FOUNDRY
EST. 1902
TRADE JOURNAL
WITH WHICH IS INCORPORATED THE IRON AND STEEL TRADES JOURNAL
VOL. 73. No. 1449. MAY 25, 1944
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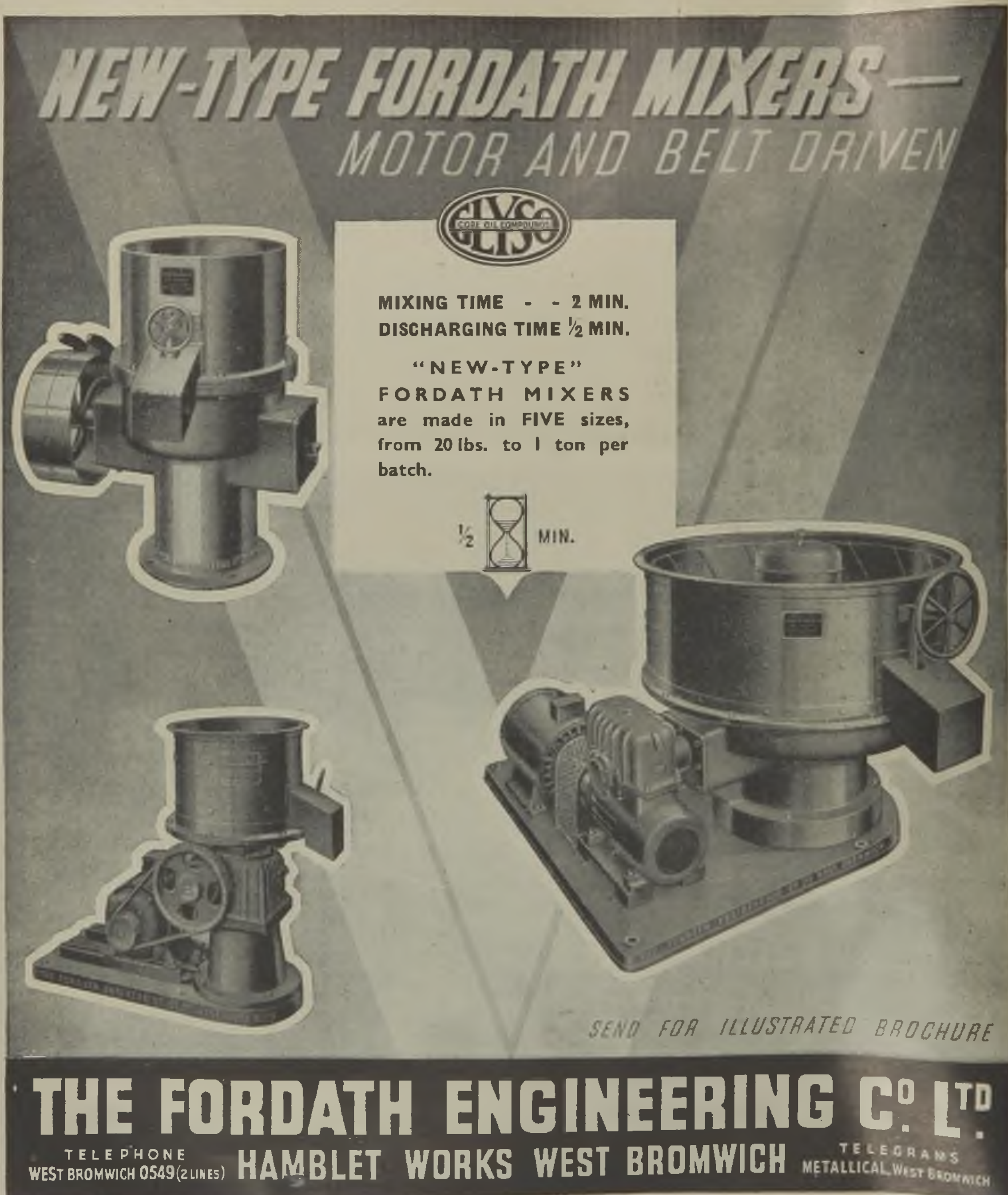
Single Copy 6d. By Post 8d. Annual Subscription Home and Overseas, 21/- (Prepaid).



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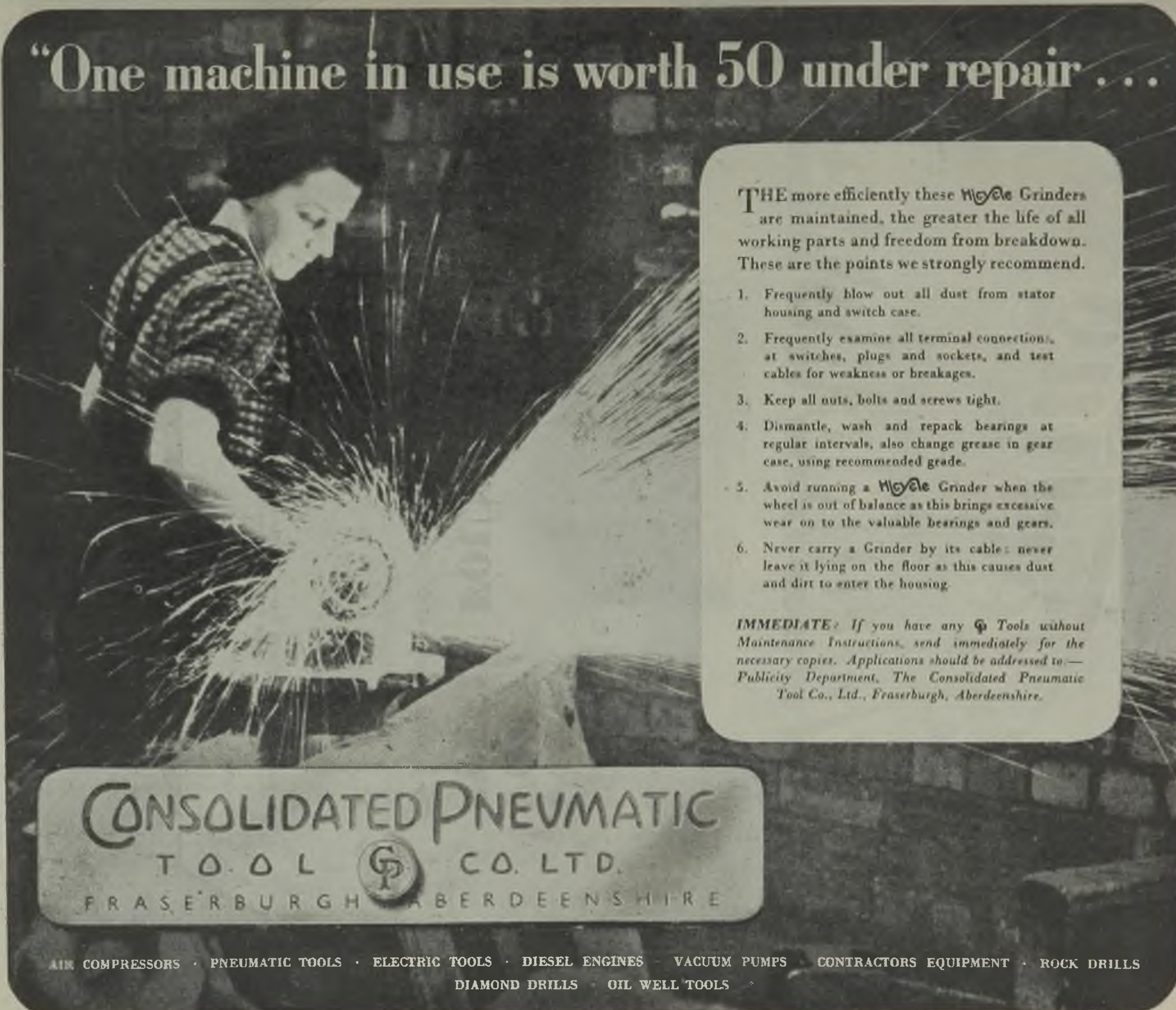

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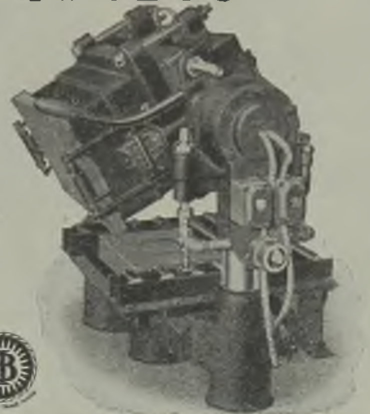


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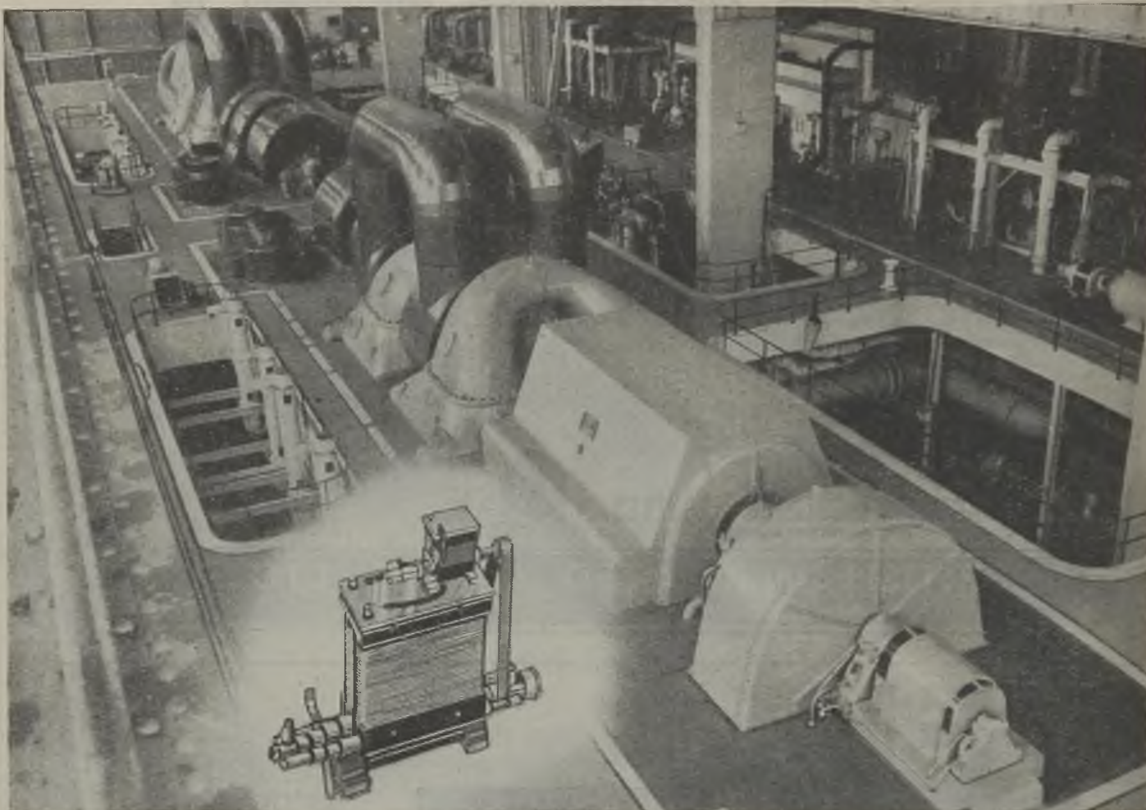

FOUNDRY TRADE JOURNAL *Established 1902*

WITH WHICH IS INCORPORATED THE IRON AND STEEL TRADES JOURNAL

49, Wellington Street, London, W.C.2.

WARTIME ADDRESS to which all communications should be sent :—
3, Amersham Road, HIGH WYCOMBE, Bucks.
'Grams : "Zacatecas, High Wycombe."
'Phone : HIGH WYCOMBE 1792 (3 lines).

PUBLISHED WEEKLY : 21s. per annum (Home and Overseas)

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FOUNDRY TRADE JOURNAL

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WITH WHICH IS INCORPORATED THE IRON AND STEEL TRADES JOURNAL

Vol. 73 Thursday, May 25, 1944 No. 1449

What is Your Percentage?

An interesting document, published in the U.S.A., has just come into our hands, dealing with the question of water-quenching of steel castings. This summarises a number of Papers which were presented at the annual meeting of the Steelfounders' Society of America, when the opportunity was taken of arranging a symposium on this subject. The improvement in mechanical properties that can be obtained in steel by the process of liquid-quenching and tempering, as compared with the ordinary commercial process of annealing, has long been known to metallurgists. The surprising thing is that only recently, either in this country or in America, have these important properties been made use of extensively by steel casting users and producers. The American symposium indicates that, in 1940, the figure of commercial steel castings which were water-quenched and tempered was not in excess of 5,000 tons—less than half of one per cent. of the entire castings production. In 1943, it is believed that not less than 250,000 tons of steel castings were given this treatment, or 8 per cent. of the entire volume of castings produced. It may be thought that this increase is solely due to wartime demands, and that ordinary commercial post-war development will result in an abandonment of liquid-quenching in favour of the ordinary commercial annealing processes. We believe, however, that this is a case where the exigencies of war have brought about a development in the application of metallurgical research which had been held back more by sheer inertia than by anything else. Customers' specifications have often specifically prohibited liquid-quenching. Both users and producers have been inclined to foster the idea that liquid-quenching, and particularly water-quenching, gave rise to unreliable properties, and was therefore to be discouraged. If, in the past, there was any truth in this, the reason was that liquid-quenching, as then conducted, was done by improvised means, and without proper metallurgical control. Wartime experience has refuted the idea that liquid-quenching involves any reduction in the standard of reliability, and has actually proved that the reverse is the case. It has been shown that liquid-quenching gives a control of the most vital factor in heat-treatment, which is the rate at which castings cool down from the soaking temperature.

Interesting figures are now disclosed, setting out the tensile strengths of cast steel as a result of different treatment processes. The yield point of 0.30 carbon steel is increased from 21 to 27 tons per sq. in., by substituting water-quenching and tempering for ordinary annealing. Normalising (air-quenching) and oil-quenching give intermediate properties. On tempering at lower temperatures, still higher yield points, up to 45 tons per sq. in., are obtainable, though with reduced ductility. Similarly, ultimate tensile strengths are improved from 35 tons per sq. in. for ordinary annealing, to 39 tons per sq. in. for water-quenching and tempering. Moreover, quenched and tempered castings are easier to machine than annealed castings of the same tensile strength.

