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Foundry Literature

The foundry industry to-day is in possession of a wealth of specialised literature, much of which is fundamental and, again, much is out of date or, what is equally serious, out of print. It is almost a daily task for us to recommend books to readers covering various phases of foundry practice, and it is not unusual to have to reply "such a book has yet to be written." Usually, there are plenty of articles available scattered throughout the technical press, but not a book specially devoted to the subject. Foremen complain that no book has been specially written for them, but they are quite definite about its desirable contents. They require the inclusion of ready reckoners, specifications, mixtures, technical data, and a list of works of reference on subjects likely to be of interest. Maybe these contents seem a little unusual, but talks with a number of foremen have provided them. Our correspondence indicates that though there are gaps in the literature of foundry practice so far as books are concerned, some technicians often demand one catering for too small a field. Only recently, a Continental reader asked for a book on a small section of centrifugal-casting practice. Another reader required one on the use of plastics as core binders, whilst a third desired one on iron die castings.

The iron and steel industry has available several books specially written to explain to the layman the general story of the plant and processes used. More could be done with advantage for the foundry industry because the man in the street still imagines it to be part and parcel of the iron and steel industry. Some sections of the foundry industry, however, are splendidly covered by books, and outstanding are its history, cast iron in architecture, methods of analysis, and general foundry practice. The present system is obviously haphazard and it is just a question as to whether a publisher deems he can make a reasonable profit or whether some interested associations considers the issue of a book to be of real use to its members. Our industry has been well serviced in this direction, but it should be remembered that many of the publications are subsidised.

We are often consulted both by publishers and authors as to whether or not a manuscript is worth publishing. The type for which we show but little enthusiasm is where the author quotes lengthy passages from the various authorities. He should be so familiar with his subject to have assimilated the various aspects, and assume it to be public property. Then he should present the matter in plain readable English. If he feels either because of historical significance, courtesy or other reasons, it is desirable to acknowledge a source, by all means let him do so, but too many references spoil the sequence and makes the reader wonder whether a gramophone record would not be preferable. Because many authors are unaware of the field already covered, an appropriate body might think around the creation of a very small panel to which budding authors might go for advice. If such a panel felt energetic, it might discover for the benefit of the industry what books amongst the very long list of books on foundry practice published during the last fifty years can still be purchased. From current investigations, we fear that the list is very attenuated, and of those missing not all are worth reprinting. Even that excellent guide to foundry literature published by the Sheffield city librarian as a bulletin is, we understand, no longer available. Moreover, the same remark applies to the industry's latest and most popular general text-book.

WE VERY SINCERELY regret that in our leading article dealing with the Presidential Address given to the Institute of Metals we misunderstood the facts. A letter from Col. Guillian informs us that "there is no intention to increase the membership fees again and this was specifically stated at the meeting. Other means are to be sought to increase the Institute's revenue."

Contents

A.F.S. Congress Papers

Papers to be presented to the 54th Annual Congress of the American Foundrymen's Society, at Cleveland, Ohio, from May 8 to 12, include:—

Aluminium and Magnesium.—"New Aluminium/Zinc/Magnesium/Copper Casting Alloys," by Mr. W. E. Sischa and Mr. H. Y. Hunsicker; "Casting of Magnesium/Rare-earth/Zirconium Alloys in Sand Moulds," by Mr. K. E. Nelson and Mr. F. P. Strieter; "Development of High-strength Magnesium Casting Alloy ZK61," by Mr. J. W. Meier and Mr. M. W. Martinson; "Magnesium Foundry Practice in Canada," by Mr. M. W. Martinson and Mr. J. W. Meier; "Corrosion and Stress-corrosion Properties of High-strength Aluminium/Zinc/Magnesium/Copper Casting Alloy," by Mr. R. A. Quadt and Mr. E. C. Riechard, and "Aluminium-alloy Castings—A Review of British Achievement," by Mr. F. Hudson (I.B.F. Official Exchange Paper).

Brass and Bronze.—"Metal Melting—Application of Thermo-dynamic Principles to Melting Nonferrous Metals," by Mr. R. I. Moore; "An Investigation of Melting and Casting Procedures for High-purity Nickel," by Mr. D. W. Grobecker, and "Effect of Superheating and Casting Temperatures on Physical Properties and Solidification Characteristics of Tin Bronzes," by Mr. B. N. Ames and Mr. N. A. Kahn.

Educational.—"Foundry Apprentice Training at Caterpillar Tractor Company," by Mr. F. W. Shipley and Mr. B. L. Bevis, and "The Engineering Student and Summer Foundry Work," by Mr. N. J. Stickney.

Foundry Costing.—"Organising Management for Profit," by Mr. W. E. George, and "Management Views Costs," by Mr. J. A. Wagner.

Grey Iron.—"Improved Test-bars for Standard and Ductile Grades of Cast Iron," by Mr. R. A. Flinn and Mr. R. W. Kraft; "Some Tests on Relaxation of Cast Iron," by Mr. V. T. Malcolm and Mr. S. Low; "An Introduction to the Annealing of Nodular Iron," by Mr. J. E. Rehder; "Composition and Properties of Grey Iron," by Mr. R. Schneidewind and Mr. R. G. McElwee; "Basic-lined Cupola for Iron Melting," by Mr. S. F. Carter, and "Dilatometer Studies of Nodular Cast Iron," by Mr. N. A. Ziegler, Mr. W. L. Meinhart and Mr. J. R. Goldsmith.

Heat Transfer.—"Solidification of Ingots," by Mr. B. H. Alexander, and "Influence of Dry Sand Conductivity on Rate of Freezing of Steel Slabs," by Mr. V. Paschkis.

Malleable.—"Sub-critical Isothermal Graphitisation," by Mr. H. A. Schwartz, Mr. J. D. Hedberg and Mr. R. Eriksen; "Furnace Atmosphere for Malleable Annealing," by Mr. W. D. McMillan; "Some Effects of De-oxidising Additions of Foundry Malleable Irons," by Mr. R. W. Heine, and "Surface Hardening of Pearlitic Malleable Irons," by Mr. S. H. Bush, Mr. W. P. Wood and Mr. F. B. Rote.

Patterns.—"An Alloy Designed for Pattern Shops," by Mr. S. Zuckor; "Cold-formed Flexible 'Precision' Patterns and Core-boxes," by Mr. R. B. Wagner and Mr. J. E. Wiss, and "Production Patterns and the Matchplate," by Mr. R. F. Dalton.

Plant and Equipment.—"Oxygen Cutting Processes in Steel Foundries," by Mr. R. Babcock; "Use of Portable Air Tools in Foundry Cleaning Rooms," by Mr. A. G. Ringer; "Material Transport in the Cleaning Room," by Mr. N. L. Smith and Mr. R. J. Wolf; "Bandsawing in Foundries," by Mr. G. H. Sheppard; "Salvage of Castings by Welding of Defects," by

(*Continued in next column*)

Forthcoming Events

APRIL 25.

Institution of Industrial Supervisors.

West Bromwich Section:—Films, "Steel," "Industrial Handling" and "Factory Safety," at the Works Canteen, J. Brockhouse, Limited, Victoria Works, Hill Top, West Bromwich, at 7.45 p.m.

Chemical Engineering Group.

"Corrosion-resisting Cast Alloys containing Nickel, Chromium and Molybdenum," by M. M. Hallett, M.Sc., F.I.M., at the Geological Society, Burlington House, Piccadilly, London, W.1, at 5.30 p.m.

APRIL 26.

Institute of British Foundrymen.

London Branch:—Annual General Meeting, followed by "Modernising an Ironfoundry," by L. W. Bolton and W. D. Ford, at the Waldorf Hotel, Aldwych, London, W.C.2 at 7.30 p.m.

Birmingham Branch:—Annual General Meeting, followed by "Patternmaking and Founding under Tropical Conditions," by G. W. King, at the James Watt Memorial Institute, Great Charles Street, Birmingham, 3, at 7 p.m.

Association of Bronze and Brass Founders.

Annual General Meeting, at the Connaught Rooms, Great Queen Street, London, W.C.2, at 11 a.m.

APRIL 29.

Institute of British Foundrymen.

West Riding of Yorkshire Branch:—Annual General Meeting, followed by the Prize-winning Paper in the S. W. Wise Memorial Competition, at the Technical College, Bradford, at 6.30 p.m.

(*Continued from previous column*)

Mr. G. E. Bellew, and "Foundry Cleaning-room Abrasive Operations," by Mr. B. H. Work.

Precision Investment Casting.—"Pattern Materials and Production in Precision Investment Casting," by Mr. E. I. Valyi.

Sand.—"Factors Affecting Moulding Sand Density, Shrinkage, Expansion and Workability," by Mr. R. P. Schauss, Mr. R. F. Baley and Mr. E. E. Woodliff; "Phenolic-resin Core Binders," by Mr. J. E. McMillan; "Treatment of Bond Clays for Foundry Sand," by Mr. A. E. Pavlish; "Reproducibility of Foundry Sand Tests," by Mr. B. H. Booth, and "Flowability of Moulding Sands," by Mr. W. H. Moore.

Steel.—"Manganese Recovery in Acid Electric Steelmaking," by Mr. S. F. Carter; "Influence of Temperature on Fluidity and Surface Appearance of Steel Castings," by Mr. G. A. Lillieqvist; "Nature of Mould Cavity Gases, by Mr. C. Locke and Mr. R. L. Ashbrook; "An Investigation of Metal Penetration in Steel-foundry Sand Cores," by Mr. S. L. Gertsman and Mr. A. E. Martin; "A Thermo-dynamic Study on Pinhole Formation in Steel Castings," by Mr. H. F. Taylor and Mr. R. E. Savage; "Fayalite Reaction in Sand Moulds Used for Making Steel Castings," by Mr. R. E. Savage and Mr. H. F. Taylor; "Metal Composition Tests for the Steel Melter," by Mr. H. H. Fairfield, Mr. H. F. Graham and Mr. A. E. McMeekin, and "Steel Quality as Related to Test-bar Fractures," by Mr. H. H. Johnson and Mr. G. A. Fisher.

Time-study and Methods.—"Standard Data for Bench Core-making," by Mr. H. R. Williams, and "Fatigue Data Summary," by Mr. M. E. Annich.

The following additional papers will not be available as separate preprints.—"Equipment for Degassing Magnesium-alloy Melts," by Mr. A. J. Juroff; "Selection and Application of Cleaning Equipment," by Mr. S. F. Krzeszeewski; "Refractory Practice in the Melting of Acid-electric Steel," by Mr. R. H. Jacoby and Mr. M. Petty, and "Administration of Wage Incentives," by Mr. C. T. Hassell.

Indian Foundry Industry*

By V. M. McGowan

After a preliminary description of general conditions obtaining in Indian foundries, the Author, who has an intimate experience of the local conditions, considers in turn foundry layout and materials—sand, pig iron, etc., and continues by describing moulding methods for a variety of large jobbing and semi-repetition castings. The foundry concerned is that of the Indian Iron & Steel Company at Kulti in Bengal. It is interesting to contrast this Paper with the account of the new mechanised foundry at Calcutta which was described in our issue of March 23.

MUCH has been heard of Indian industry, and of actual or potential plans to bring India into line with other commercial countries. Hearing and reading of the many and varied plans has left the Author with the impression that it is not quite realised just how far industry in India really has progressed. It must be remembered that there have been, for a great number of years, able and efficient men from Britain and other countries resident in India who have spent a considerable part of their lives training Indian labour in all aspects of engineering activities.

The general impression engendered among the peoples of the Empire from the many broadcast speeches, newspaper articles, etc., is that India is a very backward country, with no engineering skill or experience. This is very far from correct. It is admitted that of the population of close on 400,000,000 only a small proportion does possess that skill and training; but that small proportion is a most valuable nucleus.

That the number of skilled and fully-trained Indians can and must be greatly expanded is very true. But such expansion will bring into play many other factors which are outside the scope of this Paper. It should be stressed at the outset that India is most certainly not devoid of technicians or tradesmen. If there was a dearth of trained men in India's engineering industry, it would be a poor tribute to the years of British rule in the country and the years of hard work and patience shown by the thousands of good men who have gone before.

Indian Conditions

As in the case of many other Eastern countries, the art of founding was not actually imported into India from the West. That art is and has been for several centuries a traditional occupation. All we from the West have done is to replace the old methods by new ones, and to build large shops with modern plant in place of small foundries supplying local domestic needs.

