the export trade and it will be seen that the mills are working under extreme pressure. The output of plates and sheets is still quite inadequate to satisfy all requirements, and home consumers look with a jealous eye upon the increased tonnages which have been licensed for shipment abroad. On the other hand, oversea trade in merchant bars seems to have been taken by the Belgian rollers, who are still quoting cut prices.

Non-ferrous Metals

There has been something like a collapse on the lead market, where only a few weeks ago the trend was very firm in view of the threat to Australian shipments. Consumers do not seem to be displaying a great deal of interest, and the existence of the backwardation robs the market of much of its appeal as a medium for hedging. At the moment the indications are that a lower price level will be seen, but whether the market will get back into the £80s is not so certain. Consumer demand is far from good just now, and a falling market is no encouragement to the buyers. Zinc has lost ground, and here, also, trade demand is disappointing, and it seems likely that Metal Exchange stocks will increase during the coming weeks. This is, of course, all to the good from a hedging point of view, for it should lead to the establishment of a contango sufficiently large to encourage operators to sell forward. Early in January a backwardation was in evidence and market developments were rather disappointing to the trade, but matters have now improved materially. Last week saw the American price down by 50 points to 12 cents, equal to about £96 per ton.

Trading in scrap is not very brisk these days, but this applies more to brass than to copper, where the highest grades are in fairly good demand at full prices. As we write, no further developments have taken place in regard to the reported desire by Chile to secure an increase of 3 cents in the price at which she is marketing her copper, but it does not seem by any means impossible that something will come of this. Demand in the United States seems to be as good as ever and the rate of delivery to consumers quite remarkable. On the other hand, figures reported for consumption do not altogether tally with deliveries, so it may be that some copper is going into stock.

The tin market has been firm. It has been reported that a contract has been concluded for the sale over the next three years of Bolivian concentrates to this country.

Official zinc quotations were:—

January—January 29, £85 to £85 10s. *February*—January 30, £84 10s. to £85; February 2, £84 12s. 6d. to £84 15s.; February 3, £82 10s. to £82 15s.; February 4, £82 to £82 10s.

April—January 29, £85 5s. to £85 10s. *May*—January 30, £84 15s. to £85; February 2, £84 17s. 6d. to £85; February 3, £82 15s. to £83; February 4, £82 10s. to £82 12s. 6d.

Official prices for refined pig-lead:—

January—January 29, £96 5s. to £96 10s. *February*—January 30, £95 to £95 10s.; February 2, £96 5s. to £96 10s.; February 3, £94 to £94 10s.; February 4, £94 to £95.

April—January 29, £93 5s. to £93 10s. *May*—January 30, £92 5s. to £92 10s.; February 2, £93 10s. to £93 15s.; February 3, £91 10s. to £92; February 4, £92 5s. to £92 10s.

Official tin quotations were as follow:—

Cash—January 29, £963 to £964; January 30, £965 to £967; February 2, £967 to £968; February 3, £970 to £972; February 4, £979 to £980.

Three Months—January 29, £944 to £945; January 30, £946 to £947; February 2, £946 to £946 10s.; February 3, £950 to £951; February 4, £950 to £951.

House Organs

One and All. Vol. 1, No. 3. Issued by Tangyes, Limited, Cornwall Works, Birmingham.

This quarterly is mainly devoted to business relations with the various agencies throughout the world. Its distribution to the whole of the staff is or would be a good practice as means of interesting them in the "overseas" side of their productions.

Peco Products Quarterly. Vol. No. 3. Issued by the Projectile and Engineering Company, Limited, Acre Street, Battersea, London, S.W.8.

This four-page pamphlet contains articles on injection moulding machines for the plastics industry and a new cold-chamber die-casting machine of the pressure type, handling up to 4½ lb. of aluminium. It is designated 5(c) and can be either hand or automatically operated. The bulletin is available to our readers on writing to Battersea.

The Bulletin of the Association of Bronze and Brass Foundries. No. 31.

Very well presented are the minutes of the council and area meetings of this Association. Somehow the Editor manages to remove "stuffiness" from the findings and make them quite good reading matter. One thing reported is the sending of their conditions of sale to the Purchasing Officers' Association—an action worthy of emulation by similar bodies. There is a reprint from the JOURNAL of Mr. Hudson's report on the Paris productivity conference, and a note as to the taking of the Census of Production.

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

(*Delivered unless otherwise stated*)

February 4, 1953

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2:—Middlesbrough, £13 1s. 6d.; Birmingham, £12 15s. 3d.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent. P, £16 8s., delivered Birmingham. Staffordshire blast-furnace low-phosphorus foundry iron (0.10 to 0.50 per cent. P, up to 3 per cent. Si), d/d within 60 miles of Stafford, £15 5s. 9d.

Scotch Iron.—No. 3 foundry, £15 19s. 6d., d/d Grangemouth.

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

Refined Malleable.—P, 0.10 per cent. max.—North Zone, £18 14s. 6d.; South Zone, £18 17s.

Cold Blast.—South Staffs, £18 2s.

Hematite.—Si up to 2½ per cent., S. & P. over 0.03 to 0.05 per cent.:—N.-E. Coast and N.-W. Coast of England, £16 2s.; Scotland (Scotch iron), £16 8s. 6d.; Sheffield, £17 3s.; Birmingham, £17 9s. 6d.; Wales (Welsh iron), £16 8s. 6d.

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

FERRO-ALLOYS

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

Ferro-silicon (6-ton lots).—40/55 per cent., £57 10s., basis 45 per cent. Si, scale 21s. 6d. per unit; 70/84 per cent., £86, basis 75 per cent. Si, scale 23s. per unit.

Ferro-vanadium.—50/60 per cent., 23s. 8d. to 28s. per lb. of V.

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

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

Ferro-tungsten.—80/85 per cent., 25s. 3d. to 25s. 9d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 28s. 3d. to 32s. 7d. per lb. of W.

Ferro-chrome (6-ton lots).—4/6 per cent. C, £85 4s., basis 60 per cent. Cr, scale 28s. 3d. per unit: 6/8 per cent. C, £80 17s., basis 60 per cent. Cr, scale 26s. 9d. per unit; max. 2 per cent. C, 2s. per lb. Cr; max. 1 per cent. C, 2s. 2½d. per lb. Cr; max. 0.15 per cent. C, 2s. 3½d. per lb. Cr; max. 0.10 per cent. C, 2s. 3¾d. per lb. Cr; max. 0.06 per cent. C, 2s. 4d. per lb. Cr.

Cobalt.—98/99 per cent., 20s. per lb.

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

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

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

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

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft, u.t., £25 4s. 6d.; tested, 0.08 to 0.25 per cent. C (100-ton lots), £25 14s. 6d.; hard (0.42 to 0.60 per cent. C), £27 12s.; silico-manganese, £33 8s.; free-cutting, £28 8s. 6d. SIEMENS MARTIN ACID: Up to 0.25 per cent. C, £31 9s.; case-hardening, £31 17s.; silico-manganese, £34 9s. 6d.

Billets, Blooms, and Slabs for Forging and Stamping.—Basic, soft, up to 0.25 per cent. C, £29 8s.; basic, hard over 0.41 up to 0.60 per cent. C, £30 8s.; acid, up to 0.25 per cent. C, £31 17s.

Sheet and Tinplate Bars.—£25 3s. 6d.