It is interesting to note that, of the liquids commonly used for quenching steel castings, *i.e.*, water and oil, water-quenching gives an appreciably greater improvement in yield point. There has been some difference of opinion as to whether water-quenching is still to be preferred to oil-quenching over the whole range of compositions which are treated in this way. We can, however, state that the dangers of setting up cracks by water-quenching have been exaggerated. This improvement in properties can be made generally available, and should be a valuable contribution to the advance of methods of engineering construction. There are, however, the following important provisos, if this is to be realised:—(1) Collaboration between founder and designer; (2) installation of suitable plant, and (3) development of adequate

(*Continued overleaf, col.* 1.)

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FOUNDRY INQUESTS—VI.

By "CORONER"

The best method of making a pattern is not always apparent at first sight to a patternmaker not possessing a large amount of foundry experience. Fig. 1 is a part section of a round casting that was required in fairly large size batches periodically. The pattern supplied was jointed through the centre with core prints each end as full lines. The corebox supplied was a half box with a loose boss to form the recess A. This core was not an easy one to make, and also not positive for positioning, as a clearance had been made at each end of the core print. After a percentage of scrap, the pattern equipment was re-designed.

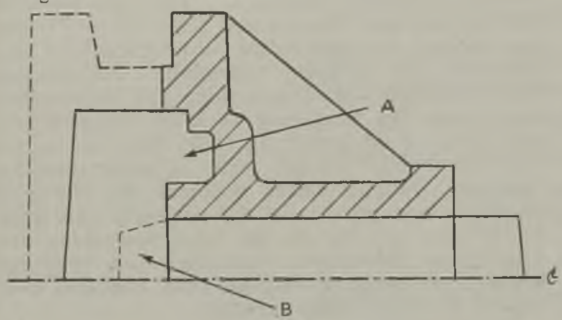


FIG. 1.

The improved method is to make the core prints as dotted lines in the sketch, and making the long round portion separate to suit in prints B. The core forming the back can be made in one piece and turned out on to a flat plate and the centre core placed in it. This method not only facilitates coremaking, but also gives a better guide for the core, and ensures a larger number of good castings, and eliminates Foundry Inquests as far as this trouble is concerned.

WHAT IS YOUR PERCENTAGE?

(*Continued from previous page.*)

metallurgical control. There is an onus on the steel foundry industry to see that these have adequate attention. There are possibilities in the wider application of liquid-quenching processes for considerably enlarging the field for the use of steel castings. Improvement in engineering products depends on improvement in the qualities of the materials available to the designer. Engineers are constantly searching for materials capable of withstanding higher stresses and giving improved wearing properties. For steel founders who are interested in the development of their post-war markets (and who is not?), here, surely, is a field worthy of consideration.

HINTS ON MANGANESE BRONZE FOUNDRY TECHNIQUE

A Paper, which Mr. H. E. McGowan presented to the Los Angeles Chapter of the American Foundrymen's Association, includes the following notes on making manganese bronze castings.

(1) Melt in a clean crucible or in a crucible that has been used previously for manganese. That is necessary to avoid lead contamination.

(2) Melt fast and bring metal to about 1,065 deg. C. and flare or flash strongly.

(3) Use coarse, dry charcoal or glass as a cover, or a good flux.

(4) Furnace combustion should be neutral if possible or slightly oxidising.

(5) Stir thoroughly but avoid flapping the metal.

(6) Flare zinc for about 1 min. but no longer in order to retain the tensile strength.

(7) Add 1 to $1\frac{1}{2}$ per cent. of electrolytic zinc for the weight of gates or risers in the heat. None should be added for the original ingots. This re-establishes the copper-zinc ratio.

(8) Skim thoroughly and pour the moulds with crucible as those to the sprue as possible and pour evenly to avoid surges or splashes. Agitation during pouring, or molten metal flowing against sharp angles in the mould, causes an oxidation within the mould that is detrimental. This alloy will oxidise easily. Inverted horn gates, strainer cores, or skim and choke gates should be used, wherever practical. Castings should be fed at bottom and a straight run of metal in the mould is desirable. Heavy risers and feeder heads must be generously used to overcome both external and internal shrinkage, which this metal has.

(9) For pouring the test-bar: (*a*) Skim dry the mould; (*b*) pour at the temperature for best physical properties; (*c*) shake out after about 45 min. Leaving bars in the sand for a longer time makes the metal brittle. Although the tensile strength will not be altered much, the elongation will be lost; (*d*) when the bars are machined, the machine shop should be cautioned against heavy cuts or allowing the bars to get too hot. Machining can harm the physical properties of an otherwise good bar; (*e*) if the feeder or riser section of the test-bar does not show a decided shrink on the top section, the bar should be discarded, and (*f*) one bar should be broken in a vice before machining, and if any bright yellow spots are apparent the bar has not been fed properly and shrink areas are present which rapidly lower the physical properties.

The production of the United States malleable-iron castings industry was virtually the same in January this year, at 75,247 short tons, as in December. Order-books, however, are well filled.

American production of magnesium castings, excluding incendiary bomb bodies, rose from 160,535 tons in 1942 to 290,449 tons in 1943. In the same period the percentage of die castings rose from 4.5 to nearly 10 per cent.

MECHANICAL AIDS TO CORE PRODUCTION

Position of the foundry industry in the light of mechanical advancement during the last century

By J. BLAKISTON, A.I.Mech.E.

(*Continued from page* 56.)

Core Stoves

As previously stated, on account of the increasing volume of core *pro rata* to tonnage that has been occasioned by modern engineering development, the core shop as a whole requires careful consideration as to its full layout and planning. Fig. 13 shows the layout for the production of 50 tons of jobbing cores up to 10 cwts. in individual weight per week. This section is intended to be operated by female and male labour in the ratio of 5 to 1. A number of 18-in. gauge light railway bogies are used to transport the sand and core plates to the operators, while the finished cores are delivered by gravity roller conveyor to the vertical or tower stove. This type of stove deserves some comment, as it is a mechanical method of drying. A number of trays are circulated up and down the interior of a vertical tower, taking a time which can be varied to suit the type of work. The cores to be baked are placed on these trays, which can be up to 7 ft. by 3 ft. in size. Hot and cold air currents are then directed on to these trays during their cycle, so that the cores are baked, dried and cooled during this passage. The cycle can be repeated for larger cores, if necessary.

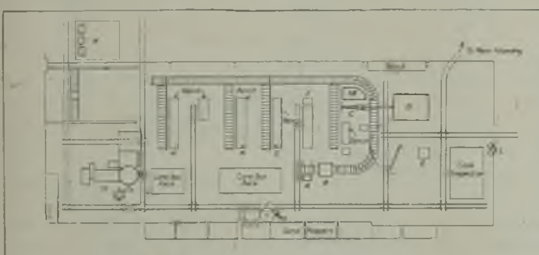


Fig. 13.—Core Plant Layout (*a*).

The outstanding features of these types of stoves are small floor space coupled with high output, and low fuel consumption with high thermal efficiency: also, the fact that the stove, on account of its basic principle, is always open at the bottom for the reception and delivery of cores. The stove in this section is fitted with the charging device previously described. A jolter station with turnover cage is situated so that the larger cores produced use a different section of the conveyor from those used by the small cores.

The core benches have attachments previously described distributed amongst them. All the smaller work is allocated to the benches with the most suitable devices for the type of core required.

Although this section has its own sand mixer, it is so situated in relation to the main sand plant as to be able to draw from it in the event of peak loads or breakdowns. After the cores have been baked they are inspected, jointed, sorted and made generally ready for the moulders, so that no additional work has to be carried out on them before use.

Fig. 14 shows a similar layout, only in this case it is of higher capacity specialising on small cores. A suspension conveyor fitted with alternate buckets and trays runs round the outside of this section. The trays take the empty core plates back to the operators and baked cores to storage and inspection. The buckets distribute the sand to the benches from the sand plant. The cores are delivered to a three-stage vertical stove by means of a steel band conveyor and are loaded by hand. The three-stage vertical stove works similarly in principle to the tower stove previously described, but had a much larger throughput, generally with smaller trays.

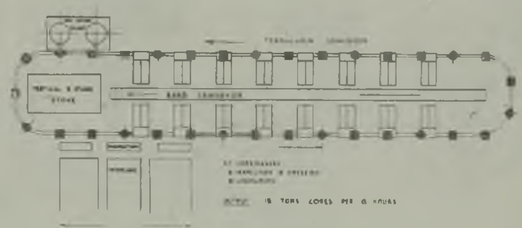


Fig. 14.—Core Plant Layout (*b*).

This plant would probably have been more complete if it had included a core-blowing machine. This machine packs the sand into the corebox pneumatically, but its use is only justified where large numbers of specialised cores are required, as each new corebox requires considerable experiment as to the correct disposition of the air vents, before successful operation is achieved. This, coupled with mechanical upkeep, cleaning and capital cost, gives only a very small margin over efficient hand methods.

Barrel Cores

Cylindrical or barrel cores have long been made by hand-driven extrusion machines and by strickling loam on a barrel turned by means of a handle. These methods are additional to the common hand method of making cores in half-rounds and, after baking, joining together. The first two methods obviously suggest themselves to power-driving, and it is surprising that this method is seldom used. Extrusion

Mechanical Aids to Core Production

machines, although long established, have two disadvantages:—(*a*) The quality of oil sand has to suit the machine and not the purpose of the core; and (*b*) with the longer cores the pressure required to force them along the conveyor causes bulging, so that accuracy cannot be maintained to close limits.

Fig. 15 shows clearly a simple method of a power drive for core barrels, the core barrel being carried on "V" stands in the normal way; an old lathe headstock is used for the drive, the spindle carrying a sliding square-holed socket, which can be moved by a rod always in easy reach of the operator. Every core barrel required for use on this machine must be fitted at one end with a square taper spigot, which can be engaged at will when the socket is slid forward. The square spigot required on the core barrel can be used for subsequent core setting and holding-down purposes. The illustration also depicts the complete layout for barrel core manufacture, and shows a one-leg wall crane, which transfers the cores from the machine to the drying-stove bogies.

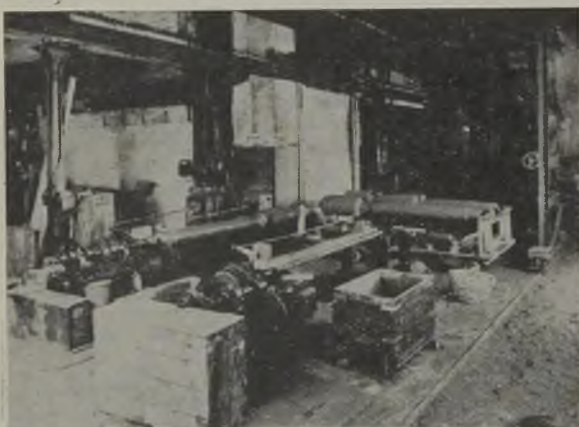


FIG. 15.—CORE BARREL MACHINE.

Fig. 16 shows a further adaptation of this barrel drive. In this case green sand cores are being made on a mass production basis; this operation is as follows:—Green sand is fed from a hopper by a mechanical feed, so that it flows at an even rate on to a clay wash wetted rotary barrel. The sand is compressed and pared to the correct diameter by means of a mechanical reciprocating strickle, the overflow sand being collected under the machine and returned into the system.

Perhaps the most striking example of the adaptation of turning methods to core manufacture is shown on Fig. 17, which shows a machine for screw cutting baked oil sand cores. The machine is really an adaptation of a chaser lathe, only a grinding wheel formed to the required thread section is substituted for the chaser. The drawing is self-explanatory, and it will be seen that by changing the pitch screw and wheel ratios of the headstock, any pitch of internal or external thread can be ground to great accuracy, this accuracy and finish being transferred to the final casting taper threads, or truly cylindrical cores can also be ground on this machine if required. This grinding is becoming more general for all shapes and sizes of cores, and Fig. 18 shows a large capacity plane surface core grinding machine of American manufacture. The main use for this type of machine to date is for cores that have to be jointed.

The "Plus" Factor

These cores are made "plus" to the joint and then ground to the exact size, so that when the cores are jointed exact dimensions are obtained.

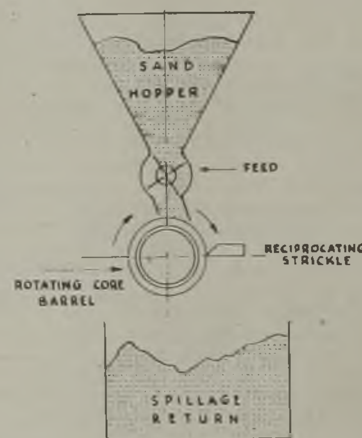


FIG. 16.—GREEN SAND BARREL MACHINE.

This is used particularly in conjunction with the jigging of cores as practised by the motor-vehicle industry,[5] the whole core assembly being built up in a jig and lowered *en bloc* into the mould. The jig locates with the box pins. After the core assembly has been secured the jig can be collapsed and withdrawn. This system can be exploited in most foundries in a small way, using plywood jigs in the simplest form for all core locations, with corresponding benefit to the finished casting.

The two main conclusions to be drawn from this Paper are, first, that the many bench tools, machines and other devices, together with better handling and transportation, are bound to produce, not only a cheaper, but more accurate and better finished core. Apart from reducing foundry wastage, the benefit has to be passed on and exploited by the machine shop, particularly as far as casting working limits are concerned.