To train Indians so that they are capable of producing almost any casting called for in modern foundry practice has been a long, expensive, and by no means easy task; nor has it had the credit it deserves. There exists to-day a body of men in India who are capable of turning out castings as good as those made in any country in the world. First-class supervision is, of course, necessary, because so far there are few Indians with the necessary foresight to visualise and plan work, to build a job up from a mere idea. That will come in time; it may be a long time, perhaps it may come sooner than many of us realise, but come it will. It is inevitable. The point is, and it cannot be stressed too much, that there are in existence to-day trained and skilled Indian artisans capable of—and indeed actually turning out—good, first-class castings which will bear comparison with the products of any other country.

The foregoing has, I hope, shattered any idea that foundries in India are all little "hole-in-the-corner" affairs, and some idea of the layout of one of the largest Indian foundries engaged in general jobbing work will now be given.

The design of the building differs greatly from those commonly found in temperate climates. This is not done just to be different, but to suit climatic conditions. Works buildings are almost invariably built from east to west, in order to prevent, as far as possible, the direct rays of the sun from entering the shops. Most of the light is admitted from the north side as far as possible, and the building is very seldom closed in, but is usually left open on the ends and to about 10 ft. from floor level. During the summer months the temperature climbs around the 120 deg. F. mark and may stay there for days, so that it is essential to get all the air possible moving through the building, even though the air at times is only a hot blast. There is no bogey of interference with production caused by over-much rain, as one can tell to within a few days when the rainy season will start and finish, and any necessary precautions can be taken in plenty of time.

Layout

The foundry to which the Author refers is one of five in a group, but reference is only made to the general shop, as that is the one with the widest appeal. It consists of two bays, each 50 ft. wide and 720 ft. long. Work is divided into four classes, *i.e.*, green-sand, light and heavy dry-sand, loam, and core shop. The north bay houses the green-sand and light dry-sand work, and the floor is serviced by four overhead cranes of varying capacity—one 2-ton, one 5-ton, one 10-ton and one 5-ton, in the order of their appearance. There are four small electric jib cranes—two of 1-ton and two of 3-ton capacity. These are normally situated on the green-sand floor, but are very often lifted and placed on a new site to serve some job with a large number to be made, so as to save any tie-up of the overhead cranes when closing, etc. The south bay is serviced also by four overhead cranes—one 10-ton, two 20-ton and one 10-ton, also in order of appearance.

The south bay houses the cupolas and blowers, and it is the pride of the foundry that this bay possesses two balanced-blast cupolas; they are 49 in. dia. There is also a third cupola 36 in. dia. of the ordinary (Rapid) type, this being used almost exclusively to cast up the green-sand work. A note may be added here about melting conditions in India, as they vary in some respects from those in South Africa, even with identical cupolas.

First, one cannot expect to get quite so fast and hot-melting, nor can melting ratios be kept so high as in

* Abstracted from a Paper presented to the South African branch of the Institute of British Foundrymen, Mr. W. C. Simpson presiding.

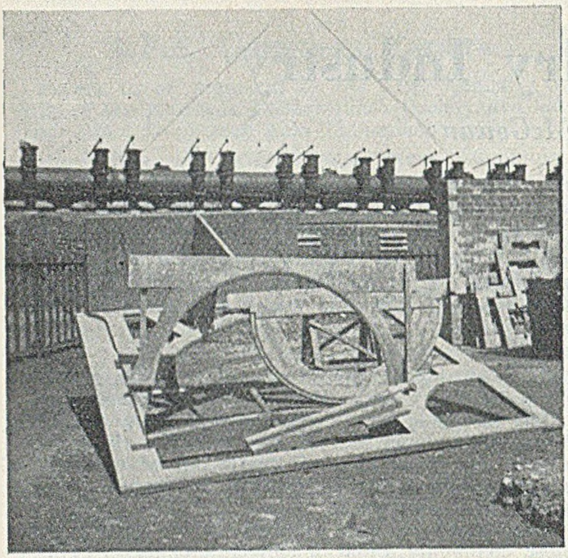


FIG. 1.—PATTERN EQUIPMENT FOR THE 60-IN. DIAM., 90 DEG. FOOT BEND PIPE CASTING—A JIG-SAW OF "BITS AND PIECES."

England, for instance. There are several reasons for this, but the chief factor lies in the coke. One has to use a coke with an ash content of from 18 per cent. to 20 per cent., and at times it goes as high as 22 per cent. This is by reason of the fact that there are no low-ash coals in the country. The ash content certainly has a substantial effect on cupola practice and slows melting considerably. It also, of course, affects tapping temperatures and produces copious slag. In spite of this high-ash content, however, it is possible by careful control of the air supply, charging practice and general manipulation to get good steady melting and a temperature at the spout of 1,320 to 1,350 deg. C. This is no mean achievement—calling, as it does, for a very careful control of all factors.

During the rainy season, humidity rises as high as 95 per cent.—while in the hot weather it drops to practically nil. This factor also has a bearing on cupola practice, of course, and has to be allowed for. Good melting is not an easy attainment in a tropical climate. All three cupolas are blown from No. 10 Sturtevant fans, of which there are two. One is reserved for the 36-in., which blows daily, and the second for the two balanced-blast cupolas, which are used on alternate days.

Sands

India is fortunate in that there are ample deposits of naturally-bonded sands. Close to hand is also an unlimited supply of good, clean, river sand, which being on the company's property, was available at the cost of loading and transport. The sands differ somewhat from those procurable in England and South Africa, but all are free venting with a high permeability figure. The two main sands are a rotten rock and one very similar to Erith loam. Mixtures are carefully controlled and new consignments are checked as they come in. B.C.I.R.A. apparatus is used for this purpose and permeability, bond, compression and grain-size tests are made. These tests are carried out for all the other foundries in the group, so that at all times each shop will know exactly what grade of raw material there is to hand and act accordingly. Samples of the floor sand, loam, facing sands, etc., are also checked at regular intervals in the same manner. In the case of floor sand, this is checked for silt and fines as well as permeability. There is no apparatus available for recording the amount of silt present, so that only a comparative test can be made. This is done by emulsifying a standard weight of sand in a 100-c.c. graduated measuring glass and allowing it to settle. No claims are made for scientific accuracy, but it is an easy and practical method of ascertaining if the sand has been exhausted and requires removing—and the method has proved very satisfactory as a rough check.

Pig Iron

There being two blast furnaces in an adjacent plant, the foundries in the group have a plentiful and varied stock of iron on which to draw. Perhaps this may appear at first sight to be ideal and just the arrangement most foundrymen dream of. But that is not always so. The blast furnaces also have their customers to think of; and, like the shoemaker's child, the foundry was very often "the worst shod." Apart from that, it is a very useful thing to be so near the source of raw material and have such large stocks of widely-varying grades to draw upon; and it is always possible to get some "special" grade quickly made if required. This does ease the founder's task a great deal, a fact which was fully appreciated by all concerned.

Moulding Methods

In some instances the moulding methods used are those of the old school, but it must be remembered that they suit the shop and the plant. The foundry was laid down many years ago to manufacture pipes and specials only, and has only lately been occupied with general jobbing of the one-off variety. Therefore, in a great many instances, where possibly other and more up-to-date methods could have been adopted, these had to be eschewed and the standard method of the shop had to be employed in preference to installing new and expensive plant, the cost of which might never have been recovered.

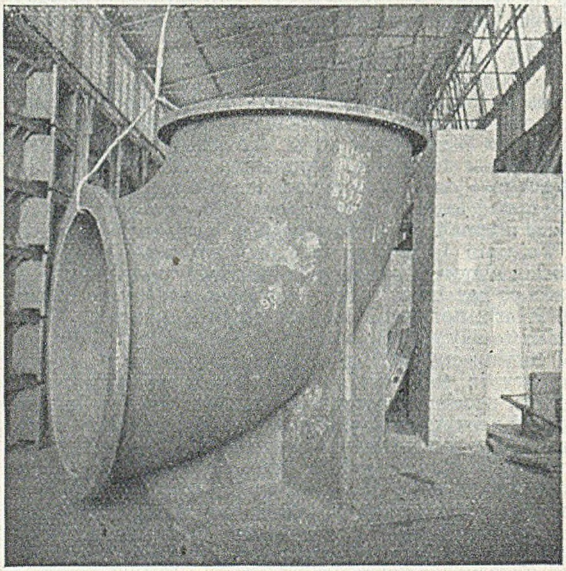


FIG. 2.—FINISHED 60-IN. DIAM. FOOT BEND PIPE CASTING.

The work undertaken was wide and varied, based on the "come one, come all," maxim. No job was refused, no matter what it was, provided it was within the capacity of the shop and cranes. The list, therefore, was a long and varied one, containing as it did pipes and specials from 2-in. to 60-in. dia., pile screws and pile cylinders, chilled rolls, ingot moulds, chemical plant of all descriptions, blast-furnace and coke-oven plant, slag ladles, hydraulic cylinders, steam cylinders, colliery plant such as head-stock pulleys, sand-stowing pipes, etc., castings for steelworks plant and many others usual to the average jobbing shop, but far too numerous to mention.

In endeavouring to convey an idea of the work done in the Indian foundry, it should be emphasised at this point that this Paper is in all respects a practical one and makes no claim to be technical. The Author, therefore, refrains from technicalities throughout and leaves that aspect of foundry work to others.

Pipe Specials

A job of particular interest was for 60-in. special pipes, the straights being made in 12-ft. lengths in the vertical-pipe casting shop by the usual methods. The special pipes could not be made by orthodox methods, as the available cranes were of 20-ton capacity and all lifts had to be kept within 40 tons. One of these pipes —60-in. dia. with a 90 deg. foot bend—presented an especially ticklish problem, which was successfully overcome by a combination of accepted moulding techniques. This was not exactly a one-off job, but just missed being so—two being required. Obviously it was entirely out of the question to make a pattern, as this would have been much too expensive. It was, therefore, decided to make a frame and sweep. This method is one usually adopted for most specials, and while it may at first seem very crude to anyone who has never seen it done, it possesses many advantages. Foremost among these is the economy in timber and pattern-making costs. Next, where there may be two or more pipes required, it is only essential to make a good sound mould for the first casting and merely skim the others up, never entirely losing the first foundations. The latter asset is, of course, lost where only one casting is required, but the men became so used to and expert in the method of working that they could work just as rapidly from a frame and sweep as from a solid pattern. Fig. 1 shows the complete equipment for the foot bend, and Fig. 2 shows the casting made from this apparent jig-saw puzzle of bits and pieces.

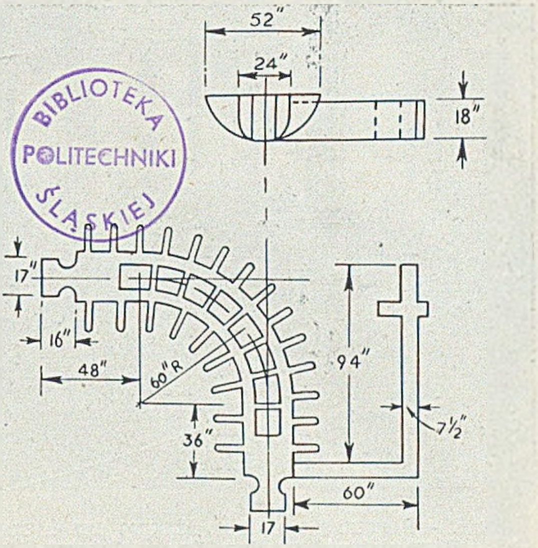


Fig. 4.—Sketch of the Core Iron for the Large Foot Bend Pipe Casting.

The foot-bend casting was made in a pit in the floor and so set out that the joints were 16 in. below floor level; this being done so that the joints could be well seamed and rammed in before casting. Four stools were set on the bottom plates of the pit to take the top box and so relieve the joints of its weight, and the frame was laid down level on tubes placed across the stools. The bottom mould was then bricked up and strickled to size with a strickle running on the frame. This mould was finished and dried and the metal thickness was put on the mould ready for making the core. It was the practice in the shop to use chaplets as little as possible, to minimise the risk of "leakers" on test. No arrangements were made on the bottom half of the mould to take a chaplet. Should it have been considered necessary, a stool would have been set on the pit bottom-plates, or a large plate, say 2 ft. square, bedded down about 2 ft. below the mould face, from there a bar would have been carried up to take the chaplet. However, as a core iron had to be made, the practice usual on small pipes was followed, the whole balanced, and so chaplets on the bottom half were entirely dispensed with. A sketch of the core iron is shown in Fig. 4.