FINISHED STEEL

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

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., untested, £31 15s. 6d.; flats, 5 in. wide and under, £31 15s. 6d.; hoop and strip, £32 10s. 6d.; black sheets, 17/20 g., £41 12s. 6d.; galvanized corrugated sheets, 24 g., £52 9s.

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

Tinplates.—57s. 1½d. per basis box.

NON-FERROUS METALS

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

Tin.—Cash, £979 to £980; three months, £950 to £951; settlement, £980.

Zinc.—February, £82 to £82 10s.; May, £82 10s. to £82 12s. 6d.

Refined Pig-lead—February, £94 to £95; May, £92 5s. to £92 10s.

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

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

Brass.—Solid-drawn tubes, 26d. per lb.; rods, drawn, 34⅛d.; sheets to 10 w.g., 282s. 3d. per cwt.; wire, 32d.; rolled metal, 269s. per cwt.

Copper Tubes, etc.—Solid-drawn tubes, 32⅜d. per lb.; wire, 317s. 9d. per cwt. basis; 20 s.w.g., 346s. 3d. per cwt.

Gunmetal.—Ingots to BS. 1400—LG2—1 (85/5/5/5), £200 to £218; BS. 1400—LG3—1 (86/7/5/2), £212 to £238; BS. 1400—G1—1 (88/10/2), £320 to £375; Admiralty GM (88/10/2), virgin quality, £325 to £380 per ton, delivered.

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

Phosphor Bronze.—Strip, 412s. 9d. per cwt.; sheets to 10 w.g. 434s. 6d. per cwt.; wire, 49⅜d. per lb.; rods, 44½d.; tubes, 42⅜d.; chill cast bars: solids 3s. 10d., cored 3s. 11d. (C. CLIFFORD & SON, LIMITED.)

Nickel Silver, etc.—Ingots for raising, 2s. 9d. per lb. (7 per cent.) to 3s. 11d. (30 per cent.); rolled metal, 3 in. to 9 in. wide × .056, 3s. 3d. (7 per cent.) to 4s. 5d. (30 per cent.); to 12 in. wide × .056, 3s. 3½d. to 4s. 5½d.; to 25 in. wide × .056, 3s. 5½d. to 4s. 7½d. Spoon and fork metal, unsheared, 3s. to 4s. 2d. Wire, 10 g., in coils, 3s. 9½d. (10 per cent.) to 4s. 11d. (30 per cent.). Special quality turning rod, 10 per cent., 3s. 8½d.; 15 per cent., 4s. 2d.; 18 per cent., 4s. 6½d. All prices are net.

Forthcoming Events

FEBRUARY 9

Institute of Metals

Scottish section:—"Production of Non-ferrous Castings," by R. F. Hudson, 6.30 pm.., at the Institution of Engineers and Shipbuilders in Scotland, 39, Elmbank Crescent, Glasgow, C.2.

Purchasing Officers' Association

London branch:—"Metal Finishes," 6.15 for 6.30 p.m., at the Royal Society of Arts, John Adam Street, W.C.2.

Institution of Works Managers

Manchester branch:—"Standardization in Industry," by R. Craig Wood, 6.45 p.m., at the Grand Hotel.

FEBRUARY 10

Merseyside branch:—"Factory Discipline," by J. Ayres, 6.30 p.m., at the Adelphi Hotel, Liverpool.

Institution of Production Engineers

Birmingham graduate section:—"Future Development of Machine-tool Design," by J. W. Wilkinson, 7 p.m., at the James Watt Memorial Institute, Great Charles Street.

Institution of Chemical Engineers

London branch:—"Heat Transfer from Luminous Gas Flames in Vertical Tubes," by S. R. Tailby, and Muhammed Aly Saleh, 5.30 p.m., at the Geological Society, Burlington House, W.1.

Beeston Boiler Foremen's Association

"The 20th Century Revolution in the English Economy," by D. Richardson, 7.30 p.m., in the Canteen, The Beeston Boiler Company, Limited, Mona Street, Beeston, Notts.

FEBRUARY 11

Institute of British Foundrymen

Birmingham students' section:—Works visit to C. Akrill, Limited, West Bromwich.

Lancashire branch:—"Patternshop Cost Production Ratio, and its Effects on Foundry Productivity," by G. N. Gott, 7 p.m., at the Engineers' Club, Albert Square, Manchester.

Purchasing Officers' Association

Birmingham branch:—"Legal Aspects of Purchasing and Sale of Goods Act," by J. Murray Grammer, 6.30 for 7 p.m., in the Colmore Room, Grand Hotel.

Slough branch:—"Industrial Organization and Current Trading Conditions," by W. A. M. Edwards, 7.15 p.m., at the Reindeer Inn.

Tees-side branch:—Brains Trust, Question Master: Frank Shepherd, 7.30 p.m., at the Council Room of the Cleveland Scientific and Technical Institution, Corporation Road, Middlesbrough.

Manchester Association of Engineers

Eighth Annual Lecture, by Sir Arthur P. M. Fleming, 6.45 p.m., at the College of Technology.

Incorporated Plant Engineers

East Midlands branch:—"An Approach to Maintenance—the Report of the U.K. Specialist Team," by H. G. Hilton, 7 p.m., at the Welbeck Hotel, Nottingham.

FEBRUARY 12

Institute of British Foundrymen

Lincolnshire branch:—"Quantity Production of Engineering Castings," by J. Burrell, 7.15 p.m., at Lincoln Technical College.

Liverpool Metallurgical Society

"Nucleation in Metals and Alloys," by J. H. O. Varley, 6.30 p.m., at the Liverpool Engineering Society, The Temple, Dale Street.

Institution of Production Engineers

London section:—"Factory Services," by R. E. Leakey, 7 p.m., at the Royal Empire Society, Northumberland Avenue, W.C.2.

FEBRUARY 13

Eastern counties section:—"Application of High-frequency Induction," by E. H. L. Cooper, 7.30 p.m., at the Public Library, Ipswich.

Institute of British Foundrymen

Tees-side branch:—"Refractory Products for Use in the Foundry," by H. Parnham, at Darlington. (Further details from the secretary.)

Institution of Mechanical Engineers

Conference on Hydraulic Servo-mechanisms, at 10.30 a.m., 2.30 and 5.30 p.m. (admission by ticket), Storey's Gate, St. James's Park, London, S.W.1.

Institute of Economic Engineering

London branch:—"Trades Unions and Productivity," 7 p.m., at the George Hotel, Church Lane, Kingsbury, N.W.9.

FEBRUARY 14

Institute of British Foundrymen

Newcastle branch:—Works visit to Clarke, Chapman & Company, Limited, Gateshead. (Further details from the secretary.)

Scottish branch:—"Controlling the Structure and Composition of Cast Iron by the Addition of Ferro-alloys," by H. P. Hughes, 3 p.m., at the Royal Technical College, George Street, Glasgow.

West Riding of Yorkshire branch:—"Modern Foundry Practice," by C. S. Johnson, 6 p.m., at the Technical College, Bradford.

Institute of Vitreous Enamellers

Northern section supper. (Further details from the secretary.)

CLASSIFIED ADVERTISEMENTS

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

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

SITUATIONS WANTED

CHIEF CHEMIST, 30 (skilled spectrography), desires position. Scotland preferred. Accommodation required.—For further details apply Box 3250, FOUNDRY TRADE JOURNAL.