The first question that will be asked is to what limits can castings be expected to be made by modern methods for a specified purpose. The following may be taken as a present day guide for commercial casting tolerances:—

Barrel hole diameters up to 2 in. ...	± 0.005
Barrel hole diameters 2 in. to 6 in. ...	± 0.01
Main dimensions in 6-in. cube	± 0.015
Main dimensions in 12-in. cube	± 0.025
Main dimensions in 36-in. cube	± 0.1

The above should be easily maintained, but a further factor should be considered. Modern production methods demand extensive jigging, Fig. 19 shows what often appears to the layman to be the hall mark of jig work, this fault being apparent on completed components supplied by some of the most reputable manufacturers. No matter how often corrections take place, this fault insidiously creeps

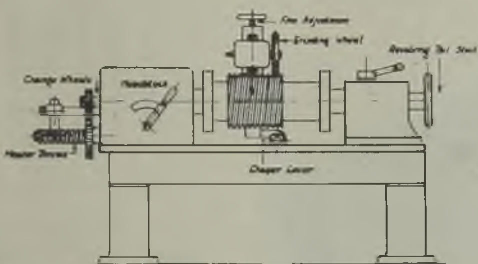


FIG. 17.—CORE GRINDING LATHE.

back, and, as far as cast components are concerned, it can be minimised, if not eliminated, by close co-operation between planning of the moulding methods and jig designing, the two being inter-related.

This illustration also shows a typical gearbox mould set up, the component being subsequently jigged for machining. The setting up of the mould, or the jig settings, should be from the same points. In the case of this illustration refractory blocks in the form of firebricks are placed in the mould, corresponding with the future setting points for the jig.

Now it will be noted that any variation that can accrue in the casting size is in most cases plus, and in no case can a total negative error occur. The pattern for this component should be made to a contraction rule, which will produce a casting to the engineer's negative tolerance.

A casting always tends to grow, and, as seen from the illustration, this growth is cumulative. This growth can occur in other directions and by additional causes to those shown in the illustration, namely, pattern rap, casting pressure, sand sagging at joints, etc., but any factor that produces a variation other than "plus" is most exceptional. It is a common fallacy to think that the external reduction of the pattern to make it fit the jig will rectify these location troubles.

The example of co-operation outlined above would enable the jig to take a casting 0.02 in. over the foundry minimum casting size, while the engineer still maintained his ± 0.01 tolerance. Explaining this in simple language, the engineer's discrepancies are above and below a limit, while the foundryman's discrepancies are all above a limit.

In a similar manner, when two components are machined for joining together, the jig setting should always be such that the foundry cumulative errors on each component run together and not in opposition.

Another source of friction between the machine shop and foundry which can be eliminated by collaboration is occasioned by misalignment of core holes in multiple walled components that are to be jig bored. Fig. 20 shows the machine shop set-up for one of these units; the boring bars must pass freely through the casting and the extra time taken to bore one hole separately would justify the scrapping of the casting. In the case of this set-up, a time-saving factor on the components of 10 to 1 is shown.

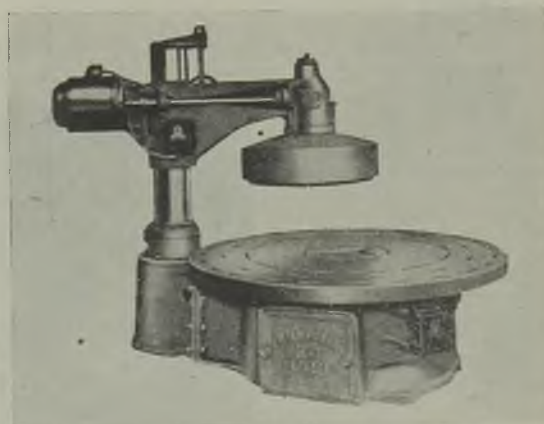


FIG. 18.—A MILWAUKEE GRINDER.

Fig. 21 shows how through incorrect coring methods there can be a chance that, owing to misalignment of core holes, the boring bar cannot be threaded through the holes, and in some cases, even when the unit can be used, inaccuracies occur in the finish caused by unequal machining in the bores.

Underneath is shown that, by eliminating individual cores and using barrel cores, doubly checked by jig cores on each side, and lowering the whole core assembly into the mould at once, will render the foregoing complaints impossible. The second conclusion is that the limits previously enumerated, finish, and conformity with the subsequent processes will become more exacting as production methods develop, particularly as improved core-making methods become universal.

Mention was made earlier in the Paper of the machine grinding of cylindrical cores and machine grinding of core faces. This development may well

Mechanical Aids to Core Production

extend and for certain exacting work the core will be completely ground to precision limits before being used. Indeed, just before the present war, the writer was privileged to examine some grey-iron castings for precision machines supplied into this country from the Continent, and was convinced that only by the above methods could these castings have been produced to such a degree of accuracy.

The supplies of foundry accessories and equipment will have to keep pace with these advancements, chaplets will have to be more accurate to dimension; plates, coreboxes and patterns will have to be right and kept right by constant inspection. This inspection should also apply to mechanical equipment, and, lastly, the foundry supervision should see that all mechanical equipment is always exploited to the full extent.

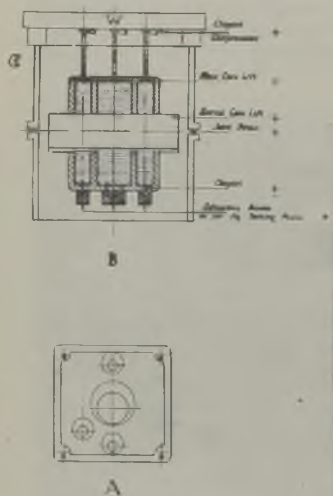


Fig. 19.—Cumulative Moulding and Core Errors.

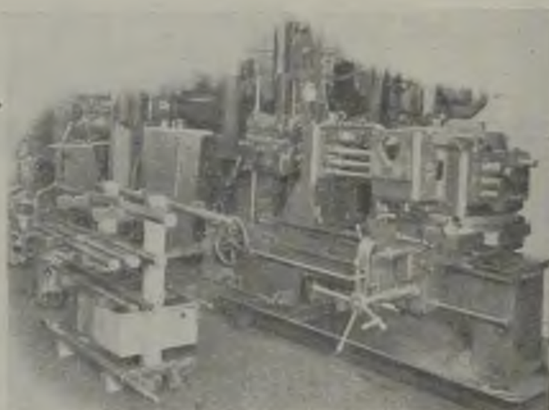


Fig. 20.—Jig Boring Set-Up.

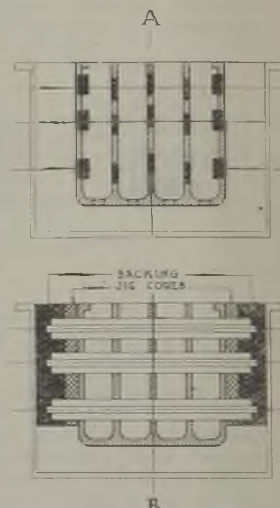


Fig. 21.—Core Position Defects.

DISCUSSION

Mr. S. H. Russell (Past-President), after congratulating Mr. Blakiston on the excellent Paper, said that, owing to various factors, it was becoming essential to use such apparatus as had been illustrated. In connection with Fig. 2, which showed two covers, the one on the left was labelled "wrong" and the one on the right was labelled "correct"; he understood that Mr. Blakiston withdrew the latter description and stated that both indicated a wrong method of production. Would he please indicate why he was of this opinion?

Mr. Blakiston said that in case "A" the design of the component was such that the casting would make its own core and strip itself, and lend itself to plate moulding. There would be no cores utilised at all. In the case of "B," the internal flange was such that it could be made by utilising loose pieces. This case depicted could be debatable, as, should a large number be required which demanded a moulding machine set-up, the time saved by this set-up might outweigh the increased cost incurred if a core was used. Example "A" indicated "Coreitis."

Mr. Simpson said he was impressed by the lecturer's remarks on the mechanical aids to coremaking. It was shown on Fig. 14 that there were 32 coremakers, six inspectors and eight labourers handling 15 tons per 8 hrs. This did not appear economical from the mechanical point of view. Was this for a light foundry?

Mr. Blakiston replied that this particular illustration showed the layout for the production of small intricate cores used for light electrical work or small valve work. This represented a continuous output of 2.2 lbs. of core per coremaker every minute, which, to the Author, appeared to be quite a high rate of production for female labour on intricate cores.

Core Plates

Mr. Measures said he was interested in the use of cast-iron core plates against steel plates. In a steel plate much weight was eliminated. They were, however, inclined to warp slightly, but that could readily be overcome by flattening them out again on a surface plate. Steel core plate came before the cast-iron plate for average work, and at his works hundreds were used. Mr. Blakiston referred to limits of $2\frac{1}{2}$ thousandths. Personal experience of extruded cores was that long lengths could be obtained to very close limits of accuracy. For the thread grinding machine, what sort of a wheel did Mr. Blakiston suggest, as he had never found one to stand up to the conditions? They all wore out extremely quickly.

MR. BLAKISTON said it was essential that the stone used on the thread grinding machine should be run at a very high speed, and the abrasive which was chosen for this work (sometimes garnet) was generally of a grit and grade to suit the particular sand and core binder used. The Americans had developed an excellent abrasive for this purpose and, when the grinding wheels lost their shape, they were re-cut with a diamond.

The extrusion machine was a very common method of producing cylindrical cores. Unfortunately, in the case of certain classes of work, the type of sand required for the satisfactory operation of the machine was not suitable as regards subsequent casting properties. He had experienced and talked to many people who had similar trouble as regards bulging. He agreed that the average extrusion machine could produce a core to $2\frac{1}{2}$ to 5 thousandths limits, but customers were now asking in some cases for a greater degree of accuracy.

The mere fact that Mr. Measures stated that a steel plate could be straightened indicated that he had experienced trouble with core plates bending. He, personally, had found that cast-iron core plates, if suitably designed, could be made very light, and, utilising some of the handling devices as described in the Paper, were very rarely broken. The thermal contraction of cast iron was much less than steel, and this was also a contributory factor to more accurate cores.

MR. P. A. RUSSELL, referring to tolerances, said he did not think foundrymen would accept Mr. Blakiston's statement that all foundry errors were plus and not minus. From the moulding point of view, he would agree that most of the moulding errors were plus errors, although there were, of course, a few moulding errors which were minus errors. Some contraction errors were minus errors. There were also minus errors due to sand swelling under the heat of the metal and sand swelling where runners or risers were cut into the mould.

The AUTHOR agreed that there were exceptions to every rule, and a minus error might creep in, but generally there were so many possibilities of plus errors that the minus errors were generally swamped, and, when this minus error did occur, it was so conspicuous as always to call for comment. Further, plus errors could creep in on account of wood pattern expansion caused by moisture absorption.

Pneumatic Clamp

MR. F. DUNLEAVY said Mr. Blakiston was certainly doing a good job of work, and to very fine limits, but he hoped that it was understood that the large quantities of castings that were required made this expense possible. The pneumatic clamp did not make any personal appeal, and he could not see any value in a machine of this character. The disadvantages of this machine appeared to outweigh the advantages and made a great deal of trouble and distortion of cores when using wooden coreboxes. He hoped that when foundrymen asked for new machines, whether it be for cores or moulds, that they did so fully realising the return expected from them. One must not suggest buying machines for the sake of the machine. Core distortion could be caused by various means, and if the core-sand mixture was unsuitable or any mishandling of the core in the green state took place, all the mechanical methods of core manufacture broke down.

MR. BLAKISTON said the point was that the methods described in this Paper had got to be used for jobbing work as well as for repetition work if the foundry was going to keep up with future requirements. As regards to pneumatic clamps, this was a standardised machine and the pressure could be adjusted so that the corebox was not damaged by excessive load.

MR. I. BUTCHER said he preferred the cast-iron plates to steel for accuracy of production, but his foundry utilised steel plates. The ones illustrated in the Paper were used on a conveyor system and, therefore, were not subject to the rough usage of a general foundry. He considered that Mr. Blakiston's Paper was more applicable to mass production than jobbing.

MR. BLAKISTON said that whenever cast-iron core plates were broken on the system described, it was generally found that this took place when they had been transferred to the main foundry. The layout shown in Fig. 14 had worked for several years satisfactorily on jobbing work, and the whole point of this Paper, as previously stressed, was to indicate the possibilities of these mechanical facilities in jobbing foundries after being mainly used in the past in mass-production foundries.

Vote of Thanks

MR. H. BECK proposed a vote of thanks to the Author. After MR. G. L. HARBACH had seconded, MR. BLAKISTON said that, when writing this Paper, it required a great effort not to dwell too much on the many mechanical aids to coremaking, but to try and bring forward to the members the necessity of looking into the future to see what the trend of the foundry industry was likely to be, so that the principals engaged in ironfounding could make some attempt to plan for the future.

There had been recently many discussions about this matter; some said that there was no future for the foundry, and others said that the foundry had an expanding future. The answer was entirely in the foundryman's own hands, and by doing everything possible in the way of improvements and making themselves adaptable, they should be in a strong position to cope with any eventuality.

REFERENCE

[5] G. W. Brown, M.I.Mech.E., "Some general remarks on Mechanical Foundries and the making of Motor Cylinders," *Proceedings of the Institute of British Foundrymen*, vol. 28.

CLEANING AND DESCALING STEEL BY ELECTROLYTIC PICKLING IN MOLTEN CAUSTIC SODA

By N. L. EVANS, B.Sc., A.I.C.
(Research Department, I.C.I. (Alkali), Limited, Northwich, Cheshire)

This Paper, which has been prepared for presentation to the Iron and Steel Institute, deals with certain aspects of a process for the electrolytic pickling of steel in molten caustic soda.

In 1936, a British patent (No. 442,859) was granted for a process for cleaning and descaling metal by electrolytic action in a bath of molten caustic soda. The specification mentions other chemicals for the bath, such as mixtures of sodium and potassium hydroxides, sodium nitrite and calcium chloride, but, so far as the Author is aware, caustic soda has invariably been used when the process has been applied in Great Britain. Suitable operating conditions are said to be a temperature of 454.4 deg. C., a current density of 100 amp. per sq. ft. and an immersion time of 10-15 sec. The metal to be cleaned is made the cathode, the anodes being of nickel or iron. The consumption of caustic soda is said to be 15 lbs. per ton in the case of wire.

Advantages Claimed for Process

The advantages claimed for the process are as follow:—

(1) It produces a cleaner and more uniform surface than can be obtained by other methods, and consequently allows the production of better coatings, whether the steel is to be plated, tinned, enamelled, painted or otherwise treated.

(2) The consumption of chemicals is small.

(3) The process avoids the loss of weight which the steel undergoes in acid pickling. This may be an important factor when expensive alloys are involved.