By placing bearing plates under the two prints and one at the extreme end of the balancing arm, there was no danger of the core sagging in the centre, and consequently no necessity for a chaplet. The half core being made in the bottom mould, the frame was once more placed on and the other half core was strickled up. A grating was inserted about half-way to the top half of the core and was securely bolted to the main core iron; this was done, of course, to circumvent any tendency of the top half core to "float." Considering

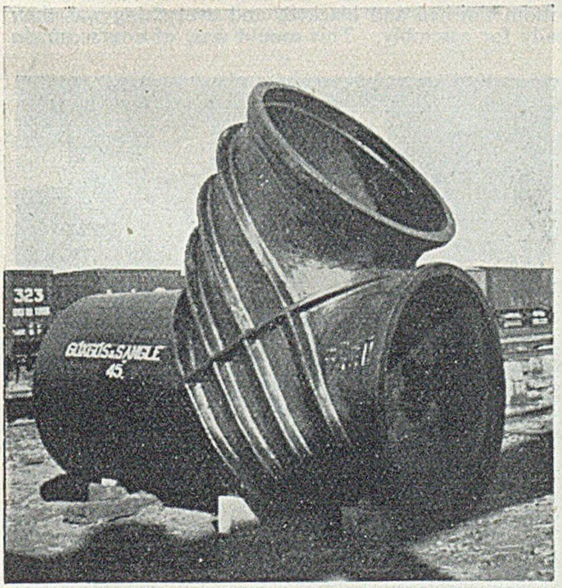


Fig. 3.—Another Special Pipe Produced in the Foundry—a 60 by 60 by 60-in. Angle Branch. The Branch is at 45 deg. to the Axis but Enters the Main Body at 90 deg.

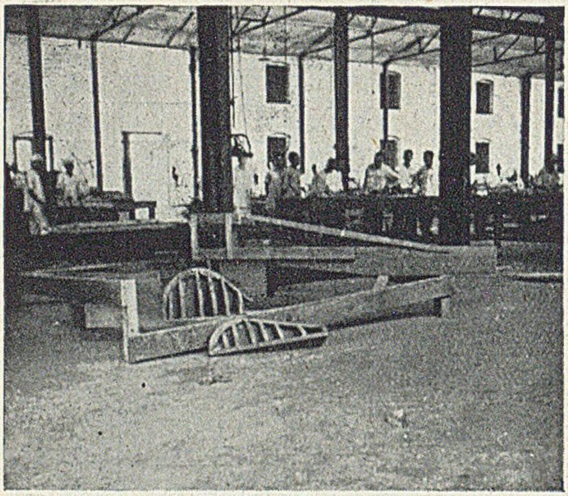


Fig. 5.—Patterns used for Making the Metal Pattern for the Pile Screw Casting.

the surface area it was thought that perhaps it would be as well to put one chaplet in the top half in case the core had tendency to lift. A bar was, therefore, built in from the main core iron to the surface of the core to take the thrust of the chaplet. When the core was completed it was also given a night's drying by building a fire round the outside walls of the pit and covering the hole in with old corrugated iron sheets. The mould thickness was then strickled on the core and a sand pattern was made by this means.

This was not the usual custom; the tops were usually strickled up in the same manner as the bottoms and turned over. It will be remembered, however, that there were only two 20-ton cranes available, and it was calculated that the rammed up top mould would weigh 48 tons in all! Therefore, it could not be turned over. In any case, it would be a very risky proceeding at any time to turn over a box of this size. So the top part box, made from loose plates and bolts and bolted together, was rammed up off the sand pattern, lifted off and laid down on stools as it was, provision being made for the chaplet by placing a small piece of plate on top of a bar running through the core and bolting this up to the box-bars. The chaplet when inserted was actually carrying the thrust from the core iron to the box-bars, and at no time was there any danger of the core bursting under metal pressure. The arrangement was made to take about six times the load that would ever be imposed upon it. (The maxim "better safe than sorry" is one in which the Author places great faith.) This lifting arrangement taxed the capacity of the cranes, and as the cranes were consistently being used for this, nobody felt very happy while the top was slung up. To procure a flat face on the foot bracket, a large plate was cast and a loam cake was made. This was butted to the joint round the foot and wedged back to the walls of the pit. It resulted in a very fine finish; two castings were made in this manner and both were very successful.

There were several large special pipes made, one being a 60 by 60 by 60-in. angle branch (Fig. 3). It will be noted that while the branch was actually at 45 deg. to the axis it entered the main body at 90 deg. This design was adopted to nullify the weakness which would have been present had the branch met the main body at 45 deg., creating a great oval opening instead of one the same size as the rest of the pipe. In all respects the pipes were manufactured in accordance with British standard specifications. Out of 10 specials ordered, including 11¼ deg., 22½ deg., 45 deg. bends, foot-bends and angles, all were successfully cast and withstood the hydraulic test without so much as a "weep," which is conclusive proof of the soundness of the methods adopted.

Pile Screws

Pile screws, though they may look formidable affairs on paper, are not very difficult to cast successfully, provided good patterns and tackle are first provided. As their name suggests, they are used for piling, and are screwed down into the earth, C.I. cylinders being bolted on as they go down to their foundations. They resemble special pipes in one respect—in that no two are ever alike. Nearly every order in India brought something new, and usually necessitated the making of a new pattern. A cheap and at the same time a sound method of pattern-making had, therefore, to be discovered. Wooden patterns were deemed to be out of the question, as they would be very costly to make and it was doubtful if they would stand up to the work if they were made. Usually there was a considerable number off each design, ranging from a dozen to 150. They varied greatly in diameter, from 1 ft. 6 in. to 8 ft. overall. Invariably the same method was adopted, as follows:—

A template frame was made with the correct pitch; this was bedded down in the floor and a spindle set up in the centre. From the spindle, the sweeps rested on the edge of the template and were free to move up and down the spindle. By this means it was a simple matter to sweep up the mould to the correct diameter and pitch, and the cost of the pattern was negligible. The bottom half mould was first swept and skin dried, then, the thickness was run on and the top-half pattern run up in loam, dried and checked over. The top part was rammed off the loam block, lifted off and finished. The block was knocked down and the bottom finished and blacked, and everything was then ready for assembly. This mould was, of course, made

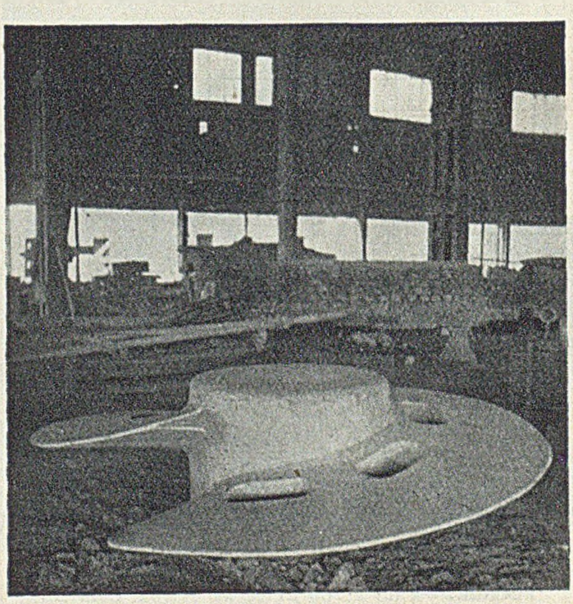


Fig. 6.—Finished Pile Screw Casting.

to double contraction to leave the resultant iron pattern correct to size. It will be seen at once that this was a very cheap and a most effective method of obtaining a good, hard-wearing pattern.

As pile screws were a fairly frequent job in the shop, special tops were made for them. No drags were used; they were rammed up in the floor. By making special tops, as much "lifter" work as possible was cut out, and the joints were made to shape with a 12-in. pitch, this being the most common pitch obtaining. Boxes were made to take screws varying 2 ft. in dia., for instance. It was possible to get screws varying from 6 ft. to 8 ft. into the same top. This was done for the obvious reason of keeping the number of boxes to a minimum consistent with economical working. Fig. 5 shows the patterns used for making the iron pattern and Fig. 6 is a picture of a finished casting as it leaves the foundry.

Chilled Rolls

Another job of great interest was the casting of some small chilled rolls. The Author had no previous experience in such work, and from the amount of literature on the subject was a bit awed at the prospect of having to produce the rolls. Fig. 7 shows typical roll designs; it will be appreciated that with cores of the dimensions given they were awkward to make. A minimum of ⅛ in. chill was asked for and this the foundry undertook to provide. The patterns and the chill made for the job can be seen in Fig. 8.

Patterns were made for the bottom and top portions only, as the roll proper, being cast in the chill, required no pattern. Boxes were made for the job, and the joints were machined out with a male and female fit to assure correct location on assembly. The head on the top-half pattern was opposite to the usual and customary design. This was done so that the casting on contraction would be free to travel down and not be in danger of hanging, and probably setting up strains and cracks in the chilled portion.

Core-making

The core was run up on a tube and was a rather delicate piece of work owing to the smallness of the diameter at top and bottom.

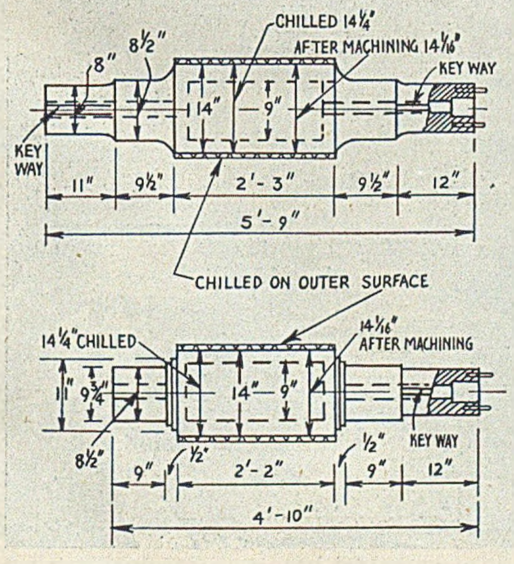


FIG. 7.—TYPICAL DESIGNS OF HOLLOW CHILLED ROLL CASTINGS.

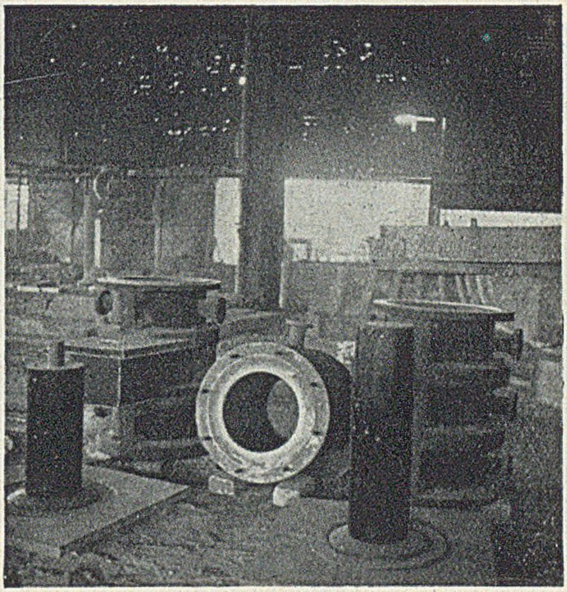


FIG. 8.—PATTERN AND CHILL EQUIPMENT FOR THE ROLL CASTINGS.

This presented problems in making—and the requirement of getting a core bar small enough in outside diameter yet strong enough to hold the weight of the core was not the least of the difficulties. The only tube available in stock was ½-in. bore steam pipe, but unfortunately this was too thin and bent under the weight of the core. To make it more rigid, a length of ¼ in. gas pipe was pushed up the inside of it, this being a nice easy fit. Then the two bars were pinned together by rivets at 12-in. centres all the way up and vent holes were drilled right through them. This gave a fairly rigid core bar and allowed about ½ in. of loam at the narrowest point, which proved satisfactory.

Much trouble was experienced, however, by the appearance of cracks on the chilled face of the casting, sometimes running its entire length and at others only a few inches, but in all cases being sufficient to cause the castings to be scrapped. Many theories were advanced as to why this should be, including bad moulding practice.