FOUNDRY ENGINEER. Managerial experience, design and maintenance of foundry plant for mechanised, semi-mechanised foundries. Good technical qualifications.—Box 3248, FOUNDRY TRADE JOURNAL.

LIGHT IRONFOUNDRY, Shipping and Transport Manager, 42, with 20 years' experience all branches foundry administration and accustomed departmental control, desires change.—Box 3252, FOUNDRY TRADE JOURNAL.

WORKS MANAGER (29). Experience of estimating, costing, design, technical development in mechanised and jobbing foundries; patterns, wood and metal; machine and engineering shops.—Box 3249, FOUNDRY TRADE JOURNAL.

GENERAL MANAGER, M.I.B.F., requires immediate change. Experienced in aluminium, yellow metals, and grey iron casting production, either by mechanised plants or general foundry. Well known by buyers in main industries. Fully experienced in all sections of administration.—Box 3236, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT

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

REPRESENTATIVE, with proved sales ability, required for foundry near Warrington making non-ferrous sand-moulded castings. Please state age, experience and remuneration required.—Box 3205, FOUNDRY TRADE JOURNAL.

METALLURGICAL CHEMISTS required for a laboratory attached to non-ferrous founders in the London area. Applicants with experience in the chemical analysis of light alloys, bronzes and white-metals preferred. Salary will be according to qualifications and experience, with a minimum of £450 per annum.—Write, giving full particulars, to Box 3223, FOUNDRY TRADE JOURNAL.

ASSISTANT MANAGER required for General Iron and Brass Foundry with Machine Shop on the South Coast. Good opportunity for young man between 25-35 years, with practical knowledge of all branches of Foundry and General Engineering Works.—Details of previous experience and salary required to Box 3216, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT—*Contd.*

METALLURGIST for Ironfoundry in Lanarkshire. Age 25/35 years. Experience cupola operation. Good salary and prospects to suitable man.—Full particulars to Box 3247, FOUNDRY TRADE JOURNAL.

CATTON & COMPANY, LIMITED, Steelfounders, have a vacancy for a Metallurgical or Science Graduate. The position is one which holds considerable prospects for the type of person who is prepared to develop a career in the steel-foundry industry.—Complete details to CATTON & COMPANY, LIMITED, Steelfounders, Hunslet, Leeds, 10.

BATH ENAMELLER required for modern plant in Australia. Applicants should have first dusting experience and be able to handle pneumatic dusting equipment and mechanically operated turning gear. State present employer and give details of experience, which will be treated in absolute confidence. Free passages applicant and family also furniture freight allowance.—Box 3239, FOUNDRY TRADE JOURNAL.

MANAGER — METALLURGIST with specialised experience in magnesium and capable of pioneering expansion from premises to finished casting including pressure die casting, modern mass production methods throughout. Exceptional appointment with established and successful group of Companies offering progressive income to capable and energetic man.—State full details of experience, technical education, age and salary level to, Chief Engineer, Box 3208, FOUNDRY TRADE JOURNAL.

A CHIEF METALLURGIST IS REQUIRED BY A YORKSHIRE STEELFOUNDRY PRODUCING APPROXIMATELY 6,000 TONS PER ANNUM OF CARBON AND ALLOY CASTINGS. THIS IS A PROGRESSIVE POSITION WITH A COMPANY WHICH IS EXPANDING OUTPUT AND UNDERGOING A COMPLETE REORGANISATION OF PLANT AND BUILDINGS. A SOUND KNOWLEDGE OF GENERAL FOUNDRY PRACTICE IS DESIRED COUPLED WITH A WIDE EXPERIENCE OF ARC FURNACE PRACTICE. COMPREHENSIVE DETAILS OF EXPERIENCE TO DATE TOGETHER WITH AGE SHOULD BE GIVEN. HOUSING ACCOMMODATION WILL BE PROVIDED TOGETHER WITH A SALARY OF £1,500 PER ANNUM. THE APPLICANT SHOULD WRITE IN FULL CONFIDENCE TO BOX 3237, FOUNDRY TRADE JOURNAL.

EXPERIENCED ENGINEERING DRAUGHTSMAN required to assist with the design and development of foundry mechanisation. This post provides scope and good future prospects for an energetic young man with practical ideas.—Please furnish details of age, education, experience and salary range, to THE SECRETARY, British Bath Co., Greenford Middlesex.

SITUATIONS VACANT—*Contd.*

FOUNDRY ENGINEER, Pattern Maker, or Metallurgist, not above 35 years of age, with drive and initiative required to form part of an administrative team, organising and running small Mechanised Foundry in Midlands. Applications treated in strict confidence.—Box 3240, FOUNDRY TRADE JOURNAL.

METALLURGIST required for mechanised and semi-mechanised Whiteheart Malleable Foundry in Midlands. Must have extensive experience of metal control, annealing, etc., and must be able to produce own pig iron.—Box 3241, FOUNDRY TRADE JOURNAL.

DIRECTORSHIP available for experienced Foundry Manager in small jobbing iron foundry employing 20 men, in East Midlands. Excellent scope for man with sound Foundry/Commercial experience to use drive and initiative in developing excellent iron connections and also lay down and develop non-ferrous floor. Experience and personality of greater importance than capital investment.—Box 3242, FOUNDRY TRADE JOURNAL.

FOUNDRY MANAGER required for small jobbing iron foundry in East Midlands. Excellent opportunity for man with sound experience, possessing drive and initiative. Please send full details of qualifications and experience along with salary required.—Box 3243, FOUNDRY TRADE JOURNAL.

STEEL FOUNDRY ESTIMATOR with knowledge of Sales Office procedure required by Steel Foundry in Yorkshire. Write giving full details of experience and career to date.—Box 3244, FOUNDRY TRADE JOURNAL.

A VACANCY will shortly occur with a well-known firm of Ironfounders manufacturing High Duty and Special Alloy Irons, for a first-class TECHNICAL AND SALES REPRESENTATIVE for the Midlands. Applications for the position are invited, but only those from applicants with actual experience in Technical and Sales representation will be considered. The position carries a salary, expenses, commission, and car allowance, and is subject to the Company's contributory Pension Scheme.—Box 3227, FOUNDRY TRADE JOURNAL.

CHEMIST and Metallurgist required to take charge of small Chemical and Sand Laboratory, (one assistant), and to control Metal, Sand, Scrap records, etc., of Floor and Mechanised sections. Practical knowledge of Cupola practice an advantage. Write stating: (*a*) Practical experience in some detail; (*b*) Academic qualifications, if any; (*c*) Age; (*d*) Present earnings and salary expected; (*e*) Date free if appointed. London District.—Box 3246, FOUNDRY TRADE JOURNAL.

SORTER required for ingot foundry in the Dudley area, for aluminium alloys. Experienced man needed, capable of grading miscellaneous aluminium scrap, both cast and rolled. Assistance with accommodation would be considered. Good prospects, permanency, pension scheme, etc.—Please reply with full details of experience, age, salary expected, to Box 3213, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT—*Contd.*

BRASS CASTINGS, young man with good practical experience in casting and machine core making pattern design, plate layout, etc., to train as foundry manager.—Apply in writing, stating age, experience and salary to JOHN WEBB & Co., LTD., Crescent Works, The Crescent, Hockley, Birmingham, 19.

FOREMAN required for steelfoundry to control the output of loose pattern moulding. The applicant should state previous experience together with age and other relevant details. A house will be provided and the salary will be £700 per annum.—Box 3238, FOUNDRY TRADE JOURNAL.