(4) The nature of the process precludes the possibility of embrittlement of the steel through absorption of hydrogen.

(5) By the use of appropriate salts and proper temperatures the steel may be given heat-treatment, such an annealing, tempering, etc., at the same time as it is being cleaned.

(6) The process completely cleans metal surfaces from all organic material, so that no preliminary degreasing step is necessary.

(7) The process can be used in place of sand-blasting in nearly all cases; it is particularly effective as a preliminary to inspection to show defects in welds, castings, etc.

(8) Steel cleaned by this process may be stored, transported, etc., without the rusting which occurs immediately after acid pickling. This makes it unnecessary to do the pickling immediately before the article is to be coated, permitting simplification of manufacturing plant flow sheets.

The process was first developed as a method of cleaning steel wire prior to electro-galvanising. Lyons has described the extreme difficulty of removing from steel wire the surface contamination resulting from the application of drawing compounds followed by the passage of the metal through dies, which raises the surface temperature momentarily to a high value. He considers that pickling in acid is inadequate for removing the resulting deposits, but that the caustic soda process produces a surface sufficiently clean for electro-galvanising. This method was developed by the Bethlehem Steel Corporation, the combined processes of cleaning and zinc-plating being known as "bethanising."

Hammell's Experiments

Hammell refers to the claims made for the process that it removes oil, dirt, scale, carbon and phosphorus from steel surfaces, and remarks that metal so treated should have less tendency to rust if stored than metal cleaned by other means. He experimented with the vitreous enamelling of sheets after cleaning by this method, and found with certain higher-carbon steels a better adherence of the coating than was obtained after acid pickling. He noted a slight etching of the surface in the case of higher-carbon steels, but it was not so marked as the etching produced by acid pickling. He gives us the conditions of carrying out the process, a bath of molten caustic soda at 500 deg. C. contained in a steel tank, nickel anodes, 6-volt direct current, a current density of 2 to $2\frac{1}{2}$ amp. per sq. in. (288 to 360 amp. per sq. ft.), and an immersion time of $1\frac{1}{2}$ to 2 min., followed by washing in hot caustic solution and then in hot water.

There are literature references to electro-galvanising with a specially pure grade of zinc (99.995 per cent.), which is claimed to possess definite advantages over the usual 99.95 per cent. grade. It is possible to apply a coating of 3 ozs. per sq. ft. on pure iron wire, which can then be wrapped around its own diameter without cracking. Electro-galvanised wire originally coated with 4 or 5 ozs. of zinc per sq. ft. can be drawn down to a smaller diameter, and it is possible in the case of sheet steel to put, say, 2 ozs. of zinc per sq. ft. on one side, and $\frac{1}{2}$ oz. on the other. An essential preliminary is the perfect cleaning of the steel by electrolysis in molten caustic soda. There are other applications of this method of cleaning, such as the manufacture of aircraft bearings and the production of stainless-steel rods, and it is claimed that in all cases it does a better and faster job, and often a much cheaper one.

Extensive Use in this Country

The bethanising process has been extensively used in Great Britain for the production of galvanised steel wire. More recently, experiments have been carried out on a fairly large scale on the descaling of steel sheet by the caustic-soda process, not as a preliminary to galvanising, but as a final treatment which confers a mild degree of resistance to rusting for an appreciable period, in contrast to the rapid rusting which follows pickling in acid.

(*Continued on page 74, column 2.*)

THE IRONFOUNDRY OF THE FUTURE*

By G. M. PRIESTLEY (Member)

In considering the foundry of the future, it is as well first to ask the question, "Will there be any foundries such as exist to-day?" War is the very best means of advancing knowledge, because money is a secondary consideration, and only the things produced matter. Research and inquiry go on unabated and results are achieved and new discoveries made which normally would take a generation or more to make in time of peace. It is therefore possible that new materials and new methods will make present-day ironfounding a thing of the past, and, when we consider the advances made in such materials as plastics and the phenomenal strengths obtained with non-ferrous metals and with various other metals by powder metallurgy, it does, in the words of a well-known broadcaster, "make you think."

However, that time is not yet, and it does appear as if ironfounding will continue at least during the lives of most of those who now live and work in the "cinderella" of the engineering trade, the foundry. So let us consider the ironfounders of the near future.

Recently the author took a layman round a foundry just at pouring time and, on entering, he remarked, "Gosh, I don't know how they work here all day; it's the nearest approach I know to hell." That, however, may be a bit overdrawn, and there are many worse places than foundries and, after all, foundry dirt is clean dirt. At the same time, it is quite unnecessary for foundries to be as untidy as they are. This brings the subject to a division of the types of "foundries of the future" to be considered, because it is undoubtedly easier to have a tidier mechanised foundry than a jobbing shop. There will always be room for both, and it is suggested that these two are best kept apart. Specialisation and concentration of effort are essentials of success to any business, and it is going to be in the interests of engineers generally to buy their castings outside and buy them, therefore, from either a repetition foundry or a jobbing foundry. They will get better castings (because of expert concentration), they will buy cheaper (because the outside foundry must be run economically), and they will be forced to consider the design of a casting from the foundry angle, as the supplying foundry will point out the most economical way to make it, both for their own profit and the buyer's profit. In other words, more notice will be taken of an outside foundry. Be that as it may, it does appear as if one should consider two types of foundry, the fully mechanised and the jobbing. Many hard words, much criticism, a lot of sarcasm and a great deal of loose thinking have been in evidence since the introduction of mechanised plants to this country, but, notwithstanding all that, and even disregarding for the moment the fact that, presuming a neophyte was taken into a modern mechanised foundry and into a non-mechanised one, there is little doubt as to which one he would prefer. A mechanised foundry is no longer a foundry; it is a precision workshop. On all mass-production jobs the clever part is not the spectacular assembly line (such as those when cars come off the line every few minutes), but all the planning and precision work leading up to it. So it will be in the foundry and, for that matter, so it is to-day.

* Winning entry in a competition for Short Papers organised by the Lancashire Branch of the Institute of British Foundrymen.

In the New Foundry

The most important part of the new foundry will be the patternshop and the pattern-plate preparation department, the toolroom of the foundry. Pattern plates and coreboxes must be correct and the production methods of to-day, demanding as little machining as possible and nearly all jig work, mean that "correct" is generally to thousandths of an inch. Highly skilled men are needed for this department, and here is the chance of an interesting and well-paid career for some of those young men who say they cannot see any prospects in a foundry, for the foundry "toolroom" man will have to be a well-trained engineer, a foundryman and a skilled user of hand tools. Boxes, too, must be a precision job and the creation of correct boxes, with correct pin centres, and the right size pins, is a job for an engineer with ability and interest in his job. It is perhaps invidious to say that moulding machines must also be kept up to concert pitch, again demanding the services of an engineer of ability. A foundry toolroom and a well-equipped maintenance department will be the "star" sections of the new foundry. It may seem a departure to talk of the future foundry by first discussing the toolroom, but, if that department is efficient, the working of the remainder of the foundry is easy by comparison. A description of a well-equipped patternshop and pattern-plate department would need a separate Paper.

The Foundry Proper

There is no doubt that, where the moulds can be taken to a common pouring point, much space is saved and a cleaner foundry floor assured, as it then becomes essential to have a common knock-out point. Automatic sand handling is undoubtedly an integral part of the future foundry, and in this connection the author looks forward to a sand-handling scheme which does not include hoppers. No doubt there will be many who will appreciate the reason for this bit of wishful thinking. Control of sand naturally follows distribution from one central point, and this, too, will be an important point of the future foundry and again will demand expert attention and provide another career for someone in the foundry. Most foundrymen by now know the more or less standard arrangements for mechanical handling in foundries, and if the commercial conditions mentioned above appertain, there is no reason why mechanical handling should not develop still further. It would appear as if one would still have to make cores of sand, but

The Ironfoundry of the Future

core blowing may become more universally adopted if conditions developed as suggested and new metals for coreboxes will probably be found in the coreshop, and a more regular and stricter inspection of coreboxes by the "foundry tool room." Already the new continuous core stoves have tidied up the coreshop, and in a decent building, properly ventilated, heated and lit, it can become a workshop where women can take pleasure in doing a job as interesting and as clean as the majority of women's jobs. It would appear as if the cupola will persist, as there is no cheaper or better method of melting iron on the horizon. Here again, however, one can visualise the cupolas out of the foundry proper with the spout only through the wall, and without going into great detail it is easy to imagine clean and neat handling arrangements for raw materials, controlled again, of course, by skilled technicians and chemists.

A Foundry Worker of the Future

This individual will not need to be a moulder, as all the thinking has been done for him. This is just as true of the foundry worker as of any other worker of the future, apart from the nucleus of technicians, but his hours will be short, his work may be rather monotonous, but he will have decent conditions and decent money, and it can be assumed that those who wish to climb to a higher status will still have the chance to do so and qualify for the foundry key jobs. He will arrive at work in clothes which will not distinguish him from those on "the staff." He will enter a changing room with the usual conveniences and warm enough to dry his clothes when wet. He will change his footwear, not because his working shoes need be heavier than his others, but because warm, perspiring feet feel the benefit of a change of footwear. Out of the changing room into the foundry he passes the compressor house with white-tiled walls and red-tiled floor, compressors gleaming, and the whole place reminiscent of mill engine houses, of which those in Lancashire are so proud. The floor on which he walks will not be covered with sand, but will be clean brick or concrete (or may be rubber in happier days), and if it is a jobbing foundry a small raised cill encloses the moulding floor.

The air he breathes is purer than that outside, as it is conditioned and draftless, coming in at the base of the walls and going out through the roof. If cinemas can do it, why not foundries, especially if the casting can be done from a common point outside the mould-making department. His eyes look up to see a high building, and the air and water lines painted different colours to tone with the general colour scheme. The machines, too, will be painted, in, say, green and cream, with boxes painted or sprayed both to ease the eye and preserve the box. Spilt sand, of course, will not be in evidence, as it will have gone down the grid to join the new sand and be returned

(*Continued at foot of next column.*)

IRONFOUNDRY FUEL NEWS—IV

The efficient use of electricity has become doubly important since the official 10 per cent. cut in supplies recently. The biggest user of electricity in the ironfoundry is often the air compressor. It should therefore be ensured that the compressed air (*a*) is produced efficiently, (*b*) is not allowed to leak, and (*c*) is used efficiently. Notes under these three headings are given below.

(*a*) Carry out maintenance work on the compressor, in accordance with the maker's recommendations, at definite regular intervals. A Regional Panel member, visiting an ironfoundry recently, found that the compressor was not fitted with a governor, with the result that the motor was constantly on full load and any air not wanted in the shops was blown out through the safety-valve!

(*b*) Keep careful watch for all air leaks which should then be rectified immediately. Check up occasionally by walking through the shops during the lunch-hour, listening for leaks, or by noting the rate of pressure drop at the air receiver at the end of the day when the compressor and the machines are shut down. Fit valves to isolate any sections of the air line which are not required for substantial periods.

(*c*) Clean and lubricate regularly all pneumatic appliances. Use sand-blast equipment to full capacity. Exercise proper supervision over the use of blowing-out nozzles (one ironfounder is known to have discontinued the use of blowing-out nozzles altogether).

Fuel Efficiency Bulletin, No. 29, "The Industrial Use of Compressed Air," is well worth studying. It can be obtained from the Ministry of Fuel and Power, London, or from the Fuel Officer, Ironfounding Industry Fuel Committee, Alvechurch, Birmingham.

(*Continued from previous column.*)

by the belts to the machines. His pattern plates will be kept in racks at his machine, and like the coreboxes inspected and replaced from time to time. When his box is made he will put it on to a roller conveyor, where it will be cored up and closed and then transferred to the mould conveyor for casting. To follow it through may be difficult, as it may wind into the roof beams on its way to the pouring point. Although it has been stated that the melting plant should be in a separate room with the spouts through the wall, it is even preferable to have the actual pouring in a separate room so that no fumes are created in the moulding shop. The knock-out, too, would be for convenience in the same building as the pouring, and the fumes controlled and taken away to atmosphere. Sand blast can be a clean and safe operation these days, and with mechanical handling even large castings can be cleaned with ease.

Thence to inspection and delivery, and who would doubt that with a little ingenuity these places can be made as pleasant to live and work in as for any other industry. Most of the foregoing refers to fully mechanised units, but many of the points and suggestions can be applied to jobbing foundries.

ZINC FUME IN THE FOUNDRY

By W. G. MOCHRIE

Ventilating conditions are not all that can be desired in the average foundry, and the atmosphere of the casting shop contributes in no small way to the feeling of repulsion experienced by the outside visitor, including the potential apprentice. Modern building design takes care of much of the ventilating problem where the building has been designed for foundry work, but many foundries are housed in buildings never intended for that purpose, and consequently difficulties arise, among other things, with regard to comfortable air conditions. Quite apart from the health hazard—which may be real or otherwise—much time is lost during pouring, particularly in the small jobbing shop, and the main culprit is undoubtedly the high zinc-copper-base mixture.

The belief is still upheld in some quarters, for instance, that to produce a sound manganese-bronze casting, it is essential that the metal should fume well during pouring. This precaution was a very necessary

TABLE I.

Fig. No.	Poured. Deg. C.	M. and S. Tons per sq. in.	Elong. Per cent. on 2 in.	Fume.
1	1,090	32.0	40.6	High.
2	1,020	32.0	40.6	,,
3	970	31.8	43.7	,,
4	940	31.75	34.4	Low.
5	920	31.85	42.2	,,
6	890	31.90	40.6	Practically nil.

safeguard to the foundryman undertaking the casting of this mixture for the first time, but this practice has

(*Continued overleaf, column 2.*)

FIG. 3.—Cast at 970.

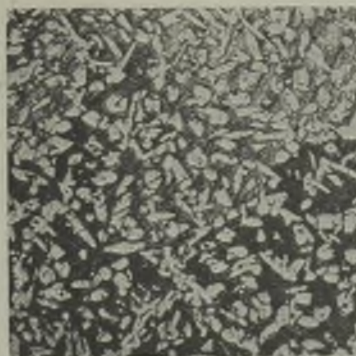


FIG. 2.—Cast at 1,020.