Ultimately, after one or two failures, the conclusion was reached that much of the trouble was caused by the chilled wall of metal not being strong enough to withstand the pressure of the expansion while the metal was throwing out the carbon. It followed that the trouble could be avoided by the use of an iron with a short freezing range. It was agreed that, by doing so, a good depth of chill would be obtained, and that this freezing quickly on the chill face would form a wall of solid metal strong enough to withhold the pressure set up. An iron containing 0.8 per cent. silicon and 1.4 per cent. manganese (B.H.N., on face, 460) was therefore used. This gave the required short freezing range, and the results were most satisfactory.

Another point was noticed and proved very important—it was fatal to the roll to have any flash on the joints or to have any obstruction of any kind whatever to prevent the casting contracting downwards. Should there be such an obstruction, then a horizontal crack was almost certain to appear on the chilled face. No chaplets were used in the job, of course. To hold the core down, the bottom end of the core bar was

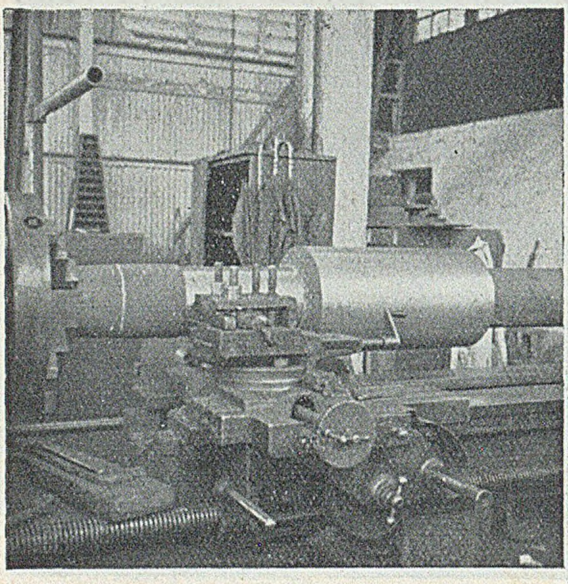
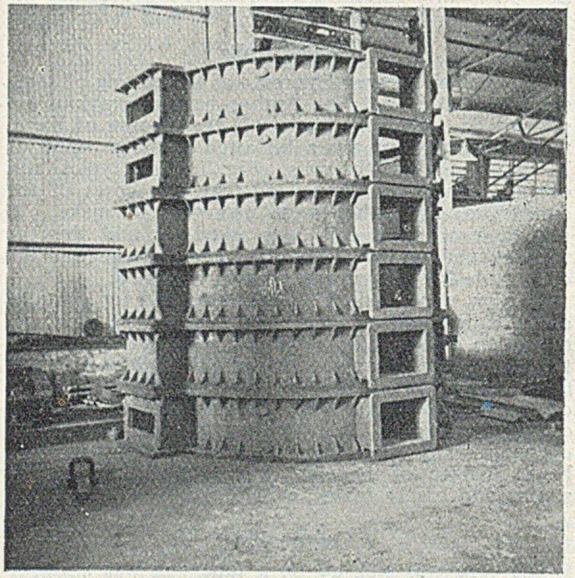


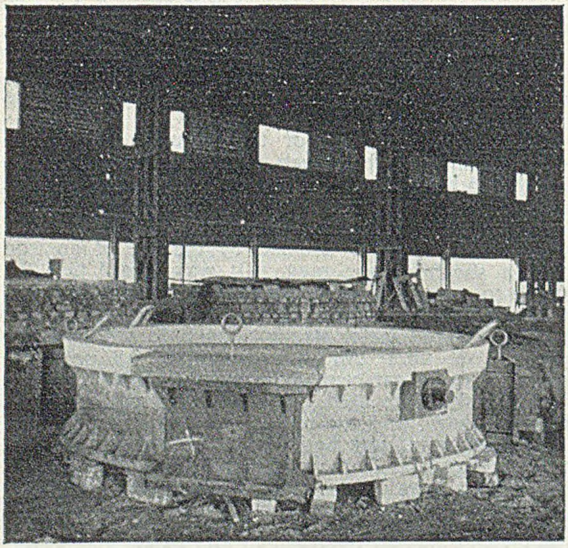
FIG. 9.—MACHINING A CHILLED ROLL CASTING.

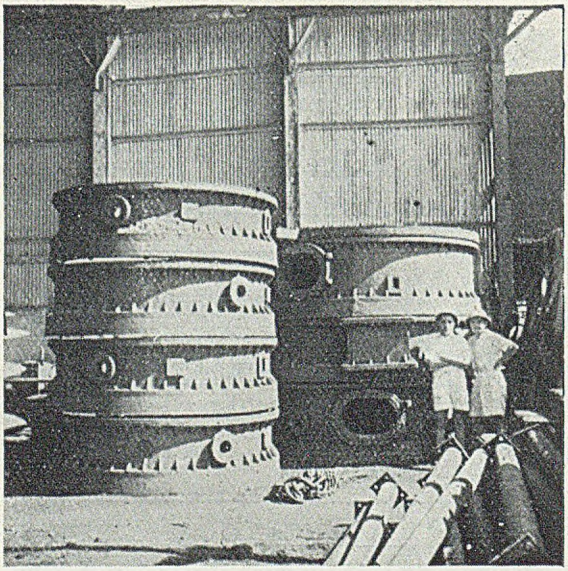
threaded in the inside and a rod was screwed in. This rod was long enough to come through the drag, and a thread on the end made tightening very simple. To centre the core at the top, a light cross piece with a hole in the centre was dropped over the projecting core bar and bolted to the top joint, and then centred and wedged into the cross piece. This was a simple and effective method, and had the advantage of being in view at all times, so that the moulder was never working blind.

No top box was used, the mould being left open and the top of the runner box was kept one inch below the top joint to avoid over-filling. The casting was poured through a single in-gate placed on a tangent at the very bottom. The size of the in-gate was worked out to give a pouring time of 30 to 35 sec. for any size of roll, and the pouring temperature was maintained as far as possible at 1,260 to 1,270 deg. C. for rolls from 12 in. to 18 in. dia. at the chill. No rolls over 18 in. dia. have yet been cast, and it was found that this pouring temperature and speed produced the best and most consistent results.

Temperatures were regulated with a Cambridge disappearing-filament type pyrometer and each casting had a record of facts tabulated on a card for future reference. This showed temperature of pouring, time taken in pouring, analysis, depth of chill and depth of chill on standard chill test-piece. A sample was cast







FIGS. 10, 11 AND 12.—EQUIPMENT AND FINISHED CASTINGS FOR CHEMICAL PLANT. THIS TYPE OF CASTING WAS MADE IN A WIDE VARIETY DIFFERING ONLY IN DETAILS OF PIPE INLETS AND OUTLETS, ETC.

into a chill test-piece before the roll was poured to assure correct depth of chill. The chill on the test-piece depended, of course, on how much chill was required on the roll. The test-piece was 8 by 6 by 1 in. thick, made in a core, and cast against a plate 10 by 8 by 2 in. thick. (For the rolls in question, where a ⅝-in. chill was aimed at, it was necessary to get 1in. to 1⅛ in. depth of chill on the bar.) When this prevailed, the chill on the roll was adequate and there were no cracks apparent. Although this was an entirely new venture, and while much trouble had been experienced it seemed to have been got over—and apart from these sources of worry never absent from the life of the foundryman, all went well with the roll in the end. Fig. 9 shows the machining of a chilled roll casting.

Chemical Plant

The war created a great demand for castings to be used in new chemical plant erected in India. These included castings of every kind and description—benzine refining and distillation, ammonia and acid plants, etc. Most of them were for large orders and called for a great deal of detail work in manufacture. Figs. 10, 11 and 12 show some of these castings.

One particular casting had considerable numbers off, and an iron pattern was swept up and turned to size. Normally castings of this size would be swept in loam, but, as they were urgently required, a pattern was made and one per day was cast from it in dry-sand. The job was laid out in such a manner that one mould was being rammed, one being finished, one being dried and one being closed simultaneously.

Five sets of plant were in use, and no time was wasted or lost. As the pattern was drawn out of the mould it was at once put in hand in the fifth set of boxes. The men were divided in the same manner—*i.e.*, one group for ramming, another for finishing and a third for closing. This method was carried out as far as possible on all war work to assure maximum production in the shortest possible time.

Besides undertaking outside orders, the maintenance of plant comprised a very large item in the Indian foundry, and made a steady and at times a very heavy call on the shop's resources. There was work for the blast furnaces, coke ovens and steel works; slag ladles (Fig. 12), pig moulds, ingot moulds (Fig. 13), by-product plant, machine-shop plant, repairs and renewals to the plant of the other four foundries in the group, and so on.

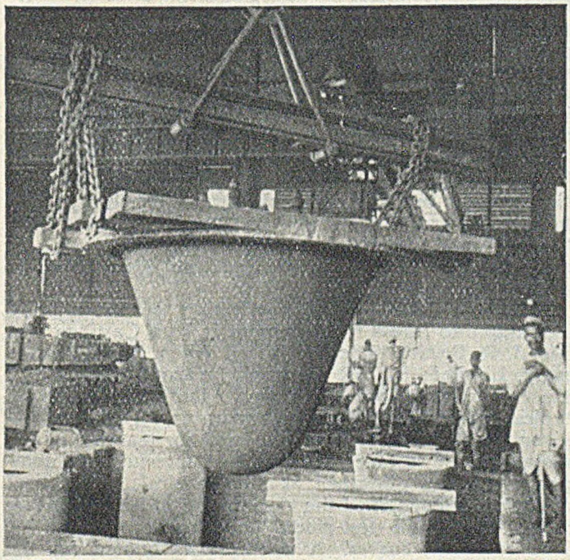


FIG. 13.—TOP PART OF A MOULD FOR A SLAG LADLE BEING LOWERED INTO THE CASTING PIT.

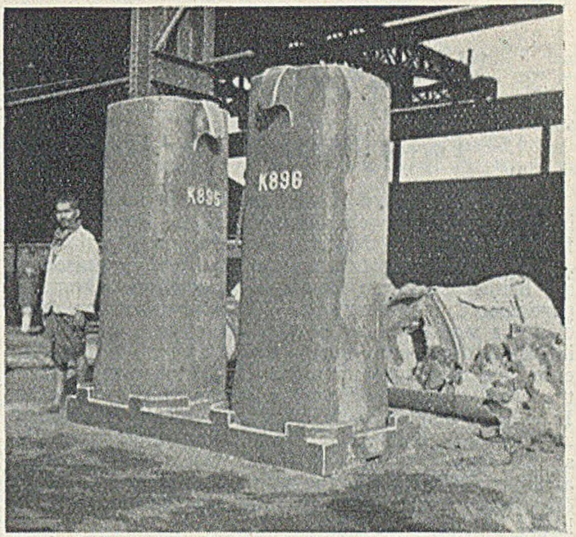


FIG. 14.—FINISHED INGOT MOULDS AND INGOT BASE CASTINGS.

It will be appreciated that the Author has mentioned only a few specific jobs, since it would be almost impossible to review all the activities of so large a shop in one Paper. The average monthly output of finished castings of all descriptions was in the region of 1,500 tons. It should be clear that the Indian foundry is not quite so backward as it would seem from some recent speeches and articles. [Acknowledgment is made to the Indian Iron & Steel Company for permission to publish this account].

B.S.F.A. Convention on Productivity

The second convention of the British Steel Founders' Association on the subject of "Productivity" is to be held at Ashorne Hill on Thursday, Friday and Saturday, April 27 to 29. Mr. F. W. Rowe, chairman of the Association, will open the proceedings at 9 a.m. on the Thursday and 23 papers will be presented in the course of five main sessions.

Representatives nominated by interested trade unions are taking part and a trade-union leader is taking the chair at one of the sessions. At the close of the convention, Mr. F. A. Martin, O.B.E., B.Sc., A.R.I.C., chairman of the B.S.F.A. productivity committee, will speak on "Future Trends in Improving Productivity" and Mr. T. H. Summerson, J.P. (vice-chairman, B.S.F.A.), on "The First Two Productivity Conventions." Finally, Mr. F. W. Rowe will make a closing statement.