ASSISTANT required in Metallurgical Department for the technical control of the Iron Foundry and general metallurgical duties. A knowledge of foundry technology is more important than analytical ability.—Apply giving full particulars, including age and salary expected to Manager, ENGINEERING DEPARTMENT & LABOUR, VICKERS-ARMSTRONGS, LTD., Crayford, Kent.

MAGNESIUM ELEKTRON LIMITED have vacancy for Experienced Metallurgist for Research Department. Must have personality and ability to control Inspection Section as well as technical qualifications of normal average calibre. Written applications should be addressed to Secretary, MAGNESIUM ELEKTRON, LIMITED, Clifton Junction, Nr. Manchester.

DIE CASTING DESIGNER required for design of Shell Moulding patterns and equipment with soundly established company in this field. London area. State experience and responsibilities.—Box 3254, FOUNDRY TRADE JOURNAL.

MAN in the thirties for modern Steel and Non-ferrous Foundries to be mainly concerned with PROCESS DEVELOPMENT. Machine and floor moulding experience essential, together with engineering and/or metallurgical training. Special experience in methods of technical controls an asset. A man of broad vision and vigour is required, and the post will be progressive in status and remuneration. Pension and bonus schemes in operation. If resident in London area housing can be arranged.—Apply in confidence, giving personal details, with history of training, experience, qualifications and salary required, to FOUNDRY MANAGER, A.P.V.-Paramount, Ltd., Crawley, Sussex.

AGENCIES

ESTABLISHED Aluminium Die and Sand Foundry in Midlands with first class facilities and room for expansion wishes to increase turnover and desires to contact Agents or Representatives who can introduce business on a commission or salary and commission basis. The Company is in a strong position and can amply support any worthwhile proposition.—Full details in first instance in confidence to BOX 3245, FOUNDRY TRADE JOURNAL.

AGENTS required. Able to obtain orders for Brass, Bronze Monel and Aluminium Castings, and machine parts of light and medium weight.—Box 3222, FOUNDRY TRADE JOURNAL.

AGENCIES—*Contd.*

ALUMINIUM Die Casters in gravity and sand require SALES AGENTS for all areas, excluding South-East Counties and London.—Apply Box 3226, FOUNDRY TRADE JOURNAL.

AUSTRALIA.—TECHNICAL REPRESENTATIVE, well known Foundry and Metallurgical Consultant, willing to consider representation of, or act in a consultative capacity for, one or two old-established firms. Foundry plant, equipment and materials.—Please address replies, in confidence, to "T.R.," Box 5255, G.P.O., Sydney, N.S.W., Australia.

WELL - ESTABLISHED progressive manufacturers of Core Binders, Ferro Alloy Briquettes and other materials for ferrous and non-ferrous foundries desire to appoint Sales Agents in the following counties: Derbyshire, Leicestershire, Lincolnshire, Nottinghamshire, North Staffordshire.—Please write Box 3230, FOUNDRY TRADE JOURNAL.

PATENT

THE proprietor of British Patent No. 597530, entitled "Methods of and apparatus for direct reduction of iron ores," offers same for licence or otherwise to ensure practical working in Great Britain.—Inquiries to SINGER, STERN & CARLBERG, 14 East Jackson Boulevard, Chicago 4, Illinois, U.S.A.

MACHINERY WANTED

BUY WE SELL

FOUNDRY MACHINERY, every description, including Moulding Machines, Sand Mills and Mixers, Cupolas, Furnaces, Cranes; also Machine Tools, etc.

Temporary Office Address:
S. C. BILSBY, A.M.I.C.E., A.M.I.E.E.
8b, Birmingham Street, Oldbury,
near Birmingham. Broadwell 1359

MACHINERY FOR SALE

ALBION TWW WORKS

"FORWARD" FOUNDRY SAND RIDDLE:

"FORWARD" FOUNDRY SAND RIDDLE. 5-tons per hour capacity. Complete with Tripod and 22 in. dia. Sieve. Motorised.

GEARED FOUNDRY CRANE LADLES (STOCK OR EARLY DELIVERY):

3-ton, 50-cwt., 2-ton, 30-cwt., 25-cwt., 20-cwt., 15-cwt., 12-cwt., 10-cwt.

½-cwt. UNGEARED LADLE.

"POLFORD" MOTOR DRIVEN VIBRATORY SCREEN, 20 in. by 40 in., CAPACITY up to 8-tons per hour; robust fabricated steel construction; driven through eccentric shaft by 1 H.P. TOTALLY ENCLOSED S.C. MOTOR, 400/3/50. IMMEDIATE DELIVERY.

AIR COMPRESSORS.—WE CARRY LARGE STOCKS OF AIR COMPRESSORS OF ALL TYPES RANGING FROM 2 C.F.M. UP TO 3,000 C.F.M. AGAINST PRESSURES VARYING FROM 5-lbs. P.S.I. to 200-lbs. P.S.I.

THOS W. WARD LTD.
ALBION WORKS : SHEFFIELD
Phone 26311 'Grams: "Forward."

Remember . Words might have it!

MACHINERY FOR SALE—*Contd.*

15,000 LB. Roll over Machine with some capacity available. Falkirk district.—Box 3228, FOUNDRY TRADE JOURNAL.

FOR SALE.

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

SAVILLE-CALVERT (MACHINERY) LIMITED.
BIRMINGHAM ROAD,
STRATFORD-ON-AVON
Tel.: Stratford-on-Avon 3681.

600

AIR COMPRESSORS.

1,000 C.F.M. ALLEY & McLELLAN, type 18B, vert., encl., 2 stage, watercooled, 100 lb. W.P., speed 360 r.p.m. With vert. intercooler.

1,000-c.f.m. FULLERTON, HODGART & BARCLAY, vert., double acting, 2 stage, watercooled, W.P. 100 lb., speed 290 r.p.m. With separate vert. Intercooler, and motorized water circulating Pump. Fitted with Flywheel and shaft ext. carrying "V" pulley suported by outer bearing.

665-c.f.m. SULLIVAN, type WJ3, vert., high pressure, right angle, watercooled 125 lb. W.P., speed 188 r.p.m. Direct coupled 170-h.p. auto synch. Motor by Crompton, 415/3/50, with control gear.

600-c.f.m. TILGHMAN, vert., single cyl., single stage, watercooled type F.C.9. Speed 365 r.p.m. W.P. 60 lb.

600-c.f.m. INGERSOLL RAND, model 10XB, horiz., 2 stage, 110 lb. W.P., speed 185 r.p.m., with Intercooler between the 2-cyls., Automatic Unloader. Driven by 127-h.p. S/R. Induction Motor by L.S.E., 415/3/50, with control gear.

600-c.f.m. ALLEY & McLELLAN, Series 18B, size No. 6., vert., single crank, 2 stage, watercooled, 100 lb. W.P., speed 290 r.p.m. Driven by New 140-h.p. S/R Brook Motor 400/440/3/50, with control gear.

GEORGE COHEN
SONS & CO., LTD.
WOOD LANE, LONDON, W.12
Tel: Shepherds Bush 2070
and STANNINGLEY nr. LEEDS
Tel: Pudsey 2241

DELIVERY EX STOCK

New shot blast cabinets complete with Dust Extractors, etc., size 5ft. × 3ft. Also new 8ft. cube room Plants

Low prices.