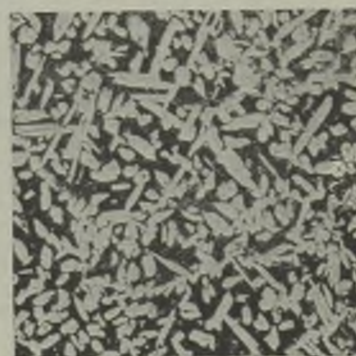


FIG. 1.—Cast at 1,090.

FIG. 4.—Cast at 940.

FIG. 5.—Cast at 920.

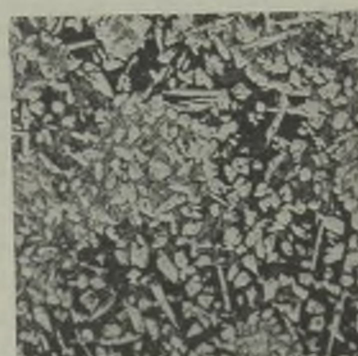


FIG. 6.—Cast at 890.

FIGS. 1 TO 6.—THESE MICRO-PHOTOGRAPHS AT 56 DIA. SHOW THAT DECREASING CASTING TEMPERATURE HAS BUT LITTLE INFLUENCE ON THE STRUCTURE.

SCRAP IRON AND STEEL TRADE

COMPETITION AND PRICES

There was a large attendance at the recent annual meeting of the National Federation of Scrap Iron, Steel and Metal Merchants, many delegates and members of affiliated associations being present.

The development of the scrap trade from its beginnings up to recent times was traced by Mr. H. V. Cashmore (Midland Scrap Iron and Steel Association), on his election to succeed Mr. A. T. Smyth-Tyrrell (London) as president of the Federation. He reminded the meeting that many old-established firms commenced in the scrap trade on the barter system. It was possible to exchange 2 tons of scrap iron for 1 ton of new bar iron, or 2 tons of cast-iron scrap for 1 ton of castings. This system operated in the 19th century and was responsible for many merchants handling both scrap iron and new material. In those days the price of scrap was very closely related to the price of finished iron. At the beginning of the present century, the competitive system began to operate, and the trade developed new methods of bargaining. There was no doubt that competition was necessary, and indeed desirable, but for a few years before the war competition at times tended to become unhealthy. Many merchants, having equipped their yards with plant and machinery, began to feel insecure in their markets. It became apparent that success in the scrap trade was not always obtained through service and efficiency. Sometimes it depended to a great extent on knowledge of "bulls and bears." The price of scrap fluctuated out of all reason, and it lost its relationship to the price of finished steel. As a result, controlled prices were imposed upon the trade.

Control After the War

Mr. Cashmore said that there had been a lot of talk recently on the abolition of control after the war, and, as an industry, they would all desire its termination as soon as it was practicable; but, if they were wise, they would take advantage of all the lessons which control had taught them. The 3½ per cent. commission granted to *bona-fide* merchants was a case in point. There had been a tendency of late for some merchants to give away part of this commission, and then to complain that the industry was not profitable. This commission was granted to the industry to enable merchants to work profitably together, so that it could give to the community that service and efficiency it was entitled to demand. Raw materials in this country must be available in abundant supplies at the lowest economical price, and merchants would be doing a great disservice to the community in general in voluntarily giving away any portion of this commission in order to stimulate unhealthy competition.

The scrap industry would require wise leadership to enable it to stabilise prices and keep the yards

(*Continued at foot of next column.*)

ZINC FUME IN THE FOUNDRY

(*Continued from previous page.*)

been very much overdone. Satisfactory castings are being produced without undue zinc evolution, and it is felt that working conditions can be very much improved by a closer watch on pouring temperature on this particular metal.

A test has been made to study the difference, if any, on the mechanical properties and microstructure of several castings of a standard shape in manganese-bronze poured with varying degrees of zinc fume evolution. The shape decided upon was the wedge-type test-bar, which was cast in B.S.S. 208/1 in green sand. Zinc fume evolution lends itself neither to easy measurement nor, once it has been measured, to intelligent interpretation, but it should serve our purpose to note the volume of zinc oxide as "high," or "low," or "nil," against pouring temperatures which can readily be understood by everybody. Table I shows pouring temperature, mechanical results, and a photomicrograph of each bar. The specimens of each for microscopic study were prepared from the shoulder of the fractured test-piece.

It will be noted that over the wide range of temperature a sound casting was produced. There was no appreciable difference in the $\alpha:\beta$ ratio. The variation, which is very slight in ultimate and elongation figures, cannot be identified with rise or fall in pouring temperatures. In short, a casting of this shape could be produced by pouring at 1,090 or 890 deg. C. to give the same final results. So why cast at a high temperature, lose zinc and make nuisance when it might just as well have been made without any loss of metal, time and temper?

City Engineering Works (Pty.), Limited, of Pretoria, have recently installed a 5-ton capacity crane for handling both production and other work.

Pembina Mountain Clays, Limited, Winnipeg and Morden, Canada, which exploits in the Morden district a deposit of bentonite, doubled its capacity during 1943. Plant facilities were increased by the installation of a 4-ft. by 100-ft. long drier which has an output of 30 tons per hour.

(*Continued from previous column.*)

working smoothly and profitably. It was apparent to him that in future selling prices would be more or less "pegged" to a limit, and it would be necessary for the industry to organise itself to new conditions. The steelworks must be supplied with the best scrap in the best form as they required it, and in this connection it was essential that all scrap should pass through the recognised channels. Merchants would have to give more attention to proper grading.

CONTROLLING THE PRODUCTION OF MAGNESIUM CASTINGS

When Mr. Ian Ross read Mr. Dean Leach's Paper, presented on behalf of the Metropolitan Chapter of the American Foundrymen's Association to the London Branch of the Institute of British Foundrymen, it was particularly well received, as indicating interesting differences in technique. The discussion, presented below, was of an informal character owing to the absence of the Author.

DISCUSSION

Mr. Ross commented that the Paper dealt broadly with the normal routine. The founders had to specify the sand they used. So far as the control of melting practice was concerned, the Author had stated that it entailed no more than to ensure that there was proper supervision and that close temperature control was maintained.

Without wishing to be critical, however, Mr. Ross emphasised that control of the melting operation was one of the most important factors in the whole business of producing magnesium castings, and unless the control was very careful, one did not get the metal required. The fluxing and cleansing of the metal before use was extremely important.

Mr. V. C. Faulkner said he presumed the material referred to as "fly ash," used in some of the sand mixtures, was very light ash such as that emitted from pulverised fuel fired installations. The ash from such installations was shown, by the microscope, to be in the form of translucent hollow spheres.

A Speaker commented that some of the oil-sand core mixtures mentioned in the Paper had a moisture content of from 3 to 6 per cent., which seemed to be very high.

Mr. Ross agreed that it was extremely high. His company did not add any water at all.

Mr. E. J. Pike said that the moisture content was in fact very much lower than 3 per cent. He asked whether the inhibitor added a certain amount of moisture to the mixture.

Mr. Ross agreed. He had also noticed, he said, that in one of the mixtures referred to in the Paper there was sulphur, boric acid and ammonium silico fluoride. Whilst some people in this country used sulphur and boric acid, he had used ammonium bifluoride; but in the mixture referred to in the Paper, all three were used.

A Speaker, commenting on the use of urea formaldehyde resin as binding for the core sand, mentioned in the Paper, asked if that practice had been followed in Britain.

Mr. Ross replied that he did not know. It seemed that in America there were not so many proprietary mixtures as in this country. It was the practice here for founders to ask the suppliers to supply an efficient core mixture, whereas it appeared that the founders in America were mixing for themselves.

Mr. E. H. Brown suggested that the Americans defined a resin rather differently from the British. He believed that a true definition in English would be "a water-soluble gum."

Mr. H. G. Warrington said that many of the materials used in America were not available here. His company (High Duty Alloys, Limited) had made experiments with phenol formaldehyde resin in the laboratory, but he had not mentioned it to Mr. Ross because it was not available at a price at which they could use it, and the results obtained did not suggest that it offered any advantage over the common binders that were in use.

Reverting to the problem of the moisture content of the core mixtures, he said that the ammonium bifluoride inhibitor introduced automatically about 2 per cent. of moisture. But on mixing, it dried off to some extent, leaving little more than 1 per cent. The use of glycol might offer some advantage, but it was not available in this country.

Mr. Ross recalled the old foundry trick of wiping out the cast-iron boxes with paraffin, which acted as a lubricant and thus rendered easier the withdrawal of the cores. In the Paper it was stated that the material mentioned there was used in order that the cores could be withdrawn from the boxes more smoothly.

Mr. A. Logan was interested in the use of urea formaldehyde, for it was one of the plastics; it was intriguing to hear the suggestion that plastics were being used in America for core binding purposes, for it was something new. Probably it was not available for such a purpose in this country by virtue of its price or other considerations.

The figures in the Paper relating to the physical properties of the sands were related to the A.F.A. standard sand testing apparatus. It would be interesting to know what apparatus was used in this country generally for sand testing. His company used the British standards.

Mr. Warrington said that High Duty Alloys, Limited, adhered to the British standards throughout.

Vote of Thanks

Mr. Faulkner proposed a hearty vote of thanks to Mr. Dean Leach (the author of the Paper), to the Metropolitan Chapter of the A.F.A., and to Mr. Ross for his kindness in presenting the Paper.

The idea of the exchange Papers, he continued, had originated in the mind of the late Mr. Cole Estep, and it was put into effect in 1921. He believed the foundry industry had led the way in the system of exchanging Papers, and many hundreds had been exchanged. The exchange of Papers as between the London Branch and its sister organisation in the States, the Metropolitan Chapter, had been very successful, and he looked forward to its continuation. So long as they could ensure such ideal exponents of particular Papers as Mr. Ross had proved to be, the exchange should be most enjoyable and instructive.

The vote of thanks was seconded by Mr. Arnold Wilson, and was carried with acclamation.

INCOME TAX ASSESSMENTS: SCHEDULE "D"

SALIENT POINTS UP TO DATE

This year with much publicity given to Schedule E ("pay as you earn" for employees), confusion may arise as regards income-tax under Schedule D (Business Profits: Persons On Own Account), so these few hints are given, inclusive of wartime and new provisions up to date. Assessments for Schedule D will still be made against income for year preceding year of assessment, thus currently a return will be required for the year ending April 5, 1944, or earlier date according to the accounting year ending date of the firm concerned (*e.g.*, December 31, 1943), payment of tax to follow January 1 and July 1, 1945, in two equal instalments.

Contrasts apply in various ways, thus payments for National Defence Contribution and Excess Profits Tax and premiums under the War Risks Insurance Act, 1939, are allowable deductions, but contributions and premiums under the War Damage Acts, 1941 to 1943, are assessable to tax. Furthermore, interest received in connection with Treasury Tax Reserve Certificates (issued in advance of tax payments) is not chargeable with tax, but interest received where War Damage Act contribution is paid in advance is assessable.

Profits received by the displaced firm under the concentration of industry schemes from the operating firm (*i.e.*, the "nucleus firm") are assessable to tax; a point of interest to note is that "wear and tear" allowances continue even though the machinery and plant (*e.g.*, the displaced firm's) has not been used in the period under review.

Life Assurance Premiums

Life assurance premiums are not deductible in full, and the allowance given is now practically stabilised at 3s. 6d. poundage of the premiums paid; there are other restrictions, and as regards that which restricts the allowance to tax on one-sixth of total income, the total income for the year ending April 5, 1939 (if higher) can be taken instead of that which would apply currently otherwise, thus assisting taxpayers with wartime incomes smaller than pre-war, so that no difference on this account need be made in previous insurances.

If of the nature of machinery and plant (*e.g.*, fire appliances, etc.), A.R.P., expenditure comes under the wear and tear rules for yearly percentage allowance, but for other items, such as equipment and stores for first-aid parties, respirators, protective clothing, wire netting, blinds, screens, cost of training employees, paint, etc., the cost goes through as a trading expense.

For fireguards, there is a standard Government subsistence allowance, and new rules now provide that if this amount is increased by the employer that increase will not be deductible for tax purposes; for whole-time firewatchers, of course, wages, if reasonable, are deductible.

Purchase of Savings Certificates

In many cases employers assist employees to purchase War Savings Certificates; this contribution is allowable as a trading expense if the share is reasonable, and a Government spokesman has recently stated that 10 per cent. of the cost is considered as reasonable.

The ordinary "wear and tear" yearly percentage rates continue (and so does the additional one-fifth which applies to all industries, as, for example, motor vehicles 20 per cent., plus one-fifth 4 per cent., total 24 per cent.) being for depreciation of machinery or plant (this term has wide interpretation, including motor vehicles, fittings and fixtures, office equipment, etc.), and as regards machinery or plant which owing to the war may be worked more than normally (*e.g.*, overtime or continuously), usually there is an additional allowance given, the amount being dependent upon individual circumstances. For commercial motor vehicles there is an additional agreed rate applying generally, where wartime working shows that the usual allowance is inadequate, this special increase being one-quarter of the usual allowance.

A special depreciation allowance also applies for buildings, machinery and plant (provided since January 1, 1937), which may be redundant with the end of the war or have depreciated in value; if the necessary conditions for this look like being fulfilled, an amount on account may be allowed each year before final settlement.

The Eastern Division of the Steel Founders' Society of America have set up in the Hall of Prime Movers, Franklin Institute, Philadelphia, a working exhibit complete with a melting furnace, which shows the public the steps to be taken right from the blueprint for the making of steel castings.

The winter edition of the "Whiting Founder," the house organ of the Whiting Corporation, Harvey, Ill., U.S.A., carries an interesting illustrated article on the "Hydro-arc Electric Furnace." This furnace, previously manufactured by the Hydro-arc Furnace Corporation, is now added to the lines of furnace equipment handled by the Whiting Corporation.

CLEANING AND DESCALING STEEL BY ELECTROLYTIC PICKLING IN MOLTEN CAUSTIC SODA

(*Continued from page* 68.)

The main object of the present investigation was to find the most favourable conditions of temperature, time and current density for carrying out the process. In the course of the investigation a considerable amount of information has been collected on such subjects as the design of plant, safety precautions, the descaling of certain alloy steels, and such like, and it is felt that this may with advantage be recorded for users and potential users of the process.