OWING to a last-minute complication, Foundry Equipment Limited, of Leighton Buzzard, will not be showing at the forthcoming American Foundrymen's Society establishment at Cleveland, Ohio, which is being held from May 8 to 12.

B.C.I.R.A. Foundry Conference

Varied Programme for Metallurgists and Foundrymen at Ashorne Hill

A large number of current aspects of foundry metallurgical problems were discussed at the Foundry Conference held on March 30, 31 and April 1 at Ashorne Hill, near Leamington Spa, and organised by the British Cast Iron Research Association. Over 200 participated, including some 20 members of the Association's staff. Many of the latter were called into informal discussions during the course of the Conference, and thereby much aided the full understanding of the problems arising from the Papers which were given. In all, 17 Papers were presented, all by recognised authorities in their field. In addition, there were film shows each evening and there was a demonstration arranged; so great was the enthusiasm that some of the discussions were prorogued until evening, and actually lasted well into the night.

Opening the Conference, Dr. J. E. Hurst, J.P. chairmen of Council, said the act of looking back over the years at the progress made in the foundry laboratory led him to speculate on the laboratory of the future and its probable functions, which he thought would show considerable changes from earlier conceptions. The B.C.I.R.A. Council had approved the holding of two conferences each year, in Spring and Autumn, the present conference being the fourth since the war. Forthcoming conferences would be devoted to malleable cast iron and high-duty and nodular irons, and possibly a further conference would deal with gating and running methods in the foundry.

SESSION I

The first session of the Conference, on the Thursday afternoon, was devoted to the presentation and discussion of three Papers. For these, Dr. J. E. Hurst occupied the chair. The first was "A Note on Sampling for Chemical Analysis," by Mr. W. Westwood, B.Sc., a member of the Association's staff. The Author first outlined the difficulties associated with the collection of a representative sample from a piece of pig or cast iron and pleaded that, in the interests of accuracy, this job should not be assigned to a novice. The methods in use at the Association's laboratories were outlined and special precautions were detailed to avoid such loss of carbon as usually takes place during drilling, it being suggested that a small solid piece of metal could best be used, weighing about 2 gm. and cut from the pig or casting by an abrasive wheel. The second short Paper was by Mr. W. E. Clarke, A.R.I.C., also on the Association's staff, who discussed the "Significance and Use of Chemical Results." He dealt mainly with the incidence and nature of tolerance and analytical error, dividing the latter into two groups—"constant" and "variable." "Constant" errors were a feature of the method used and the purity or otherwise of the reagents. Human considerations were mainly responsible for the "variable" errors, and the importance of duplicate estimation was emphasised in this connection. In the discussion of these first Papers, consideration was initially given to the cleaning of samples for drilling, the special treatment for chill-cast pig iron and the merit of drilling horizontally. A query was raised as to the need for such "second-decimal-place" accuracy as was often reported by the chemist, it being held that the accuracy should be related to the job—whether routine or research—and the use which was to be made of the figures provided. The conveyance by post of drillings for analysis was deprecated, as carbon was lost in transit. Further discussion was postponed until the late evening session.

The third Paper, Dr. J. G. Pearce in the chair, was by Mr. J. Dearden, B.Sc., and Mr. H. W. Howard, both of the British Railway Executive. It dealt with the breakage of castings in transit and was divided into two sections, Mr. Dearden dealing with the technical side, and Mr. Howard with the commercial aspects. Such points as the alleged comparative "fragility" of cast iron, fractures as a result of residual stresses, and the relations between the breakages and the freight rate selected were dealt with in turn. Mr. Howard added general remarks on methods of protection for castings despatched as "through" traffic, the hazards to be associated with transhipment and the measures for the elimination of the latter operation by the zoning of collection and delivery. He concluded with a note on the need for the education of transport personnel, a point much emphasised in the short discussion which followed, some members recounting their experiences of lack of care taken in transit of their products. The utilisation of "shock-proof" railway trucks, which were becoming increasingly available, was recommended to founders.

Laboratory Design

The session was resumed in the evening, when Mr. C. L. Prior, of Baird & Tatlock (London), Limited, gave a Paper on chemical laboratory layout and equipment. (For this and for the resumed discussion later in the evening, Mr. N. D. Ridsdale was in the chair.) Initially, Mr. Prior stressed that laboratory builders and furnishers were dependent for guidance on user's comments and he hoped that many such comments would be forthcoming at the meeting. In designing a laboratory, about 250 sq. ft. floor area was generally allowed per worker, exclusive of corridors (*e.g.*, a space 12 ft. 6 in. long by 20 ft. wide, the latter dimension being a normal daylight "limit" from side windows). Ideally, chemist and architect should co-operate in building a laboratory, but so few architects had the necessary experience that specialist laboratory furnishers were usually called in. Mr. Prior concluded by examining various details of laboratory construction, such as building materials, drains, bench tops, and fume cupboards and stressed that good ventilation both "local" and "general" was a *sine qua non* for extending the life of equipment and, not less important, that of the chemist.

The next Paper was "Application of Strain-gauge Technique to Stress Measurement in Iron Castings," by Mr. J. R. Bryant, B.Sc., of W. H. Allen, Sons & Company, Limited; Mr. H. Morrogh (research manager of the Association) took the chair. After first detailing a typical set-up of strain-gauge apparatus, an account was given of the accuracy to be expected for readings of the movement of surfaces, the effect of moisture and temperature being described as most critical. Practical applications concerned the exploration of actual surface strains on tensile test-pieces and the formulation of load/extension curves. A method was quoted for the calculation of stresses from the strains measured, but its applicability was later called to question from the chair. Results for tests carried out on an iron casting for a centrifugal pump showing strain against internal pressure were presented and general inferences were indicated. Further applications of this comparatively new and promising line of investigation for work on iron castings were brought out during the short discussion which was all time permitted.

In the late evening, there was a further discussion on sampling and the interpretation of laboratory results, following which there was an informal discussion on routine and special methods for chemical analysis of cast iron, with Mr. W. E. Clarke of the B.C.I.R.A. Chemical Laboratory and Miss R. Presser of the Chemical Research section at the chairman's table to answer questions. These were many and varied, and ranged from comparisons of the volumetric finish for total-carbon estimations to the estimation of magnesium in cast iron and the relative merits of chemical, spectographic and absorptiometric methods.

At the same time as these discussions were being held in the dining room of the mansion, three films were shown in the conference hall—" All Star Casting " (by courtesy of F. H. Lloyd & Company, Limited), a documentary and an entertainment film.

SESSION II

On the Friday, the first session was conducted with Mr. R. H. Rowse (Smith & Wellstood, Limited) in the Chair. The first Paper was by Mr. A. A. Timmins, F.R.I.C., F.I.M., of Mansons, Limited, and was entitled " Shrinkage and Porosity in Cast Iron." After defining " Shrinkage," the Paper explained the significance which could be attached to the results of experiments conducted by the Association some time ago with dumb-bell test castings. Soundness for these castings was expressed in terms of silicon, carbon and phosphorus content ratios. General methods were subsequently outlined for avoiding porosity, which, in round terms, was said to increase with the phosphorus content unless silicon and carbon (particularly carbon) were reduced. The next Paper, by Mr. E. Longden, M.I.Mech.E., of David Brown-Jackson, Limited, carried the subject of porosity a stage further by outlining methods for combatting the effects of solid shrinkage in heavy castings. Contraction of large complicated bed-plate castings in relation to " camber " in moulding was discussed together with such matters as comparative conductivities of mould materials, effect of chaplet coatings and pouring temperature. Finally, examples of moulding and running methods were outlined for a number of large castings, including a carding machine cylinder, a lathe bedplate, a chilled boring bar and a chilled roll.

The third Paper of the morning session was a short account of experiences with exothermic feeding compounds by Mr. W. Paton, of Cameron & Roberton, Limited. In it, the Author outlined the method of preparing a " Thermit " type of material bonded in the manner of core sand and fashioned into riser sleeves for incorporation in the mould. In the short discussion on this subject, the relative efficiencies and additional applications of some similar materials were disclosed by one speaker, although another considered the saving in feed metal as a result of the process was not worthwhile for iron castings. Yet a third was enthusiastic about the application of exothermic materials in the non-ferrous field.

The final Paper of the morning was " Some Factors affecting the Fluidity of Cast Iron " by Mr. E. R. Evans, who is on the staff of the Association. For this Paper Mr. W. J. Colton of Newton Chambers & Company, Limited, took the chair. After defining what a foundryman wanted with regard to " fluidity," the Paper listed the factors which affected this value and the means taken to standardise the conditions for the " spiral " tests which were carried out at the laboratories of the Association, and at the foundries of a member firm. The effect of various elements on fluidity as measured by the " spiral " test was summarised. It could be said from the experiments that phosphorus increases the fluidity of cast iron solely by depressing the melting point. On the other hand, carbon, and to a lesser extent, silicon, increase the fluidity even after allowing for the change in melting point.

Discussions arising out of the Papers on shrinkage, contraction, feeding compounds, and fluidity were carried over to the afternoon session. As regards shrinkage and feeding, much attention was focused on the characteristics of the new nodular cast irons, it being stated by one member that contraction for this material was one in 75 parts and, in the mould, feed-metal provision was of the same order as for white iron or steel castings. Mr. P. A. Russell (S. Russell & Sons, Limited) added a note concerning the application of lip feeders (Connor runners). Subsequently, comparisons were of various fluidity tests, dimensions of test-pieces and relative sensitivity, mention being made of the U-type of test-piece used by the sub-committee T.S. 6 of the Institute of British Foundrymen in its experiments. The influence of composition on fluidity and the perennial question of the significance of the inclusion of steel in the cupola melt for irons of otherwise similar compositions was raised. This point brought no positive replies at that stage, but received further attention at a resumed discussion which was held at some length later in the evening.

Non-destructive Testing

The next session, with Mr. P. A. Russell in the chair, was concerned with non-destructive testing of castings and commenced with a Paper by Dr. F. Gottfeld, of Solus-Schall, Limited. Progress in the utilisation of three methods of non-destructive testing—X-ray, gamma-ray, and magnetic—was critically examined with particular reference to gamma-ray applications using the newer products of the atomic pile such as radio cobalt. This material was said to have a working " life " and price level of such an order as to bring this branch of inspection technology within reach of a large number of foundries, though the Author could quote no example of an ironfounder using the process at present. X-ray equipment for ferrous castings of substantial section was described as prohibitively expensive.

The next item was a demonstration of the " black-light " (ultra-violet) inspection of castings and this was arranged by Mr. A. G. Deeming of the Staveley Iron & Chemical Company, Limited. Dr. J. G. Pearce, director of the Association, presided at this feature.

Following the demonstration, there was a brief but thought-provoking description by Dr. J. E. Johnson of the Atomic Energy Research Establishment, of the possible uses of radio-active isotopes in the foundry. After dealing with the new materials which were becoming available, such suggestions as the inclusion of radio-active slugs in furnace walls for investigating the slagging of refractories and the use of isotopes for tracking diffusion in mixed metals were put forward.

In the evening, film shows were again featured. " Propeller Erosion," which concerned cavitation in cast-iron marine propellers, and a documentary film were among those exhibited.

SESSION III

The final session of the Conference, held on the Saturday morning, concerned mainly the interests of the makers of light iron castings and attendance was somewhat proportionately reduced. Mr. R. H. Rowse took the chair and two short Papers, in the nature of progress

B.C.I.R.A. Foundry Conference

reports by members of the Association's staff, were presented. These were "Corrosion of Cast-iron Boiling Pans" by Mr. R. I. Higgins, B.Sc., and "Rust Spotting on Light Iron Castings," by Mr. R. G. Godding. The first Paper discussed the relation of the "life" in service of the pans used for bulk food cooking in canteens, etc., with the microstructure and composition of the material. The pans sometimes failed either by a pitting attack or by developing a non-adherent flaky rust coating. Evidence so far accumulated indicated that a well-developed, rosette-graphite structure might be inimical to a long "life" and that it was probably desirable to have about 1.3 per cent. phosphorus in the material of the pan. Surface treatments were discussed and vitreous enamelling was said to be very satisfactory. In the Paper on rust spotting, this defect and its effect during subsequent treatment of the castings was described. The occurrence was identified experimentally with the artificial inclusion in the moulding sand of coarse particles or aggregates of coal dust which contained alkali chlorides. In practice, such chlorides could, it was suggested, be carried over from the coal-treatment plant, into the raw coal dust. Use of non-siliceous parting powders was said to offer less protection from the incidence of the "disease."