Please send for our NEW illustrated catalogue on request

ELECTROGENERATORS LTD.
14 AUSTRALIA RD., SLOUGH
Telephone: SLOUGH 22877
BUY FROM US AND SAVE MONEY

MACHINERY FOR SALE—*Contd.*

PAN MILLS, 4 ft. and 5 ft. dia. under-driven, stationary pans, self-discharging new, for delivery from stock.—W. & A. A. BREALEY (MACHINERY), LTD., Ecclesfield, Sheffield.

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

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

HAND Rammed Pneumatic Roll-over and Draw Moulding Machine, to take boxes up to 6 ft. 9 in. by 4 ft. 5 in. £150.

Large Core Blower (sand container capacity 100 lbs.), with skip hoist, electrics for 440/3/50. £100.

Coke Fired Core Oven, Four Drawer Type. Each 32 in. by 26 in. by 9 in., at £35.

"Electricar" Works Truck, 1 ton capacity, complete with battery charger, 440/3/50 input, 36 volts d.c. output, at £100.

TOWER FOUNDRY, LTD.,
Spurgeon Road, Leicester.

MACHINERY FOR SALE—*Contd.*

"WADKIN" motorised Ball-bearing Woodworking Machines:—18 in. "PKA" Canting Spindle Dimension Saw, 30 in. "JV" Double Disc Sander (both practically new); 30 in. "DNA" Bandsaw; 6 in. centre "RTA" Lathe; 18 in. "AZA" Rising Table Sawbench.—DALTON'S, Canal Street, Nottingham.

IMMEDIATE DELIVERY.

Pneulec Royer. £85.

Jackman Ballbearing Sand Mill, with a.c. Motor drive. £155.

Sand Mill, by James Evans. 48 in. diam. £55.

New unused Sand Thrower. a.c., 3-phase. £50.

New Cupolette, unused, complete.

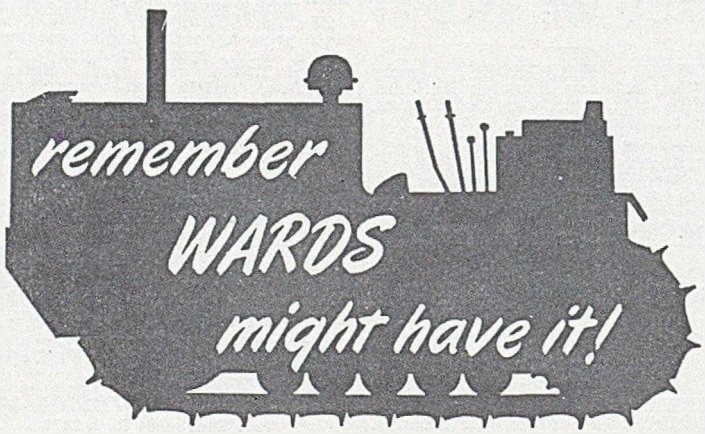
Over 70 new and secondhand Tilting and Bale-out Furnaces, by Morgan, etc.

Foundry Git Cutter, as new, for 1½ square.

Six nearly new Ballard Core Stoves. £55 each.

Our new Catalogue would interest you. May we send you a copy—free.

ELECTROGENERATORS LTD.,
Australia Road, Slough.
Telephone: Slough 22877.



CAPACITY WANTED

CONSULTANTS wish contact maker Iron or Steel Piping (Flg. S. & S.). B.S.S. Details.—BOX 3251, FOUNDRY TRADE JOURNAL.

CAPACITY AVAILABLE

THE ACE PATTERN COMPANY, Hillmorton Road, Rugby. (Tel.: 3638.) First-class patterns in wood or metal. Speedy delivery and competitive prices.

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

PATTERNMAKER, well equipped for small and medium work, desirous of business on own account, wishes to contact prospective customers.—BOX 3123, FOUNDRY TRADE JOURNAL.

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

LANCASHIRE FOUNDRY, with sound reputation over many years, has Capacity for Aluminium Sand Castings. Patterns if required.—BOX 3182, FOUNDRY TRADE JOURNAL.

CAPACITY available for High Quality Grey Iron Castings, Exhaust Manifolds, Switch Gear, Stove and Grate, and any castings up to 5 cwts. Quality and prompt delivery guaranteed.—Apply CRADLEY CHAIN & MFG. CO. LTD., Mill Street, Cradley, Staffs.

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

PROCESSED SANDS FOR

SHELL MOULDING

INCLUDING THE ORIGINAL "H" GRADE SAND.

HOOKER

W. J. HOOKER LTD.
4 MIDLAND CRESCENT, LONDON, N.W.3
Phone: HAMpstead 2495

CAPACITY AVAILABLE—*Contd.*

IMMEDIATE capacity for the complete manufacture of Dies for Aluminium Gravity Die Castings.—R. E. Ormerod, Ltd., Ednall Lane, Bromsgrove, Worcs.

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

NON-FERROUS SAND CASTINGS.—Clean, high quality, sand blasted castings in gun metals, brass, aluminium, etc. Necessary patterns if required.—Meinell & Sons, Ltd., Montrose Street, Wolverhampton.

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

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

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

H. C. HOPPER (Kingston) Ltd.
HAMPDEN ROAD, KINGSTON
KIN 0177/8/9

PATTERNS (Wood & Metal)
CASTINGS (Iron & Non-Ferrous)
GEAR CUTTING
GENERAL MACHINING

All at our

KINGSTON WORKS

Good Deliveries

MISCELLANEOUS

FOR all classes of Foundry Engineering, installations, maintenance, overhaul of Plant, consult The Chemical & Foundry Eng. Co., Winker Green Mills, Leeds, 12. 'Phone 37240.

ANALYSIS, assaying of metals, alloys, residues, etc., ferrous and non-ferrous. Reliable results available promptly at considerate rates. Enquiries invited.—Box 3253, Foundry Trade Journal.

CASH BUYERS—Non Ferrous Metal Swarf, Grindings, Skimmings. Send samples and details to D. Harris, 28, Geary Road, Dollis Hill, London, N.W.10, or Telephone Gladstone 1238. Members of the Non Ferrous Scrap Metal Merchants Association.

PATTERNS, any description or size. High-class Patterns in wood or metal for all types of engineering work. Competitive prices. Good delivery.—Frank Mitchell (Brighouse), Ltd., General Pattern Makers, Victoria Pattern Works, Aire Street, Brighouse, Yorks. Tel.: Brighouse 1244.

REFRACTORY Repairs and Renewals to Annealing Muffle, Refinery, and Reverberatory Furnaces, and Furnaces of all types.—B. Richardson, 49, Milton Avenue, East Ham, E.6. Tel. No.: Grangewood 0619.

SEA SAND for Castings, any quantity, by road or rail.—John Livesey, Ltd., Leamington Road, Ainsdale, Southport.

FIREWOOD for Cupolas. Sleepers and Sleeper Wood in wagon loads.—Tilley's (Wolverton), Ltd., Wolverton Bucks.

MANURE, especially suitable for Foundry work and as supplied to the trade for over 25 years. Quotations on request.—Frank Ginster, Moxley, Wednesbury. Phone: 0688 Wednesbury.

GRAPHITE / PLUMBAGO. — We specialise in the supply of all qualities and all meshes. Enquiries welcomed and answered immediately. Prompt deliveries from stocks. — Woodstock (London), Ltd., 33, The Little Boltons, London, S.W.10. FREmantle 6646/7.