The Paper includes a study of the mechanism of pickling in molten caustic soda; a description of the laboratory experiment, and finally indicates the design of plant for carrying out the process.

NEW PATENTS

The following list of Patent Specifications accepted has been taken from the "Official Journal (Patents)." Printed copies of the full Specifications are obtainable from the Patent Office, 25, Southampton Buildings, London, W.C.2, price 1s. each.

559,834 WESTINGHOUSE ELECTRIC INTERNATIONAL COMPANY. Devices for threading a length of material between work devices such as adjacent roll stands of a strip rolling mill.

559,838 NEWALL, A. P. Manufacture of bolts.

559,885 BRAITHWAITE & COMPANY, ENGINEERS, LIMITED, BIRDSEYE, N. H., and PARTRIDGE, F. A. Flanged plates such as are used in the construction of storage tanks and the like.

559,944 TRIGGS, W. W. (Courtis, T. M., and Courtis, W. F.) Method of treating ores and treatment agent therefor.

559,945 WARNER, J. Apparatus for use in shaping the operative surface of grinding wheels.

559,959 BISHOP, W. H., and CLEMENTS, W. E. Screw and nut fastening devices.

559,961 FELL, H. Manufacture of articles made from aluminium or aluminium alloys.

559,963 BRASSERT & COMPANY, LIMITED, H. A., and THOMSON, T. Bessemer converters.

559,964 TRIGGS, W. W. (American Can Company). Method of and machine for treating black plate blanks.

559,982 ADAMS, J. Rail clip for light railway lines.

560,003 TOLEDO WOODHEAD SPRINGS, LIMITED (Eaton Manufacturing Company). Shot-blasting of coil springs.

560,009 T. I. (GROUP SERVICES), LIMITED, and EVANS, D. W. T. Machines for effecting straightening or other operations on metal tubes or bars.

560,026 MELTON, E. Device for making headless wire spokes.

560,041 SQUARE GRIP REINFORCEMENT COMPANY (LONDON), LIMITED, and GLEGG, G. L. Method of and means for attaining constant yield point in the strain hardening of steel by twisting.

560,061 BRITISH THOMSON - HOUSTON COMPANY, LIMITED. Methods of welding.

560,064 NEUSTADTER, D. Stoves for drying foundry moulds and cores, and for other analogous purposes.

560,104 and 560,108 BRADBURY, T. F. Magnesium alloy.

560,129 CONSETT IRON COMPANY, LIMITED, and TOMLINSON, H. V. Means for removing residual charges from furnace hearths and the like.

560,138 STUSSI, J., and INTERNATIONALE SIEGWART-BALKEN-GES. Centrifugal moulding-machine for the production of pipes, masts and the like.

560,163 BOLTON & SONS, LIMITED, T., and BERRISFORD, S. Devices for the feeding of metal bars, rods or strips.

560,247 CANNON IRON FOUNDRIES, LIMITED, CLAYTON, R. T., and OATLEY, A. F. Ovens heated by gas.

560,273 DAVY & UNITED ENGINEERING COMPANY, LIMITED, WATKINS, V., and MAYNE, J. S. Roll or shaft bearings.

NEW TRADE MARKS

The following applications to register trade marks appear in the "Trade Marks Journal":—

"KLEX"—Steel. DONVALE STEELS, LIMITED, 6, Campo Lane, Sheffield, 1.

"DARLOY"—Steel. DARWINS, LIMITED, Fitzwilliam Works, Templeborough, Sheffield.

"MILENCO"—Bushes, pulleys, and spindles. MILES ENGINEERING COMPANY, Brighton Street, Coventry.

"MERITUS"—Electric welding machines. MERITUS (BARNET), LIMITED, 36, Wood Street, Barnet, Herts.

"HERKE"—Machine tools and parts. A. W. & H. L. CLARKE, 160, Fawe Park Road, Putney, London, S.W.15.

"EAGLE" (device).—Agricultural machinery. W. T. TEAGLE (MACHINERY), LIMITED, Blackwater, Truro, Cornwall.

"PREMETRIC"—Lubricating systems for machinery. TECALEMIT, LIMITED, Great West Road, Brentford, Middlesex.

"GF"—Iron castings. BRITANNIA IRON & STEEL WORKS, LIMITED, Britannia Iron Works, 1, Kempston Road, Bedford.

"DIXONIA"—Textile machines. DIXON, HAWKESWORTH, LIMITED, Taylorac Works, Hanson Street, Middleton, Lancashire.

"HENBIS"—Metal taps, fittings for water installations, etc. HENRY BISSEKER, LIMITED, New Bartholomew Street, Birmingham, 5.

"BORARD"—Unwrought and partly wrought common metals. SPEAR & JACKSON, LIMITED, Aetna Works, Savile Street East, Sheffield.

"DATS"—Studs or tips made of metal for attachment to footwear. MERIMEX, LIMITED, Dashwood House, Old Broad Street, London, E.C.2.

"TUBULAR Q.B. BRAND" (and device)—Enamelled hollow-ware. TUBULAR HOLLOW-WARE COMPANY, LIMITED, Quarry Bank, Brierley Hill, Staffs.

EYE AND WELDING ELECTRODE (device)—Brazed, soldered, or welded metal parts. X-RAY WELDING COMPANY, LIMITED, 50, Pall Mall, London, S.W.1.

"VITALINE"—Hydraulic pumps and hydraulic power transmission systems. INTEGRAL AUXILIARY EQUIPMENT, LIMITED, Agnes Road, The Vale, London, W.3.

"PENGUIN PUMPS" (and device of a penguin)—Centrifugal pumps, etc. RONALD L. CHRISTIANSEN, LIMITED, Windmill Works, Ruislip Manor, Middlesex.

"NICORITE"—Oxy-acetylene welding rods of common metal or of common metal alloys. LITTLEJOHN & NYKERK, 14, Prince of Wales Terrace, London, W.8.

"DELTA"—Unwrought and partly wrought common metals and their alloys. DELTA METAL COMPANY, LIMITED, Tunnel Avenue, East Greenwich, London, S.E.10.

"MANICOR"—Unwrought and partly wrought common metals and their alloys. MALLORY METALLURGICAL PRODUCTS, LIMITED, 78, Hatton Garden, London, E.C.1.

"FEROGINUM"—Chemical compounds for coating metals to prevent carburization in the course of manufacture. JOSEPH P. EMERY, LIMITED, Grange Street Colour Works, Grange Street, Cobridge, Staffordshire.

NEWS IN BRIEF

The Mid-Lincolnshire Iron Company, Limited, is being wound up voluntarily. Mr. E. G. Dayer, Orb Ironworks, Newport, Mon., is the liquidator.

The directors of Johnson & Phillips, Limited, manufacturing electrical engineers, intend to give notice to repay the 4½ per cent. debenture stock on January 1, 1945, at 102 per cent.

The future of the British shipbuilding and the repairing industry is to be considered by the Board of Trade, the Admiralty, the shipbuilding employers, and the unions, and their recommendations are finally to be discussed at a joint conference.

Richard Thomas & Company, Limited, steel and tinplate manufacturers, have notified the Share and Loan Department of the London Stock Exchange that drawings will take place for the redemption at par on June 5 of £182,191 4½ per cent. first mortgage debenture stock.

The partnership between John Albert Walshaw and William Locking, carrying on business as ironfounders at 2, Court Mowbray Street, Sheffield, under the style of Walshaw & Locking, has been dissolved by mutual consent. Debts will be received and paid by J. A. Walshaw, who is continuing the business under the same style.

The British Shipbuilding Research Association has been registered as a company limited by guarantee without share capital. The word "Limited" is omitted from the title by Board of Trade licence. Following are the members of the Council:—Mr. W. Ayre, Sir G. T. Edwards, Sir M. E. Denny, Commander Sir Charles Craven, Sir F. E. Rebbeck, Mr. H. Main, Sir S. Hunter, and Mr. L. T. G. Soulsby.

A meeting of shareholders of Steel & Company, Limited, engineers and ironfounders, was held at Sunderland on Monday to consider a resolution providing for an increase in capital from £300,000 to £600,000 by the creation of 150,000 £1 6 per cent. cumulative preference and 600,000 5s. ordinary shares. Treasury permission will be sought to issue the balance of existing authorised capital, £80,000, and a proportion of the proposed new capital. It is proposed to apply the proceeds of the new issue in consolidating the position of the company's subsidiary and associated companies and to provide additional working capital.

Mr. G. M. Garro-Jones, M.P., Parliamentary Secretary to the Ministry of Production, speaking in Birmingham, said it seemed necessary to issue a warning against buying from other countries under monopolistic conditions the results of their research activities. This dependence on the results of foreign research was manifest in a number of industries, such as engineering and shoe manufacture, before the war; when certain trades hired, at great cost, machinery from foreign countries, or leased the rights for that plant—machinery which they were not allowed in any way to alter. This dangerous system made costs rigid and stultified further research. We must not be too dependent on overseas patents.

OBITUARY

Mr. Harry Young, of Munro & Young, engineers' merchants and agents, Glasgow, died recently.

Mr. Harry Gambier, for many years a member of the staff of Lee Howl & Company, Limited, of Tipton, died on May 11.

Mr. Herbert Fiennes Bather, a director of Chamberlin & Hill, Limited, ironfounders, died suddenly at Lichfield on May 13.

Mr. James Jack McCall, formerly partner in the firm of McCall and Millar, analytical and metallurgical chemists, Glasgow, died recently.

Mr. William Gray, a director of Charles Henderson & Company, Limited, Glasgow, metal merchants and engineers' agents, died on May 15.

Mr. John Sutherland, late of the British Aluminium Company, Limited, Milton, Staffs, died at Coatbridge on May 14, in his 79th year.

Mr. William B. Davidson, of Arbroath, died recently. He had been works manager of Keith Blackman, Limited, engineers, since 1915.

Mr. John Stafford Nuttal, for many years managing director and chairman of Platt Bros. & Company, Limited, textile and general engineers, died on May 14. He was in his 81st year.

Mr. George Davidson Cooper, secretary of Head Wrightson & Company, Limited, Teesdale Ironworks, Thornaby-on-Tees, died suddenly at his home at Saltburn on May 11. He was in his 61st year.

Mr. Joseph William Leach, of Newport, Shropshire, has died at the age of 66. For many years he was managing director of the Audley Engineering Company, Limited, Newport, retiring only a short time ago.

Mr. Benchara Branford, who has died at Whitstable, Kent, was formerly principal of Sunderland Technical College. While at Sunderland he prepared a memorandum on the training of engineering apprentices which was adopted by Sunderland shipbuilding and engineering firms. He was 79 years of age.

TITANIUM PIGMENT MANUFACTURERS

The titanium pigment manufacturers in the United Kingdom have formed a Titanium Pigment Manufacturers' Specification Committee, whose sole object is to assist in the preparation of official specifications involving titanium oxide. The chairman of the Committee is Mr. W. Woodhall (National Titanium Pigments, Limited), and the secretary is Mr. S. G. Tinsley (British Titan Products Company, Limited, Burlington House, Yarm Road, Eaglescliffe, Stockton-on-Tees).

The new body has been invited to nominate representatives to those Committees of the B.S.I. dealing with paints and pigments. The Committee will also welcome invitations to assist in specification matters affecting other industries in which titanium oxide is used.

COMPANY RESULTS

(Figures for previous year in brackets)

British Timken—Dividend of 15% for 1943 (same).

Enfield Rolling Mills—Ordinary dividend of 5% (2½%).

Tube Investments—Interim dividend on the ordinary stock of 10% (same).

Atlas Steel Foundry & Engineering—Interim dividend of 3s. per share, or 15% (same).

Bairds & Scottish Steel—Net profit for 1943, £87,407 (£78,731); dividend of 6% (5%).

G. Beaton & Son—Profit, £12,683 (£11,945); dividend of 10% and a cash bonus of 5% (same).

Milners Safe—Net profit to March 31 last, £17,307 (£16,458); dividend of 7½% and a bonus of 2½% (same).

R.F.D. Company—Net profit, £9,419 (£9,307); final dividend of 8%, making 12% (same); forward, £4,698 (£3,924).

Rio Tinto—Balance, after half-year's preference dividend, £192,560 (£191,042); forward, £564,352 (£560,669).

Summerlee Iron—Loss for year to February 29, after providing for income-tax and contingencies, £8,487; credit balance brought in, £2,464; debit forward, £6,023.

Tharsis Sulphur & Copper—Gross profit for 1943, £24,103 (£23,519); expenses, £33,058 (£33,641); depreciation, £17,548 (£16,815); net loss, £26,503 (£26,937); forward, £4,641 (£13,144).

Projectile & Engineering—Profit for 1943, after taxation, £122,545 (£107,895); to general reserve, £12,058; depreciation reserve, £40,000; staff pensions, £3,000; deferred repairs, £5,000; final dividend of 12½%, making 20% (same); forward, £34,017 (£31,530).

Robey & Company—Trading profit for 1943, £86,342 (£82,222); balance, after providing for depreciation and other charges, £78,127 (£73,672); taxation and contingencies, £62,500; debenture interest and sinking fund, £2,436; dividend on the 5% non-cumulative preference shares, £3,017; dividend of 7½% on the ordinary shares, £5,858; carried forward, £21,037 (£16,721).

Colvilles—Trading profit and other income for the year, after providing for taxation and war damage insurance, £538,969 (£513,323); net dividends from subsidiary companies, £109,438 (£109,212); depreciation and obsolescence of fixed assets, £350,000; dividend on the 5½% cumulative preference stock, £55,000; interim dividend of 3%, less tax, on the ordinary stock, £58,793; final dividend on the ordinary stock of 5%, less tax, £97,989; balance carried forward, £252,088 (£166,963).

Permeable Refractories

A Paper on "Uses of Permeable Refractories for Furnace Construction," by Mr. R. H. Anderson, Mr. D. C. Gunn and Dr. A. L. Roberts, was presented to the Nottingham Section of the Institute of Fuel on May 11. This Paper was also presented at the Royal Society of Arts in London on May 18, and to the Midland Section of the Institute to-day (Thursday).

NEW COMPANIES

("Limited" is understood. Figures indicate capital. Names are of directors unless otherwise stated. Information compiled by Jordan & Sons, 116, Chancery Lane, London, W.C.2.)