"Rust Prevention on Ferrous Materials," the next Paper, was presented in two sections. The part by Mr. G. P. Acock, B.Sc. (British Iron and Steel Research Association), concerned general methods of investigation of rust-prevention problems (in particular, for steels) and the protection afforded by alloying and the application of coatings. In the second part, Mr. W. Westwood, B.Sc. (B.C.I.R.A.), discussed the significance of atmospheric, liquid and subterranean conditions on the corrosion of cast-iron articles, the last two conditions referring to cast-iron pipes. Illustrations showing architectural and building uses of cast iron, where long life was a valuable attribute, were passed around among the conference delegates. Methods of protection for cast-iron components, as well as the use of alloys, were reviewed.

Low-phosphorus Light Iron Castings

The final Paper of the Saturday morning session was read by Mr. A. N. Sumner of the Association's Scottish laboratories, and was on the use of low-phosphorus cast iron for thin-section castings. It was a communication on behalf of Mr. Ronald Taylor of Robert Taylor & Company (Larbert), Limited and detailed that firm's experiences in changing from high-phosphorus material which had normally been used for their products. The initial change was a war-time expedient, but the experience then gained, when viewed in the light of post-war pig-iron shortages, led to the general adoption of a composition T.C., 3.4 to 3.5, Si, 2.5 to 2.7, and P, 0.65 to 0.8 per cent. for all castings. This was despite the reversion to light ruling sections and large surface areas for the bulk of the castings being turned out. No special precautions were made to secure high metal temperatures from the cupola, although drum-type ladles had been found advantageous in the shops. The number of short-run castings was regarded as negligible and the saving from reduction of breakages was said to balance the increase in costs for material over those required for the higher phosphorus iron. No changes had been made in runner practice, there were no complaints from the enamellers, better "life" in service was reported from boiler castings and less tendency was exhibited in the castings towards unsoundness due to porous and drawn areas.

The discussions on the morning's Papers were all concerned with points of detail. Presence of rust-spotting was related to the time for which a casting was left in the sand mould before cleaning and the substitution of pitch for coal dust was given as a preventive for this defect. Electrolytic corrosion was queried in respect of the boiling pans and components and bio-chemical influences were discussed in relation to pipe failures.

At the close of the Conference, Mr. Rowse, chairman of the concluding session, thanked the Authors of Papers and the speakers from the body of the delegates and commented on the worth-while nature of the many informal discussions which he had observed in progress outside the conference hall and which he regarded as a valuable feature of such gatherings. Finally, he expressed the gratitude of the delegates to Dr. J. G. Pearce, director of the Association, and added a few words in admiration of the organising ability of the British Cast Iron Research Association, which had so materially contributed to the atmosphere of friendliness and helpfulness permeating the whole proceedings.

House Organs

The Beetle Magazine, January, 1950. Issued by British Industrial Plastics, Limited, Ideal House, 1, Argyll Street, London, W.1.

It can be presumed that we received this issue because the first article is devoted to synthetic resin core binders. It is quite interesting for foundrymen to keep reading of moulders and moulding which have nothing to do with their industry. When the plastics industry was established it was thought that it would filch much business from the foundry. Actually, the reverse has been the case, and plastics manufacturers are now important users of castings. Now they are entering the foundry supply industry. This house-organ is one which caters for the company's own staff and does it very well.

Nickel Bulletin, Vol. 23, No. 3. Published by The Mond Nickel Company, Limited, Sunderland House, Curzon Street, London, W.1.

"Developments in Modern Magnet Alloys," by Alan Torry, A.I.M., and Alun Edwards, F.I.M., is the subject of the article in this issue. Some idea of the progress made in permanent-magnet materials since the beginning of the century may be gathered from a diagram among those appearing in the article which stresses the importance of the research carried out by the Permanent Magnet Association of Sheffield and its member firms during the period. Among the many abstracts included in the bulletin are the following: Electrodeposition of Nickel-phosphorus Alloys; Welding of Nickel Alloys to Dissimilar Metals, and Corrosion-Resistance of Molybdenum-containing Nickel/Chromium Steel.

Albion Works Bulletin, Vol. 4, No. 2 (March). Published by John Harper & Company, Limited, Albion Works, Willenhall.

There is usually some lesson to be learnt from this bulletin, and this one draws attention to the loss of castings through breakages. Of course the Albion Works make the most delicate of castings, but the figure given does make one wonder whether the loss due to this cause should not be checked and published by other foundries. There is a report of an order for sewing-machine castings from America which was obtained by Mr. W. H. Harper when he recently visited that country.

Patternmaking for General Engineering Castings

By H. S. W. Brittain

(*Concluded from page* 397)

The "One-off" Problem

When only one casting is required, and a new pattern is necessary, the patternmaker is expected to produce the cheapest possible job. Very often this throws great expense on to the foundry by omissions in the pattern construction. Where the pattern is of reasonable dimensions, the well-known skeleton construction is used. This often permits the omission of cores, hence the pattern is *almost* like the required casting.

Fig. 17 shows a typical example of a skeleton pattern, which is for a 20-ton slag-ladle casting. There are a number of special features occurring in this example that are common to other patterns in a greater or lesser degree:—

(1) The skeleton construction allows of a great saving in timber and patternmaking time;
(2) two castings are made at one and the same time;
(3) use is made of splitting cores;
(4) there is the application of a considerable number of loose pieces to draw into the mould;
(5) large trunnions are made in two sections, again to draw inwards;
(6) the round bolt hole core passes through the lug core marked No. 1. This allows the round core to be aligned through the heavy lugs;
(7) tail-prints are used and
(8) the construction technique is such as to ensure a rigid pattern.

Any moulder or foundryman interested in the moulding method can find it fully illustrated in the Paper by J. Roxburgh[6] entitled "Some Iron Castings for Steelworks Plant."

Fig. 18 shows the exterior of a 7-ton slag ladle as opposed to the skeleton construction, this shows details of a pattern that is so made that the very minimum of moulding art is necessary. This demands a pattern of high finish. The example of a full pattern for a 7-ton-capacity slag ladle is typical of such a set up. Even special box parts were constructed and sectional core-irons were provided to reduce ramming for the inside portion. The exterior view indicates the high degree of finish obtained by pattern varnish and enamel.

Fig. 19 is an interior view of the slag ladle. The main object in including this is to make clear how the pattern was constructed. Each piece used in the building of this shape had to be carefully cut and fitted to form the framework structure and filling in portions. The methods of jointing and the plan of its construction are very evident. The innumerable pieces forming the shape do credit to the skill and thought of the patternmaker.

Green-sand Moulding

Recently, Dr. J. E. Hurst,[7] in a talk to the Willenhall Rotary Club, attributed the tremendous growth and development of this country's ironfounding industry largely to the invention of a Sedgley (Dudley) man, Abraham Darby. It was he who discovered the method known as green-sand moulding, as far back as A.D. 1707.

It is germane to make a distinction between two kinds of green-sand moulding. The original sand used was of the naturally-bonded variety, which is still very much in use to-day. Slowly for the past 25 years or more investigations have been made into the development of synthetic bonds to improve moulding sands, particularly for green-sand work. Great strides are being made in the use of these synthetic sands, particularly in the field of machine moulding. The art of green-sand moulding with naturally-bonded sands is a highly-skilled section of moulding technique, and by the passage of time, and consequent experience in its manipulation, certain firms have developed hand moulding to almost a science. The principle involves the provision of specially-designed equipment for every design of casting. Even when the quantities of castings involved may be as low as 20, the same principle is applied.

Briefly the equipment requires:—

(*a*) A pattern preferably made to mould without coring.
(*b*) A ramming board conforming to the contour of the pattern, and forming the mould-joint shapes.
(*c*) Bottom-part moulding-box patterns, shaped in accordance with the ramming-board joint profile.
(*d*) Top-part moulding-box patterns, with the box joint assuming the fitting shape of the bottom-part box.

This top part has bars fitted to follow the contour of the pattern when the pattern is in position on the ramming board. The bars carry the usual taper on their edges and are fixed to within ⅜ or ½ in. of the pattern. From these box-part patterns cast-iron moulding boxes are made with the necessary lugs, etc., in the approved manner, and are so designed as to give the minimum of sand ramming consistent with the usual measure of safety.

Core Irons

The method of using green-sand is also adopted in the manufacture of cores, thus avoiding the cost of core drying. Even for core irons, the pattern-shop produces a pattern from which to mould the core iron. Often the core iron is designed on fabricated lines so that two or more parts are jointed and can be extracted from the casting for use over and over again. A Paper given by F. Whitehouse in 1938, "A General Engineering Foundry," gives quite detailed information on this point.

A mouthpiece casting is an example of a simple form of green-sand moulded job. The pattern is exactly like the required casting, except that the top flange is loose for moulding purposes, this being a three-parted mould. A ramming board is not used in this case; instead, the pattern is bedded into the bottom part. The section between the flanges is carried by a specially-designed middle part which allows access to the loose flange.

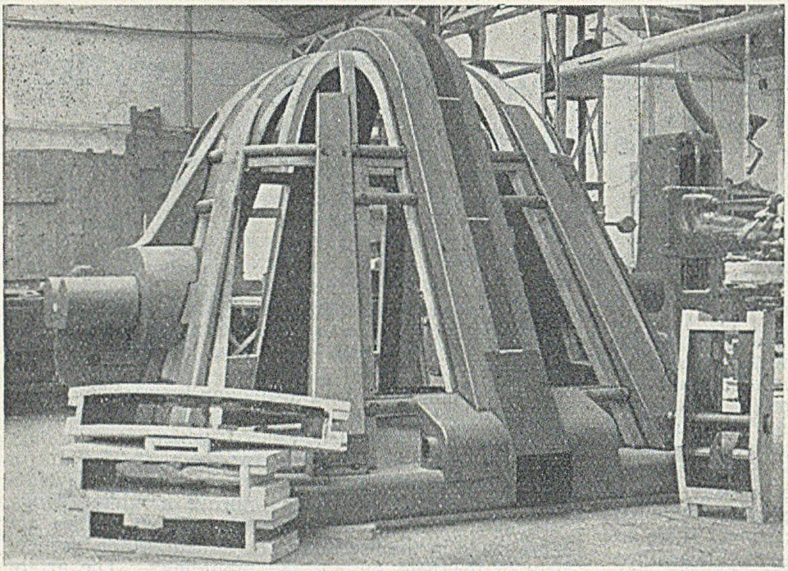


FIG. 17.—SKELETON PATTERN FOR A 20-TON SLAG LADLE.

The demand for higher production made it necessary to mould these by machine methods. A machine of large-enough proportions was available, so a block-type of pattern was constructed, and the portion between the flanges was cored out. Figs. 20 and 21 shows the set-up for machine moulding.

The pattern construction is clearly visible. One point to note is the provision of lifting and rapping plates for withdrawing the pattern by hand. The actual moulding sand used for the job was of the naturally-bonded type.

The core boxes merit special attention, as there are three, for cores one, two and four, which can be rammed directly to a core-plate. No. 3 has a bottom board and needs turning over on to the core-plate. The loose flanges are provided to bed into the core with the bolt holes cut through the flange. Wherever possible, sufficient core is allowed to balance the overhanging portion of the core. All cores were made in oil-sand and consequently needed drying.

Fig. 22 shows a number of valves mounted on plates. The part played by the pattern-shop in ensuring the success of machine moulding cannot be over-stressed. This illustration is of two pattern plates designed with four valve patterns arranged to make one board for the top part and the other for the bottom part mould. The boards are from crossed timbers fitted into a mild-steel frame, and securely screwed to it. In the back of the board are four mild-steel inserts (Fig. 23) with a tapped hole in the centre. These are arranged for attaching the board to the machine table. The machine used for the job was a jolt-squeeze roll-over type, and used cast-iron boxes 3 ft. square. Great care was necessary in arranging the patterns on the correct centres to allow for matching separately-rammed tops and bottoms. These were moulded in green sand.