MISCELLANEOUS—*Contd.*

PATTERNS for all branches of Engineering for Hand and Machine Moulding.—Furmston and Lawlor, Ltd., Letchworth.

REFRACTORY MATERIALS.—Moulding Sand, Ganister, Limestone, Core Gum; competitive prices quoted.—Hensall Sand Co., Ltd., Silver Street, Halifax.

PATTERN Equipments, Machined Plates, Castings, Components, Assemblies, Jigs, Fixtures, Corebox Air Vents and Dowels. Developing firm requests enquiries. Keen personal attention.—Booth Bros. Engineering, Baggrave Street, Leicester.

MOISTURE TEST—3 MINUTES! Exact percentage of water in foundry sand determined in 2/3 minutes by "SPEEDY" MOISTURE TESTER. Portable; non-electric; simple for use by unskilled labour; inexpensive. Over 6,500 in use in Foundries and many other industries.—Write for fully descriptive Illustrated Brochure to Thos. Ashworth & Co., Ltd. (Dept. F.T.J.), Burnley, Lancs.

D.C.M.

QUALITY

INGOTS

IN

ALUMINIUM ALLOY

TO

ALL SPECIFICATIONS

ON A.I.D. LIST

D.C.M. METALS (SALES) LTD.

LONGLEE WORKS, BAILLIESTON, GLASGOW

Phone: Baillieston 1061

PATTERNMAKERS' *Section*

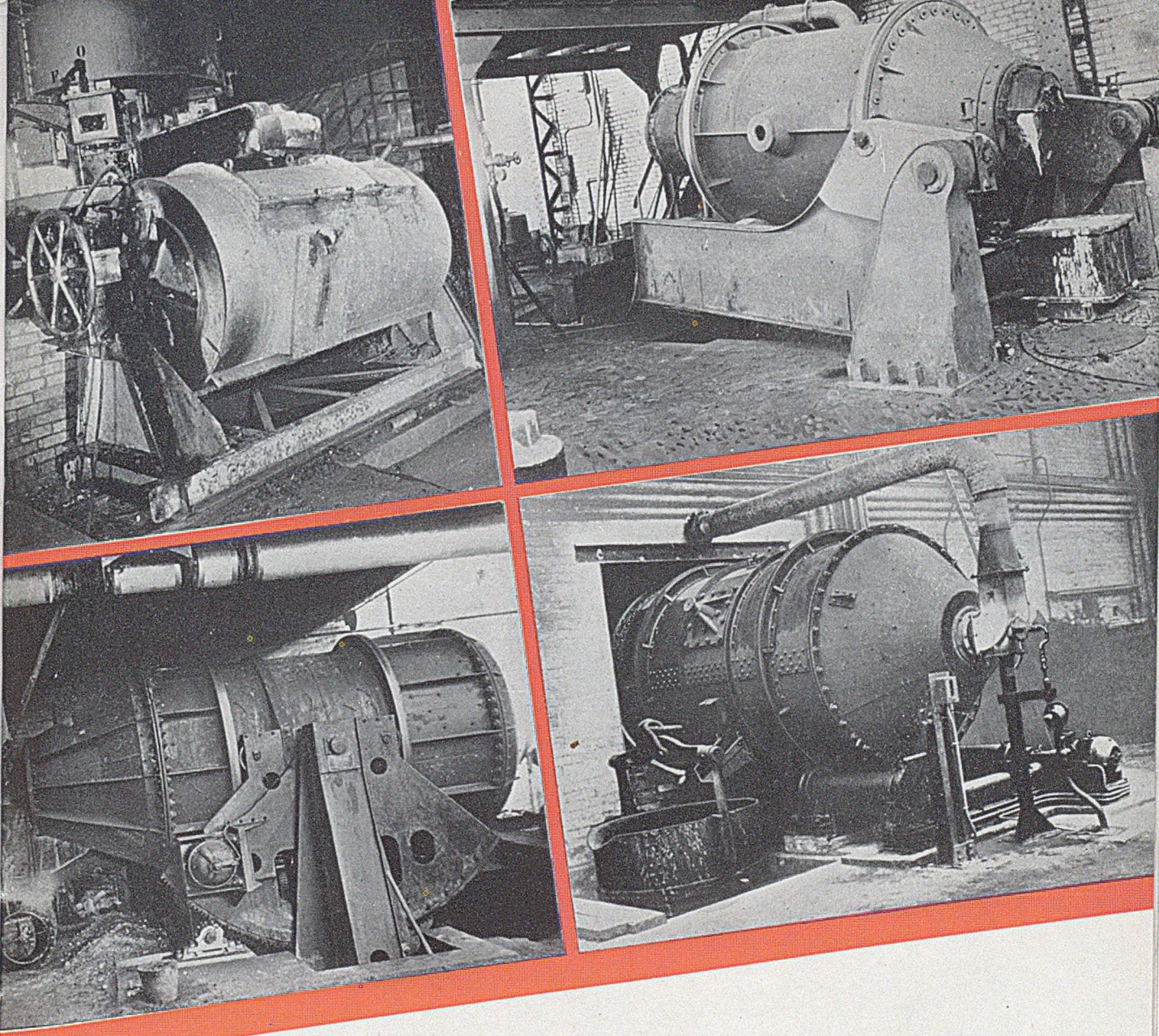
A PATTERN SERVICE

- LARGE AND SMALL WOOD PATTERNS AND CORE-BOXES.
- ★ METAL PATTERNS IN ALUMINIUM, BRASS, AND CAST-IRON.
- SYNTHETIC RESIN PATTERN AND MATCH-PLATES.
- ★ PRESSURE CAST ALUMINIUM ALLOY PATTERN AND MATCH PLATES.
- INSERT METAL AND PLASTIC PATTERNS IN CUSTOMERS' OWN PLATES.
- ★ METAL PATTERN EQUIPMENT FOR THE "C" PROCESS.
- PLASTER, PLASTIC OR METAL ODD-SIDES, CORE-DRIERS, ETC.
- ★ FABRICATED METAL PATTERN EQUIPMENT.
- PRESSURE OR GRAVITY DIES.
- ★ STEEL AND ALLOY MOULDS FOR ALL TRADES.

H. FORREST & SONS (ENGINEER'S PATTERN MAKERS LTD.)
CHAPEL STREET WORKS, LEVENSHULME, MANCHESTER, 19
Telephones: RUSHOLME 3699 and 3807