Miromi Steel Products, 167, Cathedral Road, Cardiff—£1,000. P. Freeman and M. T. Einleger.

A. Halliwell & Son, 360, Bolton Road, Darwen, Lancs—Engineers, etc. £500. A. Halliwell.

Kitson Pump & Engineering Company, 25, Victoria Street, London, S.W.1—£2,000. H. G. Ayres and C. E. Baylis.

S. Walker & Sons (Mansfield), Station Foundry, Station Street, Mansfield, Notts—Iron and brass founders, etc. £10,000. C. H. Walker and C. B. Webster.

Sintered Products, Sheepbridge Works, Chesterfield, Derby—Manufacturers of and dealers in articles produced from the sintering or pressing of metal powders, etc. £5,000.

Edbarr, 3, Albemarle Street, London, W.1—Manufacturers, repairers, dismantlers and breakers of forgings, castings, etc. £1,000. J. H. Henderson and C. J. R. Lee.

J. & H. Mellor, Norah Street, Hollinwood, Oldham—Ironfounders and engineers. £1,500. H. and W. Ainsbury, 79, Station Road, Pendlebury, Lancs, and R. P. Whipp.

B.B.W. Metal Form Company, 6, Broad Street Place, London, E.C.2—Designers and manufacturers of metal plate work, etc. £1,000. V. W. Beamish, W. Bentley, and G. Woof.

John D. Driver & Company, Pear Tree Lane, Holly Hall, Dudley, Worcs.—Reclaimers of aluminium and non-ferrous metals from waste, etc. £5,000. J. D Driver and W. L. Bailey.

PERSONAL

Mr. J. S. Whitmore, late chief engineer of John Lysaght, Limited, has been appointed by W. H. A. Robertson & Company, Limited, of Bedford, as their representative in Wales.

Mr. M. Burningham, director and secretary of Keith Blackman, Limited, has been elected deputy chairman of the company. He joined the firm in 1896, became secretary in 1925, and was elected to the board in 1929.

Mr. Thomas Henry Gameson, of Thos. Gameson & Sons, Limited, ironfounders, of Walsall, and a past-president of the Birmingham Branch of the Institute of British Foundrymen, has been elected a member of the Walsall Town Council.

Dr. L. A. Stockem is the first recipient of the £100 prize offered annually for at least five years by Newton Chambers & Company, Limited, Sheffield, to the Royal Institute of Chemistry, for original and creative research work tending to industrial welfare. The prize was presented to Dr. Stockem by Mr. H. E. G. West, managing director of Newton Chambers & Company.

Raw Material Markets

IRON AND STEEL

The pig-iron market has taken a quieter turn. Much the larger proportion of the blast-furnace output is required for the steel industry, and requirements show relatively little variation from week to week. The position at the foundries, however, is less favourable. The depression in the light-castings trade persists, and while activity is maintained at some of the engineering foundries, other establishments are less favourably situated than they were a couple of months ago. The demand for No. 3 iron is therefore restricted; and even low-phosphorus irons are wanted in somewhat lesser quantities. Makers of refined iron are clearing their outputs without much difficulty, and, of course, the meagre output of hematite is readily absorbed.

The foundries are keen buyers of all grades of cast-iron scrap, especially machinery metal in cupola sizes. Supplies have become rather tight, and selected steel scrap is particularly scarce. The quantity of heavy mild-steel scrap available still falls short of consumers' needs. If anything, the demand for heavy wrought-iron scrap has increased.

There is a fairly heavy demand for iron bars. The heavy trades are eager to secure best bars, and there is also strong pressure for crown bars. Small steel bars are difficult to obtain, and in many cases bar iron is being utilised in their place. No. 3 and 4 iron are still in steady demand, and adequate supplies are forthcoming.

Capacity outputs of sheets are still a pressing need, and operation of the mills is not retarded by any lack of sheet bars. On the other hand, steelmakers are being pressed to increase their deliveries of prime billets, and re-rollers are also making extensive use of defectives, so as to limit as far as possible encroachment on their stocks of imported material.

Re-rollers are well booked ahead for small steel bars, and the tonnage now on the order-books will last well into next quarter. Heavy structural sizes and joists may be obtained reasonably quickly. Large quantities of plates are absorbed by the shipbuilding, tank, and other heavy industries, but the call does not seem to be quite so urgent as it was some time ago. The sheet makers are still very busy, and although the demand for the heavier gauges may have fallen off somewhat, there is steady pressure for the lighter sheets and plates from the shipyards and locomotive builders in particular.

NON-FERROUS METALS

Early this year it was announced that Rhodesian copper output was to be reduced by from 20 to 25 per cent. The cut was to be enforced as from April 1. It now appears that this reduction in output has not been made. A statement has been made by Colonel Stanley, Secretary for the Colonies, to the effect that it has been decided by the Combined Raw Materials Board in Washington that, "in order to safeguard the Allied Nations' copper position, production from all sources shall be maintained as far as practicable in the existing circumstances. Any production from the sources hitherto allocated to the United Kingdom in excess of their requirements will be made available to the U.S.A. and Soviet Russia." This means that although Rhodesian output may be somewhat lower than it was during 1943, the cut will be considerably less than the 25 per cent. originally planned. In the words of the official statement: "In Northern Rhodesia, production will be at the level which can be maintained with the existing labour force and without involving H.M. Government in abnormal capital expenditure on replacement of plant."

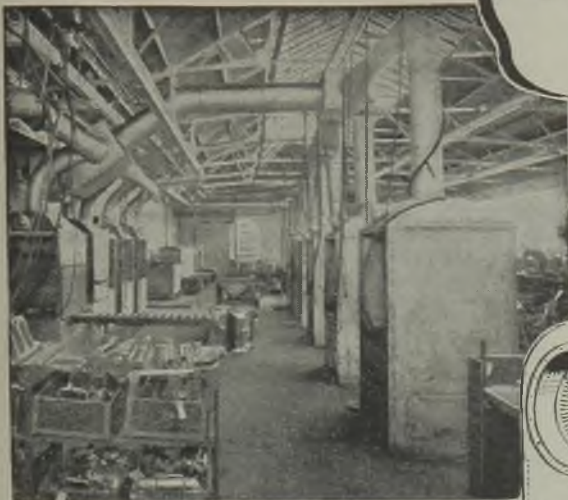
The position of copper supplies in this country seems to be satisfactory. On the other side of the Atlantic they have been calling for every ton that can be raised from the domestic mines, and have been taking in considerable imports from Latin America and Canada. There are no indications of what proportion of the Rhodesian output will be sent to the United States.

Regarding the aid we are giving to Russia, it was recently announced by Mr. Churchill that, among many other items, 37,000 tons of copper and 3,300 tons of tin were sent from Great Britain and the Empire. Russia is not a producer of tin and the supplies were no doubt of the greatest assistance to her. In this country there is still a need for strict economy in the use of tin, but all really essential requirements are being covered and it seems likely that the reserves now held are sufficient to cope with any immediate emergency.

B.S. Drawing Office Practice

A revised and considerably enlarged edition of B.S.308, "British Standard Specification for Drawing Office Practice," has now been published. The recommendations for standard practice commence with sizes and typical layouts of drawing sheets and the planning, numbering and referencing of series of drawings. Recommended scales, types of line, methods of projection, lettering, dimensioning and sectioning are set down, followed by standard methods of indicating machining symbols, surface finish, screw threads, bolts, nuts, rivets and welds. Notes on structural steelwork, a list of abbreviations for drawings and directions for the preparation of graphs complete the numbered clauses, which are followed by appendices dealing with the reproduction of drawings and the selection, preparation and storage of drawing paper, tracing paper and cloth, and sensitised materials. Other appendices contain references to British Standards for material specifications, general engineering standards and the use of symbols on drawings. The revised edition, which is illustrated with 40 figures and diagrams and four folded plates, supersedes B.S. 308/1927 (price 3s. 6d., post free).

DUST REMOVAL FROM *Castings*



A batt ry of cabinets for cleaning castings, the dust being extracted by a "Sirocco" Fan.

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(Delivered, unless otherwise stated)

Wednesday, May 24, 1944

PIG-IRON

Foundry Iron.—CLEVELAND No. 3: Middlesbrough, 128s.; Birmingham, 130s.; Falkirk, 128s.; Glasgow, 131s.; Manchester, 133s. DERBYSHIRE No. 3: Birmingham, 130s.: Manchester, 133s.; Sheffield, 127s. 6d. NORTHANTS No. 3: Birmingham, 127s. 6d.; Manchester, 131s. 6d. STAFFS No. 3: Birmingham, 130s.; Manchester, 133s. LINCOLNSHIRE No. 3: Sheffield, 127s. 6d.; Birmingham, 130s.

(*No. 1 foundry 3s. above No. 3. No. 4 forge 1s. below No. 3 for foundries, 3s. below for ironworks.*)

Hematite.—No. 1 (S & P 0.03 to 0.05 per cent.): Scotland, N.-E. Coast and West Coast of England, 138s. 6d.; Sheffield, 144s.; Birmingham, 150s.; Wales (Welsh iron), 134s. East Coast No. 3 at Birmingham, 149s.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent. P, 140s. 6d., delivered Birmingham.

Scotch Iron.—No. 3 foundry, 124s. 9d.; No. 1 foundry, 127s. 3d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, 174s.; South Zone, 176s. 6d.

Refined Malleable.—North Zone, 184s.; South Zone, 186s. 6d.

Cold Blast.—South Staffs, 227s. 6d.

(NOTE.—*Prices of hematite pig-iron, and of foundry and forge iron with a phosphoric content of not less than 0.75 per cent., are subject to a rebate of 5s. per ton.*)

FERRO-ALLOYS

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

Ferro-silicon (5-ton lots).—25 per cent., £21 5s.; 45/50 per cent., £27 10s.; 75/80 per cent., £43. Briquettes, £30 per ton.

Ferro-vanadium.—35/50 per cent., 15s. 6d. per lb. of V.

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

Ferro-titanium.—20/25 per cent., carbon-free, 1s. 3½d. lb.

Ferro-tungsten.—80/85 per cent., 9s. 8d. lb.

Tungsten Metal Powder.—98/99 per cent., 9s. 9½d. lb.

Ferro-chrome.—4/6 per cent. C, £59; max. 2 per cent. C, 1s. 6d. lb.; max. 1 per cent. C, 1s. 6½d. lb.; max. 0.5 per cent. C, 1s. 6¾d. lb.

Cobalt.—98/99 per cent., 8s. 9d. lb.

Metallic Chromium.—96/98 per cent., 4s. 9d. lb.

Ferro-manganese.—78/98 per cent., £18 10s.

Metallic Manganese.—94/96 per cent., carb.-free, 1s. 9d. lb.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms and Slabs.—BASIC: Soft, u.t., 100-ton lots, £12 5s.; tested, up to 0.25 per cent. C, £12 10s.; hard (0.42 to 0.60 per cent. C), £13 17s. 6d.; silico-manganese, £17 5s.; free-cutting, £14 10s. SIEMENS MARTIN ACID: Up to 0.25 per cent. C, £15 15s.; case-hardening, £16 12s. 6d.; silico-manganese, £17 5s.

Billets, Blooms and Slabs for Forging and Stamping.—Basic, soft, up to 0.25 per cent. C, £13 17s. 6d.; basic hard, 0.42 to 0.60 per cent. C, £14 10s.; acid, up to 0.25 per cent. C, £16 5s.

Sheet and Tinplate Bars.—£12 2s. 6d., 6-ton lots.

FINISHED STEEL

[*A rebate of 15s. per ton for steel bars, sections, plates, joists and hoops is obtainable in the home trade under certain conditions.*]

Plates and Sections.—Plates, ship (N.-E. Coast), £16 3s.; boiler plates (N.-E. Coast), £17 0s. 6d.; chequer plates (N.-E. Coast), £17 13s.; angles, over 4 un. ins., £15 8s.; tees, over 4 un. ins., £16 8s.; joists, 3 in. × 3 in. and up, £15 8s.

Bars, Sheets, etc.—Rounds and squares, 3 in. to 5½ in., £16 18s.; rounds, under 3 in. to ⅝ in. (untested), £17 12s.; flats, over 5 in. wide, £15 13s.; flats, 5 in. wide and under, £17 12s.; rails, heavy, f.o.t., £14 10s. 6d.; hoops, £18 7s.; black sheets, 24 g. (4-ton lots), £22 15s.; galvanised corrugated sheets (4-ton lots), £26 2s. 6d.; galvanised fencing wire, 8g. plain, £26 17s. 6d.

Tinplates.—I.C. cokes, 20 × 14 per box, 29s. 9d., f.o.t. makers' works, 30s. 9d., f.o.b.; C.W., 20 × 14, 27s. 9d., f.o.t., 28s. 6d., f.o.b.

NON-FERROUS METALS

Copper.—Electrolytic, £62; high-grade fire-refined, £61 10s.; fire-refined of not less than 99.7 per cent., £61; ditto, 99.2 per cent., £60 10s.; black hot-rolled wire rods, £65 15s.

Tin.—99 to under 99.75 per cent., £300; 99.75 to under 99.9 per cent., £301 10s.; min. 99.9 per cent., £303 10s.

Spelter.—G.O.B. (foreign) (duty paid), £25 15s.; ditto (domestic), £26 10s.; "Prime Western," £26 10s.; refined and electrolytic, £27 5s.; not less than 99.99 per cent., £28 15s.

Lead.—Good soft pig-lead (foreign) (duty paid), £25: ditto (Empire and domestic), £25; English, £26 10s.

Zinc Sheets, etc.—Sheets, 10g. and thicker, ex works, £37 12s. 6d.; rolled zinc (boiler plates), ex works, £35 12s. 6d.; zinc oxide (Red Seal), d/d buyers' premises, £30 10s.

Other Metals.—Aluminium, ingots, £110; antimony, English, 99 per cent., £120; quicksilver, ex warehouse, £68 10s. to £69 15s.; nickel, £190 to £195.

Brass.—Solid-drawn tubes, 14d. per lb.; brazed tubes, 16d.; rods, drawn, 11⅜d.; rods, extruded or rolled, 9d.; sheets to 10 w.g., 10⅞d.; wire, 10⅝d.; rolled metal, 10½d.; yellow metal rods, 9d.