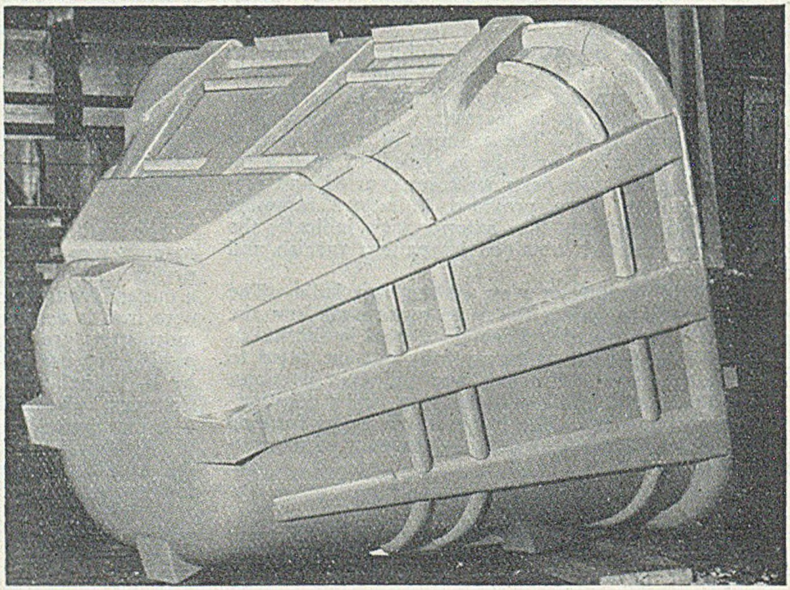


FIG. 18.—EXTERIOR OF 7-TON SLAG LADLE PATTERN MADE AS A COMPLETE UNIT.

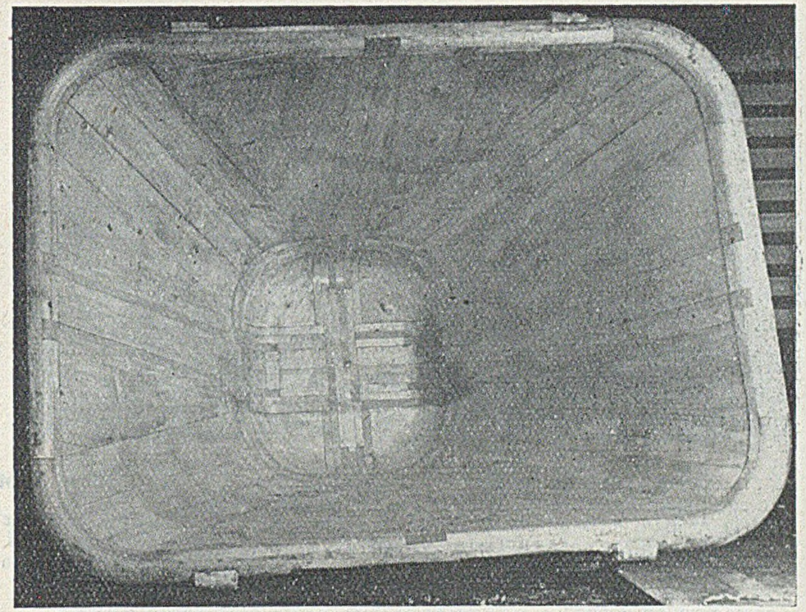


FIG. 19.—INTERIOR OF THE 7-TON SLAG LADLE PATTERN.

Fig. 24 shows a pig mould pattern. It was one of these jobs which come along and call for a completely new layout before machine moulding could be used. Two pattern plates were made integrally with the pattern, the shape of the mould joint being reproduced on each half of the plates. Mild-steel plates were inserted on the joints to take the weight of the box part. Box parts were made specially to suit the shape of the board and pattern contours. The top-part board is the one to the left of the illustration. These castings were made in green-sand moulds.

The Author has purposely avoided giving examples of smaller machine-moulding patterns, or quoting any examples where large quantities demand the production of metal-pattern equipment. A discussion of this side of pattern-making would be too prolonged. Its importance is none the less appreciated.

Loam Work

The making of loam moulds is a highly-skilled branch of foundry moulding processes, being much older than the green-sand process. From the patternmaker's point of view it is associated with a series of "strickling" boards which serve to give shape to the built-up loam work. Any casting design that is of a circular nature, even if carrying many branch pieces, flanges or other abutments, often lends itself to the application of the loam-moulding process. So far as the patternmaker is concerned, the process eliminates the cost of large circular patterns and core boxes. Additional parts, either internal or external, are usually made to the required shape or formed by cores. These parts are then set in position and built into the mould. The process also lends itself to the combination of a loam-work exterior and cored centre, or *vice versa*.

It will be well to remember that the application of this form of moulding can be, and is adopted, when using a full pattern. Naturally, the castings from this process come into the heavy category. For instance, Fig. 25 shows a loam mould for a cast-iron skirt. It is almost fully assembled, and relates to a semi-circular casting, where the outside has been struck up and the inner surface has been formed by a series of oil-sand cores. The flange portion, visible on the right, was formed by part-pattern equipment. For the shape

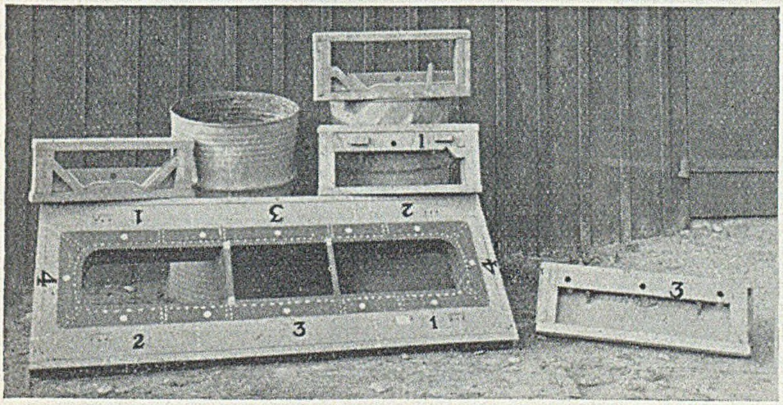


FIG. 20.—MOUTHPIECE PATTERNS ARRANGED FOR MACHINE MOULDING.

FIG. 21. — MOUTHPIECE HALF-MOULD MADE ON A MACHINE.

of the outside, the striking board was used. The pattern equipment for this job, shown in Fig. 26, includes:—

(1) A loam striking board for the outside.

(2) A segment core to form the internal shape as far as the half-circle point.

(3) A core box to form the interior shape past the semi-circular portion.

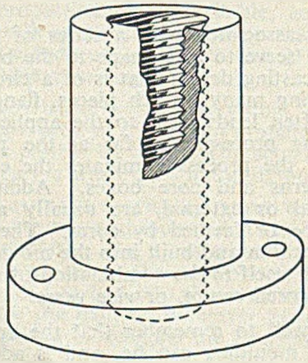


FIG. 23.—MILD-STEEL INSERT FOR PATTERN BOARD.

The exterior portion beyond the semi-circle lining is formed by the pattern pieces, including the flanges and closing core-prints, attached to a centre board. This is visible immediately in front of core boxes in the illustration. A flat closing core box (not shown) includes runner pieces to form the ingates.

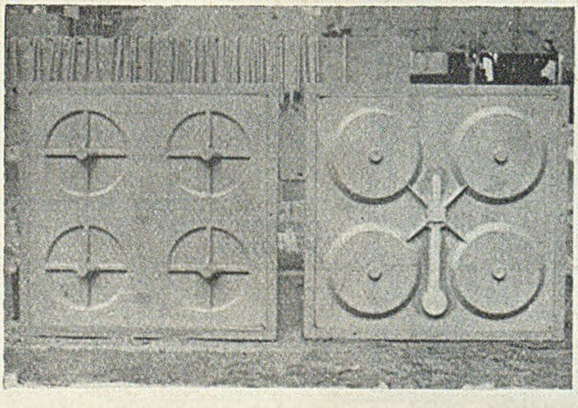


FIG. 22.—VALVE PATTERNS MOUNTED ON MACHINE PLATES.

Castings in Other Metals

Castings for the engineering industry are made in almost every kind of metal. It is therefore not uncommon for the pattern-shop of an engineering firm to make patterns for castings in brass, bronze, gunmetal, steel, etc.

The Brightside Foundry Company, being general engineers and founders, use castings made in all the usual metals; thus its patternmakers make patterns for their own use and in other foundries, too. When making patterns for other concerns, they endeavour to obtain the founder's own ideas on the method of moulding to be adopted. On other occasions, they rely on their own experience and, with many other patternmakers, hope they are correct.

Steel Castings

The final illustrations are of patterns for steel castings. A cast-steel finger is shown in Fig. 27. The pattern is made in halves for machine moulding. The various shapes give some idea of the many forms the patternmaker has to construct in a relatively small pattern, together with the inclusion of coreprints. The bomb-

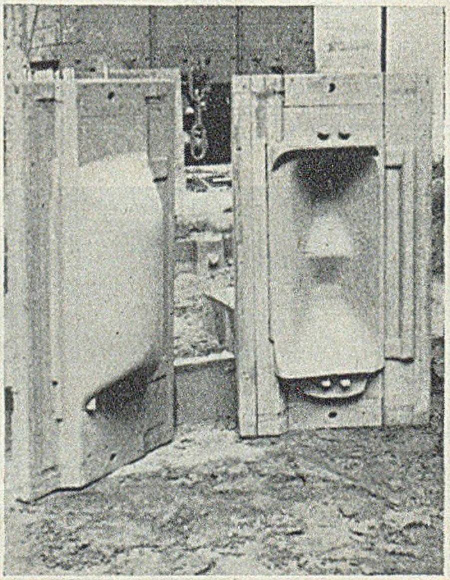


FIG. 24.—PIG MOULD PATTERN PLATES.

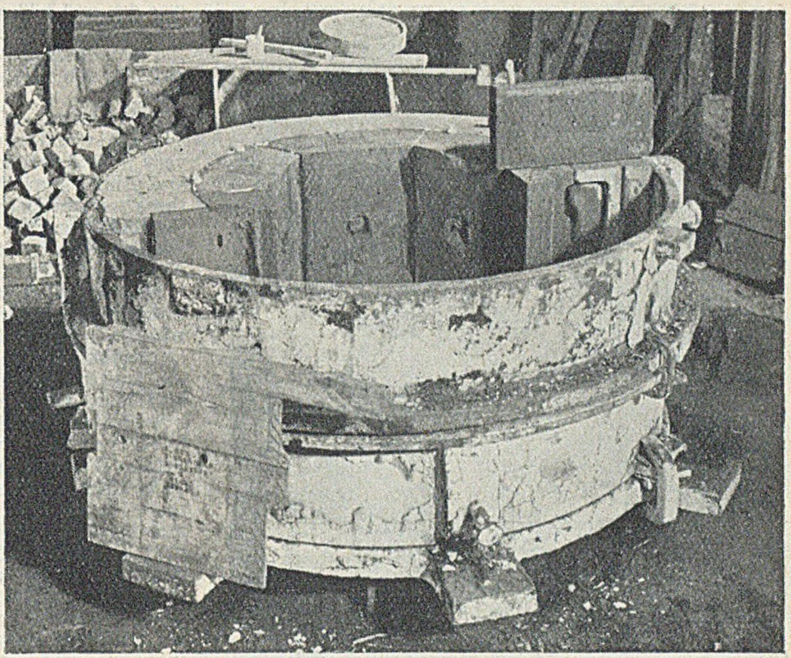


FIG. 25.—LOAM MOULD FOR SKIRT CASTING.

shaped core, when in position in the mould, protrudes into the top half of the mould. To obviate crushing, the top-part print is made larger than the actual core, giving a clearance on the ends and the vertical face of the core. This is a method often advocated by foundrymen, but not often applied in practice.

Another example of a pattern for a steel casting, that of a lifting finger, is shown in Fig. 28. It is split in halves for machine moulding, if so desired. The main core is made large enough to core the part in between the tapered lugs and the domed section in one core. The formation of the "banjo" shape, plus the tailpiece, prints, lugs, etc., calls for a high degree of patternmaking skill and understanding of foundry methods. It will be noted that the domed portion of the core is formed by a framework and strickle.

Conclusions and Acknowledgments

The Author has endeavoured to give a general idea of the multifarious types of patternmaking which come the way of most general engineering patternmakers. In conclusion, he thanks the directors and managements of the Brightside Foundry & Engineering Company, Limited, for allowing him to present this Paper, and for the use of so many illustrations of their work. His thanks are also due to Newton, Chambers & Company, Limited, for permission to use examples of their production.