PATTERNMAKERS' Section

PATTERNMAKERS' Section



SUPPORTED BY 35 YEARS' EXPERIENCE IN FURNACE DESIGN FOR THE FOUNDRY AND ALLIED INDUSTRIES

OVER 150 FURNACES INSTALLED FOR MELTING, SUPERHEATING AND REFINING FOR THE IRON, STEEL AND NON-FERROUS FOUNDRIES

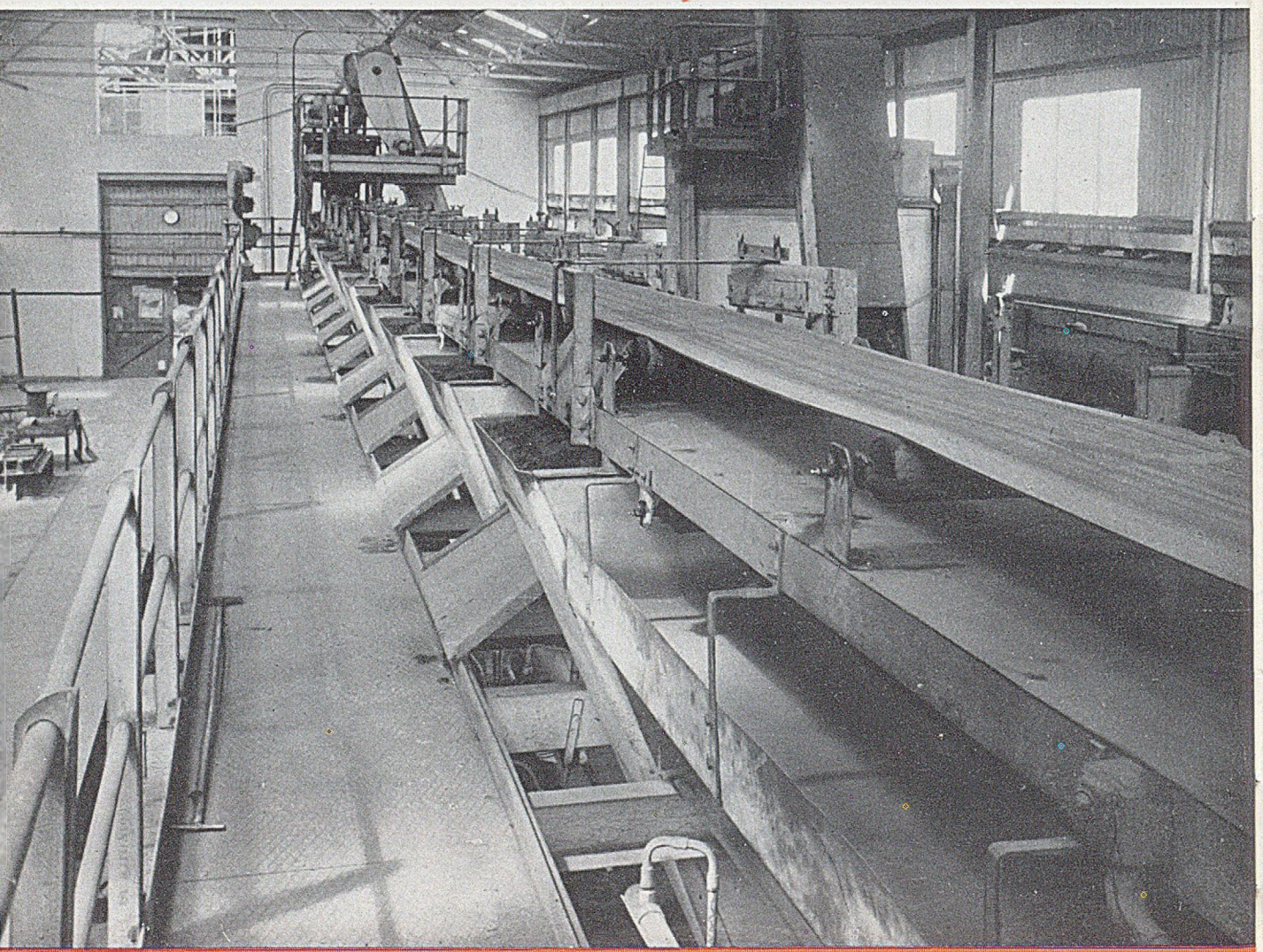
STEIN & ATKINSON LTD

Parnell House, 25, Wilton Road, Westminster, London, S.W.1

ASSOCIATED COMPANIES

Surface Combustion Corporation	Toledo, U.S.A.
Vickers Incorporated	Detroit, U.S.A.
Stein Roubaix	Paris and Liége

Achievement in Foundry Mechanisation



Someone has suggested that it requires a genius to design the perfect foundry plant. We make no claim to genius, but the success of Coleman-Wallwork equipment and the excellent results being obtained in the many foundries where it is installed, demonstrates that we have the ability to understand the needs and problems of the Foundry Industry, and the necessary high engineering skill to serve it. It is our job to help all foundrymen, our research and development departments are at your disposal. If we can work with you to solve a problem we shall be pleased, for achievement inspires the greatest pleasure.

THE COLEMAN-WALLWORK CO. LTD.

Member of the J. Stone Group

TELEPHONE: STOTFOLD 381

GIVE YOUR PATTERNS THE
Wonsover
FOR PERFECT MOULDS

FOUR POINTS TO EFFICIENCY

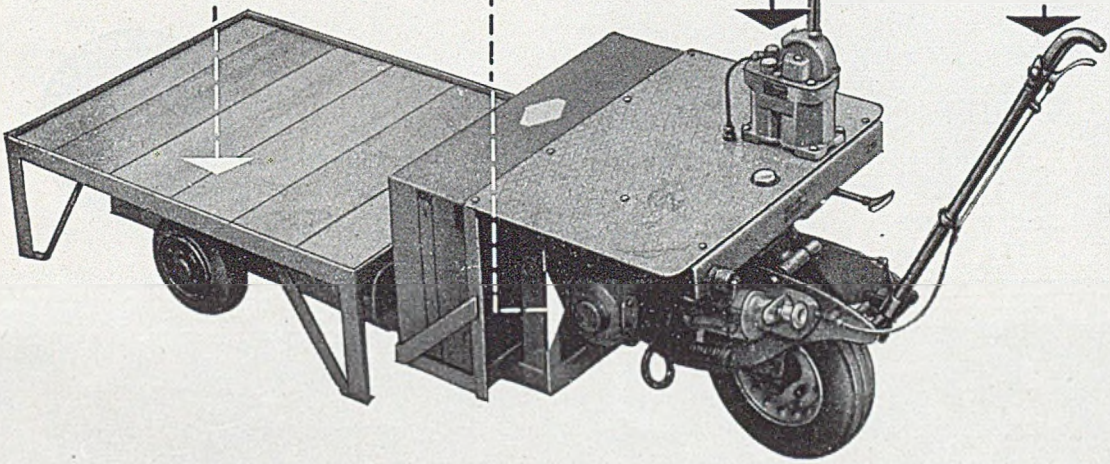
— and economy too

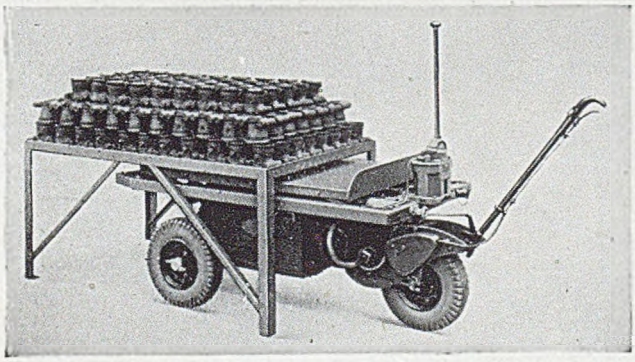
Only 12 inches high, the stillage table gives you an area of more than 10 square feet.

Self-contained power unit contains motor, shock-proof automatic clutch and reduction gear.

A few short strokes lift the loaded platform 4 inches. A simple release valve lets it down again.

This handle controls forward and reverse drive, steering and braking. Little skill is needed.





For those who prefer a high stillage. The table has an area of 13½ square feet and stands 27 inches high.

GRAISELEY stillage trucks will carry 20 cwt. at a time, work all day up inclines, round corners and in and out of confined spaces. After 8 or 10 miles they need recharging with about 4 units of electricity. That's economy for you. At night they simply plug into the charger which automatically switches off when they are ready for the next day's work. Delivery is good at present. May we arrange a demonstration with your nearest service depot.