Copper Tubes, etc.—Solid-drawn tubes, 15½d. per lb.; brazed tubes, 15½d.; wire, 10d.

Phosphor Bronze.—Strip, 14d. per lb.; sheets to 10 w.g., 15d.; wire, 16½d.; rods, 16½d.; tubes, 21½d.; castings, 20d., delivery 3 cwt. free. 10 per cent. phos. cop. £35 above B.S.; 15 per cent. phos. cop. £43 above B.S.; phosphor tin (5 per cent.) £40 above price of English ingots. (C. CLIFFORD & SON, LIMITED.)

Nickel Silver, etc.—Ingots for raising, 10d. to 1s. 4d. per lb.; rolled to 9 in. wide, 1s. 4d. to 1s. 10d.; to 12 in. wide, 1s. 4½d. to 1s. 10½d.; to 15 in. wide, 1s. 4½d. to 1s. 10½d.; to 18 in. wide, 1s. 5d. to 1s. 11d.; to 21 in. wide, 1s. 5½d. to 1s. 11½d.; to 25 in. wide, 1s. 6d. to 2s. Ingots for spoons and forks, 10d. to 1s. 6½d. Ingots rolled to spoon size, 1s. 1d. to 1s. 9½d. Wire round, to 10g., 1s. 7½d. to 2s. 2½d., with extras according to gauge. Special 5ths quality turning rods in straight lengths, 1s. 6½d. upwards.

NON-FERROUS SCRAP

Controlled Maximum Prices.—Bright untinned copper wire, in crucible form or in hanks, £57 10s.; No. 1 copper wire, £57; No. 2 copper wire, £55 10s.; copper firebox plates, cut up, £57 10s.; clean untinned copper, cut up, £56 10s.; braziery copper, £53 10s.; Q.F. process and shell-case brass, 70/30 quality, free from primers, £49; clean fired 303 S.A. cartridge cases, £47; 70/30 turnings, clean and baled, £43; brass swarf, clean, free from iron and commercially dry, £34 10s.; new brass rod ends, 60/40 quality, £38 10s.; hot stampings and fuse metal, 60/40 quality, £38 10s.; Admiralty gunmetal, 88-10-2, containing not more than ½ per cent. lead or 3 per cent. zinc, or less than 9½ per cent. tin, £77, all per ton, ex works.

Returned Process Scrap.—(Issued by the N.F.M.C. as the basis of settlement for returned process scrap, week ended May 20, where buyer and seller have not mutually agreed a price; net, per ton, ex-sellers' works, suitably packed):—

Brass.—S.A.A. webbing, £48 10s.; S.A.A. defective cups and cases, £47 10s.; S.A.A. cut-offs and trimmings, £42 10s.; S.A.A. turnings (loose), £37; S.A.A. turnings (baled), £42 10s.; S.A.A. turnings (masticated), £42; Q.F. webbing, £49; defective Q.F. cups and cases, £49; Q.F. cut-offs, £47 10s.; Q.F. turnings, £38; other 70/30 process and manufacturing scrap, £46 10s.; process and manufacturing scrap containing over 62 per cent. and up to 68 per cent. Cu, £43 10s.; ditto, over 58 per cent. to 62 per cent. Cu, £38 10s.; 85/15 gilding metal webbing, £52 10s.; 85/15 gilding defective cups and envelopes before filling, £50 10s.; cap metal webbing, £54 10s.; 90/10 gilding webbing, £53 10s.; 90/10 gilding defective cups and envelopes before filling, £51 10s.

Cupro Nickel.—80/20 cupro-nickel webbing, £75 10s.; 80/20 defective cups and envelopes before filling, £70 10s.

Nickel Silver.—Process and manufacturing scrap: 10 per cent. nickel, £50; 15 per cent. nickel, £56; 18 per cent. nickel, £60; 20 per cent. nickel, £63.

Copper.—Sheet cuttings and webbing, untinned, £54; shell-band plate scrap, £56 10s.; copper turnings, £48.

IRON AND STEEL SCRAP

(Delivered free to consumers' works. Plus 3½ per cent. dealers' remuneration. 50 tons and upwards over three months, 2s. 6d. extra.)

South Wales.—Short heavy steel, not ex. 24-in. lengths, 82s. to 84s. 6d.; heavy machinery cast iron, 87s.; ordinary heavy cast iron, 82s.; cast-iron railway chairs, 87s.; medium cast iron, 78s. 3d.; light cast iron, 73s. 6d.

Middlesbrough.—Short heavy steel, 79s. 9d. to 82s. 3d.; heavy machinery cast iron, 91s. 9d.; ordinary heavy cast iron, 89s. 3d.; cast-iron railway chairs, 89s. 3d.; medium cast iron, 79s. 6d.; light cast iron, 74s. 6d.

Birmingham District.—Short heavy steel, 74s. 9d. to 77s. 3d.; heavy machinery cast iron, 92s. 3d.; ordinary heavy cast iron, 87s. 6d.; cast-iron railway chairs, 87s. 6d.; medium cast iron, 80s. 3d.; light cast iron, 75s. 3d.

Scotland.—Short heavy steel, 79s. 6d. to 82s.; heavy machinery cast iron, 94s. 3d.; ordinary heavy cast iron, 89s. 3d.; cast-iron railway chairs, 94s. 3d.; medium cast iron, 77s. 3d.; light cast iron, 72s. 3d.

(Note.—*For deliveries of cast-iron scrap free to consumers' works in Scotland, the above prices less 3s. per ton, but plus actual cost of transport or 6s. per ton, whichever is the less.*)

SITUATIONS

FOUNDRY SUPERINTENDENT MANAGER (age 39), M.I.Brit.F., Inter.B.Sc., practical foundryman and patternmaker, expert repetition light castings, grey and malleable; accept full control; rates, costs, organisation, metallurgist, metal control, annealing; commercial experience; energetic; good record; opening wanted with medium progressive Midland Foundry; salary results basis; principals only.—Box 494, FOUNDRY TRADE JOURNAL, 3, Amersham Road, High Wycombe.

MELTING SUPERINTENDENT, experienced in melting and casting of ferrous and non-ferrous metals, heat-treatment and analytical experience, requires similar position in London area.—Apply Box 502, FOUNDRY TRADE JOURNAL, 3, Amersham Road, High Wycombe.

HEAD FOREMAN, ironfoundry, seeks re-engagement; disengaged; highest references.—Box 504, FOUNDRY TRADE JOURNAL, 3, Amersham Road, High Wycombe.

FOUNDRY SUPERINTENDENT required for control of Foundry producing light and medium malleable grey iron and non-ferrous castings; must be good disciplinarian and organiser; good post-war prospects for applicant having good technical qualifications and experience.—Write, stating age and full particulars of experience and salary required, to Box 512, FOUNDRY TRADE JOURNAL, 3, Amersham Road, High Wycombe.

FOUNDRY SUPERINTENDENT required for Non-ferrous Foundry, London area, to supervise production of light and medium size castings; capable of planning and progressing work through all stages; a good disciplinarian; salary, £500-£600 per annum.—Write, stating age, experience, and qualifications, to Box 500, FOUNDRY TRADE JOURNAL, 3, Amersham Road, High Wycombe.

HEAD FOREMAN required in large Iron Foundry, Manchester district, producing high-grade engineering castings; experienced in modern methods, coremaking and moulding practice; rate fixing and control of men; machine moulding and mechanical handling plant; scope for good man; give full details of age, general and technical education, and history from apprenticeship.—Box 506, FOUNDRY TRADE JOURNAL, 3, Amersham Road, High Wycombe.

REPRESENTATIVES required for Non-Ferrous Foundry; must be keen and energetic men; previous experience an advantage.—Box 508, FOUNDRY TRADE JOURNAL, 3, Amersham Road, High Wycombe.

AGENCY

WANTED, by Non-ferrous Foundry, SELLING AGENTS, on a commission basis, to operate in Birmingham, Manchester, and the North, the North-East and Scotland.—Box 486, FOUNDRY TRADE JOURNAL, 3, Amersham Road, High Wycombe.

MACHINERY

FOR SALE.—One Electric Sand Riddle; one 6-ft. Intensive Sand Mixer; both new.—Box 510, FOUNDRY TRADE JOURNAL, 3, Amersham Road, High Wycombe.

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BABCOCK WATER-TUBE BOILER; evaporation 10,000 lbs.; working pressure 180 lbs.

LANCASHIRE BOILER; 30 ft. by 7 ft. 6 in. by 180 lbs. w.p.

LANCASHIRE BOILER; 30 ft. by 8 ft. by 120 lbs. w.p.

Two LANCASHIRE BOILERS; 30 ft. by 8 ft. by 160 lbs. w.p.

Two LANCASHIRE BOILERS; 30 ft. by 9 ft. by 160 lbs. w.p.

VERTICAL MULTI - TUBULAR BOILER; 16 ft. 6 in. by 6 ft. 6 in. by 100 lbs. w.p.

NEW PRESSED STEEL SECTIONAL STORAGE TANKS; plates 4-ft. square.

LARGE AND VARIED STOCK GOOD SECONDHAND ROLLED STEEL JOISTS, ANGLES, CHANNELS, ROOF PRINCIPALS, ETC.

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'Grams: "Forward." 'Phone: 26311 (15 lines).

FOR SALE.—Green's "Emergency" Cupolette; complete, with ladles and fan; all unused.—CHAS. GUEST, 11, Bath Row, Stamford, Lincs.

Broadbent Brick Crusher Jaws 8 in. deep.
6-ft. Bonvillain Flat Plate 2-Roller Sand Mill.
Herbert's "Cloudburst" Hardness Testing Machine, by Massey; 3/50/550 volts; 1,430 r.p.m.
Morgan Type "S" Oil-fired Tilting Furnace; 400-440 lbs. capacity.
5-ft. Under-driven Stationary Pan Sand Mill.
Jackman Foundry Sand Riddle.
Electric Vibratory Sand Riddle; 2/50/200 volts.
Sand Mills; 5 ft., 4ft. 6 in., and 5 ft. 6 in.
S. C. BILSBY, Crosswells Road, Langley, Birmingham.

10 in. Plain Foundry Jolt Rammer; 42 in. by 54 in. table; J. W. Jackman & Co., Ltd.
16 in. Plain Foundry Jolt Rammer; 48 in. by 72 in. table; The Tabor Manufacturing Co.
6 in. Plain Foundry Jolt Rammer; 36 in. by 36 in. table; The Tabor Manufacturing Co.
ARCHIBALD BAIRD & SON, LTD., HAMILTON.

SKLENAR Patent Melting Furnaces; coke- or oil-fired; capacity 2 tons, 1 ton, ½ ton, 500 lbs.—SKLENAR PATENT MELTING FURNACES, LTD., East Moors Road, Cardiff.

PNEUMATIC, jolt-squeeze, roll-over Moulding Machine, with 6 in. pattern draw and table 36 in. by 26 in., by British Moulding Machine Co.; practically new. Also Ingersoll-Rand Air Compressor; 40 cub. ft. air p.m.; 100 lbs. pressure.—Box 492, FOUNDRY TRADE JOURNAL, 3, Amersham Road, High Wycombe.

MISCELLANEOUS

METALLURGICAL CONSULTANTS offer their services on all Metallurgical Work covering Founding, Forging, Extrusions, Heat Treatment, Welding, and Protective Treatment Processes.—51, Russell Road, Horsell, Woking.

SMALL Jobbing Foundry for Sale, South Midlands, as going concern; capacity 10 tons per week; high-class castings up to 18-ton tensile, showing a good profit; satisfactory reasons for selling. Further particulars to Box 482, FOUNDRY TRADE JOURNAL, 3, Amersham Road, High Wycombe.

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

"GO TO WARWILL, LTD., ABERTILLERY, MON., FOR NON-FERROUS CASTINGS UP TO 1 CWT.; GOOD DELIVERIES.

JOHN REDGATE (IRONFOUNDERS), LTD., CROCUS STREET, NOTTINGHAM, will have capacity available shortly for 1 or 2 tons of Engineering and Machine Tool Castings weekly, and will be glad to receive enquiries.

NON-FERROUS FOUNDRY, capacity available, including sand blasting; competitive prices quoted.—ALBUTT, SON & JACKSON, Valve Makers and Brass Founders, Greenmount Works, Halifax.

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

CAPACITY AVAILABLE.—Machine-Cut Spur Gears up to 6 ft. dia.; 10 in. face by 2 in. C.P.; can supply in all materials, and can offer very good deliveries in Cast-Iron Gears.—WARWILL, LTD., Abertillery.

LARGE Midland Iron Foundry invites enquiries for Castings up to 20 tons each, to any specification, in High-Duty and Alloy Irons; we can also undertake to make the necessary patterns; prompt deliveries.—Box 448, FOUNDRY TRADE JOURNAL, 3, Amersham Road, High Wycombe.

CAPACITY available for Grey Iron Castings up to 1 ton; Non-Ferrous up to 1 cwt.; good deliveries.—Please send enquiries to WARWILL, LTD., Abertillery, Mon. 'Phone 71.

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NEW SHOT BLAST CABINET PLANTS with motor driven Exhaust Fans, complete, all sizes; air compressors to suit in stock, also motors if required.
Britannia large size plain jolt and pattern draw moulding machine, 8" diameter cylinder, table 4' x 3', reconditioned.
Pneulec Royer Sand Thrower.
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Jackman taper roll Sand Mill.
New 600 lb. oil or gas-fired centre axis tilting furnace complete with bar burner and equipment, £220.

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Published by the Proprietors, INDUSTRIAL NEWSPAPERS, LIMITED, 49, Wellington Street, Strand, London, W.C.2 and Printed in Great Britain by HARRISON & SONS, LTD., 44/47, St. Martin's Lane, London, W.C.2

FOUNDRY TRADE JOURNAL

EST. 1902

WITH WHICH IS INCORPORATED THE IRON AND STEEL TRADES JOURNAL

VOL. 73. No. 1449. MAY 25, 1944

Registered at the G.P.O. as a Newspaper.

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

[Single Copy 6d. By Post 8d. Annual Subscription, Home and Overseas, 21/- (Prepaid)