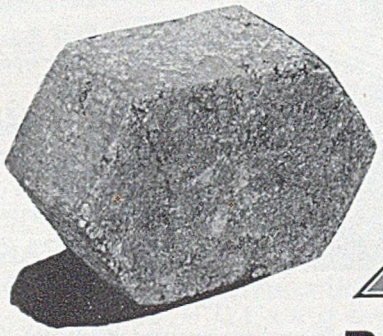
DIAMOND MOTORS (WOLVERHAMPTON) LTD

UPPER VILLIERS STREET · WOLVERHAMPTON

TELEPHONE: WOLVERHAMPTON 22951

SILICON

MANGANESE



CHROMIUM

BEMCO

BRIQUETTED ALLOYS

PROVIDE CUPOLA ECONOMY

- **Uniform in size**
- **Regular and consistent recovery obtained**
- **No mechanical loss of alloy**
- **Weighing is avoided**
- **Greater convenience in use**

ZIRCONIUM

TYPE	Manganese		Silicon (Standard)			Silicon (Special)		Zirconium (+ Silicon)		Chrome
WEIGHT OF BRIQUETTE (LBS.)	3	1½	5	2½	1¼	3½	1¾	5	2½	1¾
WEIGHT OF CONTAINED ALLOY (LBS.)	2	1	2	1	½	2	1	2	1	1

BRITISH ELECTRO METALLURGICAL COMPANY LTD.

WINCOBANK SHEFFIELD ENGLAND

Telephone: ROTHERHAM 4257 (2 lines) Telegrams: "BEMCO" SHEFFIELD

TWW

FOUNDRY PLANT

FROM STOCK

'FORWARD' FOUNDRY SAND RIDDLE

'FORWARD' FOUNDRY SAND RIDDLE, 5 tons per hour capacity. Complete with Tripod and 22in. dia. sieve. Motorised.

RUMBLING BARRELS

'FORWARD' MOTOR DRIVEN RUMBLING BARREL, Model 23J; approx. ½-ton capacity; length 4ft. 7½in., width A/F 1ft. 10½in.; speed of barrel 36 r.p.m.; 3 h.p. S.C. Motor, 400/3/50. TOTALLY ENCLOSED trunnion mounted driven through Totally Enclosed Worm Gear Reduction unit.

MOTOR DRIVEN HEXAGONAL RUMBLING BARRELS, 36in. long by 18in. across flats, 12in. plate, driven by 3 h.p. motor and complete with Starter, 400/3/50.

BELT DRIVEN HEXAGONAL RUMBLING BARRELS. size 36in. long by 30in. across flats, driven through fast and loose pulleys with belt striking gear.

FANS & BLOWERS

MOTOR DRIVEN BLOWERS 400/440/3/50

SIZE 20 MULTIVANE STEEL PLATE PRESSURE FAN, 1,500 c.f.m. against 18in. W.G. 10 h.p. S.C. Motor, 12in. inlet; 8½in. by 3½in. outlet.

SIZE 15 MULTIVANE STEEL PLATE PRESSURE FAN, 2,500 c.f.m. 10in. W.G. 10 h.p. S.C. Motor.

SIZE 24 MULTIVANE STEEL PLATE PRESSURE FAN, 2,820 c.f.m.; 22in. W.G.; 20 h.p. S.C. Motor, inlet 13in. dia.; outlet 12in. by 4½in.

EXHAUST FANS

SIZE 12 PADDLE BLADE, 1,000 c.f.m. against 5in. W.G. 2 b.h.p. S.C. Motor, 8in. dia. inlet; outlet 9in. by 9½in.

SIZE 15 PADDLE BLADE FAN, 2,000 c.f.m. against 6in. W.G. 5 h.p. S.C. Motor, outlet 9½in. by 8in.; inlet 9in. dia.

SIZE 17 PEERLESS EXHAUST FAN, capacity 6/7,000 c.f.m., 3in. W.G. 10 h.p. S.C. Motor, Starter, slide rails, 17in. inlet; outlet 12in. by 15in.

FURNACES

TYPE K2 COKE FIRED LIFT OUT CRUCIBLE FURNACE with Heat Resisting Cast Iron Dome; quick action drop bottom; arranged with special air distributing belt also acting as preheater for air; M.D. Blowing Fan, 400/3/50. CAPACITY 120-200 lbs.

TYPE F1a ALUMINIUM BALE OUT AND HOLDING FURNACE, fabricated of heavy steel plate; Heat Resisting Cast Iron Top; Lined with alumina firebricks and well insulated; M.D. Blowing Fan, 400/3/50. CAPACITY 150 to to 200 lbs.

GEARED FOUNDRY CRANE LADLES

(STOCK OR EARLY DELIVERY)

3-ton; 50-cwt.; 2-ton; 30-cwt.; 25-cwt.; 20-cwt.; 15-cwt.; 12-cwt.; 10-cwt.

¾-cwt. UNGEARED LADLE.

'POLFORD' MOTOR DRIVEN VIBRATORY SCREEN, 20in. by 40in.; CAPACITY up to 8 tons per hour; robust fabricated steel construction, driven through eccentric shafe by 1 h.p. TOTALLY ENCLOSED S.C. MOTOR, 400/3/50.

HAMMERS & DROP STAMPS

20-cwt. capacity **'MASSEY' CLEAR SPACE PNEUMATIC POWER HAMMER,** stroke 32in.; ram pallet face 13in. by 10in.; ram pallet face from floor 24in.; complete with anvil block, pallets, baseplate; 70 h.p. Crompton Parkinson S.C. Motor, 400/440/3/50 and starter.

5-cwt. capacity **'MASSEY' CLEAR SPACE TYPE PNEUMATIC POWER HAMMER,** max. stroke 21in.; ram pallet face 8in. by 7in.; approx. 140 blows per min.; 26 h.p. S.C. Motor, 400/440/3/50; together with starter.

4-cwt. **'EMUCO' PNEUMATIC HAMMER (GUIDED TYPE),** 18½in. overhang; ram 4½in. dia.; ram face 8½in. by 3½in.; 21in. stroke, anvil face 24in. by 13in.; 25 h.p. S.R. Motor, 400/3/50; Elison Starter.

'HERCULES' BELT DRIVEN FORGING HAMMER, weight of ram 160 lbs., 16in. stroke, 225 blows per minute to take bars up to 4½in.

'GOLIATH' BELT DRIVEN FORGING HAMMER, weight of ram 60 lbs. 15in. stroke, 275 blows per minute to deal with bars up to 3½in.

Published by the Proprietors, INDUSTRIAL NEWSPAPERS, LIMITED, 49, Wellington Street, Strand, London, W.C.2, and Printed in Great Britain by HARRISON & SONS, LIMITED, Printers to the late King George VI, London, Hayes (Middx) and High Wycombe.

FOUNDRY TRADE JOURNAL

EST. 1902

WITH WHICH IS INCORPORATED THE IRON AND STEEL TRADES JOURNAL

VOL. 94
No. 1901
Registered at the G.P.O. as a Newspaper

FEBRUARY 5, 1953
Offices: 49, Wellington Street, Strand, London, W.C.2

Single Copy, 9d. By Post 11d. Annual Subscription, Home 40/-, Abroad 45/- (Prepaid)