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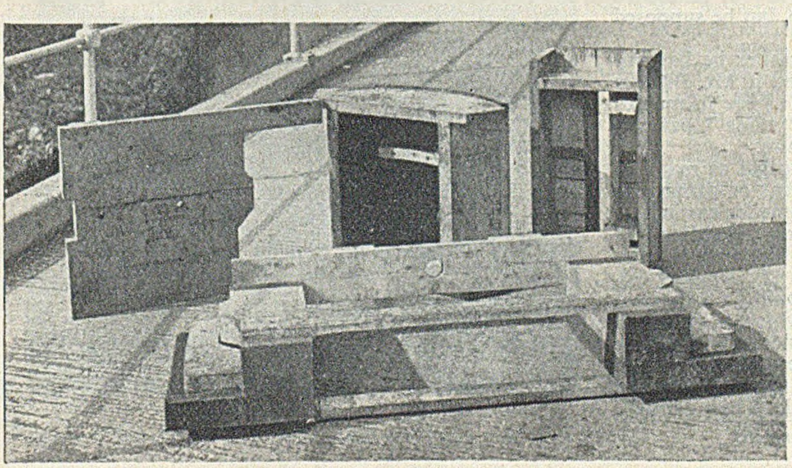

FIG. 26.—PATTERN EQUIPMENT FOR THE SKIRT CASTING.

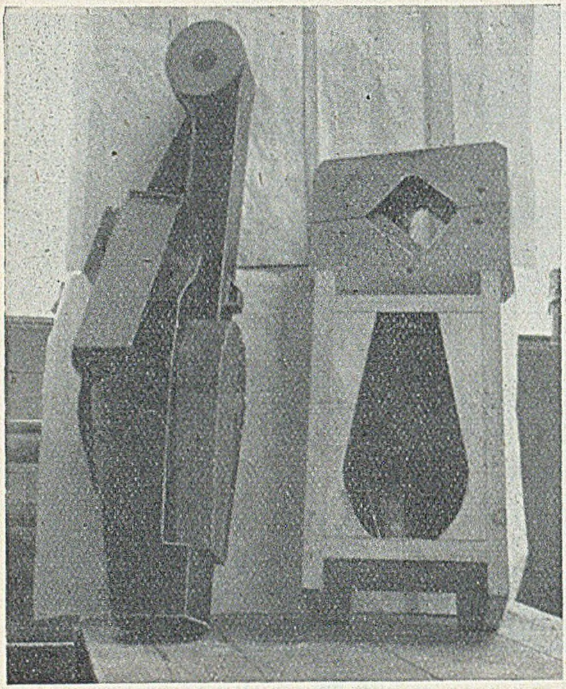

FIG. 27.—PATTERN EQUIPMENT FOR A CAST STEEL FINGER.

DISCUSSION*

Following the lecture, a vote of thanks was proposed by Mr. Weaver, and seconded by Mr. Brown.

MR. WEAVER said he had two criticisms to make, one that the suggested chart (Fig. 8) showing the list of information required from the foundry by the patternmaker was not practicable, and the second regarding the storing of patterns. Mr. Weaver said that he considered machine-made patterns also quite as good as hand-made, and said that quite recently he had been responsible for the design and handling of a mechanised foundry which involved the expenditure of £150,000 in metal patterns. These were eminently satisfactory and had been made by machines.

MR. HOLLOWAY asked whether Mr. Brittain had ever encountered mild-steel enamelled patterns.

MR. BRITTAIN replied that he had never met the mild-steel pattern, and he thought it would not be very successful. If Mr. Holloway referred to vitreous-enamelled patterns, he had never had to use these, but he supposed they would be fairly easy to use.

MR. BROWN said that as a patternmaker he had enjoyed the lecture very much, and asked if Mr. Brittain could inform him what was the term of life in moulds which could be obtained from the "stone" patterns which had been referred to in the lecture.

MR. BRITTAIN said it was possible to get as many as 500 moulds off one pattern without wear or damage to it, and even more moulds for certain smaller castings.

MR. WEAVER asked for information regarding the moisture in the patterns and also the best way to store "stone" patterns.

MR. BRITTAIN said that the ideal would be a thermostatically controlled temperature in which to store all patterns. His own company attempted to keep the moisture at about 10 per cent. They also varnished patterns with ordinary varnish first and then they covered that with two coats of pattern enamel. Their foundry was dry and self-contained, and one corner was reserved for patterns. They found little or no trouble because the temperature was fairly uniform at all times. Timber patterns actually tended to shrink a little rather than to swell.

MR. GREEN said, referring to Fig. 1, showing the Wadkin wood-working machine, that there would be very little difference between turning the job on a lathe and using the machine, and whilst appreciating fully that there were numerous jobs which could be done on this particular machine to advantage, there was very little advantage in a "turned" job, against the actual rotation of the pattern on the table of a machine.

MR. BRITTAIN said, regarding the particular illustration shown and the job it related to, that he agreed with the speaker that his estimate was not far out, but at the time the photograph was taken, his firm were in the position of wanting two jobs at the same time; one was being made on the lathe, and therefore the Wadkin machine was used for the other. In actual fact, the Wadkin machine was a little faster in the long run.

MR. TWIGGER said that he was interested in the reference which had been made to plastic patterns, but said that this involved the making of a mould, usually of metal and very highly polished, and that this cost a great deal of money. Once having done this, however, one could, of course, use the mould in conjunction with a press to turn out a very large number of articles very cheaply. In the case of making of patterns, surely they did not want a quantity of patterns, but numerous castings. He did not think that the literature which had been circulated could possibly refer to phenolformaldehyde plastic.

MR. BRITTAIN said that the only information he had on the subject of the American plastics was that contained in the leaflets, and there it was suggested that it was not particularly expensive, as compared with a metal pattern.

(*Continued on page* 433)

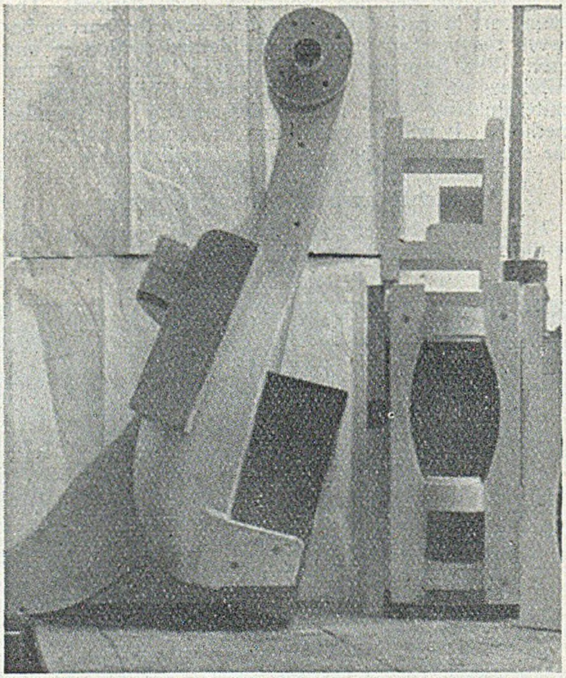

FIG. 28.—PATTERN EQUIPMENT FOR A LIFTING FINGER.

* At the meeting of the Birmingham branch.

Growth of Nodular Cast Iron

By Tsun Ko

When cast iron is subjected to repeated cycles of heating and cooling, it grows as a result of internal oxidation[1] and of partially irreversible expansions[2]. The presence of flaky graphite in the ordinary grey iron facilitates the penetration of oxygen, thereby increasing the internal oxidation. It probably also increases the irreversible expansion due to internal bursting, as the flaky cavities may act as stress concentrators. Nodular cast irons, on the other hand, with the graphite present in spheroids, should resist growth better when subjected to alternating cycles of heating and cooling.

Cylindrical bars 5 in. long and 0.5 in. dia. of grey irons of the composition shown in Table I were heated in air at 900 deg. C. for 30 min. and cooled. Both heating and cooling were carried out in the furnace. After measurements had been made, the procedure was repeated. The results are shown in Fig. 1.

TABLE I.—*Percentage Composition of Irons Used for Growth Tests.*

	T.C.	G.C.	Si.	P.	Ni.
Ordinary grey iron ..	3.17	2.50	2.58	1.44	—
Nodular cast iron (Mg treated)	3.16	2.64	1.88	0.02	1.77

In spite of the high phosphorous content the ordinary grey iron had grown 12 per cent. in length after 27 heatings and was so brittle that it fractured on dropping 3 ft. to a concrete floor. Metallographic examinations showed that extensive oxidation had taken place, along with the incidence of numerous oxide inclusions in a ferritic matrix (except in the central core of about $\frac{3}{16}$ in. dia. where a small amount of pearlite remained). The growth of the nodular iron after repeated heatings at 900 deg. C. was only about one quarter of that of the ordinary grey iron. The reduced amount of growth cannot be entirely attributed to the presence of the nickel in this material. There was no marked change in the microstructure of the pearlitic matrix, except very near the surface, where de-carburisation had taken

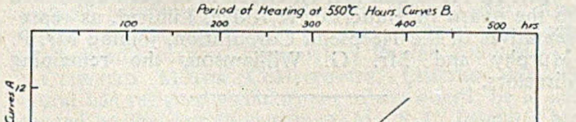

FIG. 1.—RESULTS OF REPEATED HEATING AND COOLING TESTS AT 550 AND 900 DEG. C. FOR NODULAR AND ORDINARY CAST IRONS.

place. The specimen after 27 cycles of heating and cooling had an Izod notched-bar (one cm. square) impact value of 3 ft. lb. and unnotched-bar impact value of 8 ft. lb.

The growths in length of the ordinary and the nodular grey irons after 550 hours at 550 deg. C. amounted to 0.6 and 0.45 per cent. respectively and were chiefly due to the graphitisation of the combined carbon. The changes in the structure of these materials were clearly reflected in the hardness:—

	V.D.P. Hardness (30 kg. load).	
	Ordinary grey iron.	Nodular iron.
As received	230	235
After 550 hours at 550 deg. C. ..	151	157
After 27 heatings of 30 min. at 900 deg. C.	82 (surface) 92 (core)	190

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Discussion—Patternmaking for General Engineering Castings

(*Continued from page* 432)

MR. DUNNING said he felt quite sure that the plastic patterns referred to could not be phenolformaldehyde, as before starting to make a job in that group of material, the expenditure of hundreds of pounds would have to be made for the requisite dies. Mr. Dunning said how much he had enjoyed the lecture, and he noted that Mr. Brittain had said that castings could not be more accurate than the patterns from which they were made. When he was a patternmaker, this was what he was always given to believe. He had found, however, that since becoming a foundryman, he was expected to make castings even more accurate than the patterns themselves. Mr. Dunning also referred to the fact that the lecturer had mentioned that cast iron was the most suitable material for making metal patterns, but he (Mr. Dunning) was sure that there were many cases where cast iron was not the best material. It was very brittle and not very easy to work up. He suggested that brass was better and, as far as the sweating was concerned, this could be overcome by slightly heating the patterns.

MR. BRITTAIN said that there was a field for each particular type of metal pattern, and it had to be decided independently as to which type of metal was to be preferred. Experience came into the picture and for the larger patterns his company had found that cast iron was quite suitable, and smaller patterns made from aluminium or brass were quite satisfactory. He said that experiments had shown that cast-iron patterns would stand a greater number off, and show less wear than the other type.

MR. H. G. HALL (chairman) regretted that he had to close the discussion at this point, and added his thanks to Mr. Brittain for his very interesting lecture.

Prices of Canadian Pine

Mr. Brittain has asked us to point out that in the first part of his Paper, printed in last week's issue, under the heading "Materials," he quoted the price of "third-quality" Canadian pine as being in the region of £70 per standard. The correct price is approximately £120 per standard, which works out at 4s. for a piece of pine 12 in. long by 3 in. by 11 in. wide.

More Foundry Amenities

A milestone was placed in the long history of the firm of James Smethhurst & Son, Limited, iron founders and engineers, of Foundry Street, Warrington, when the Mayor of the Town, Councillor W. Higham, J.P., officially opened the recently-installed hot shower baths for the use of the foundry employees, together with a new canteen and rooms containing heated and ventilated clothes lockers.

Also present at the ceremony were the Mayoress of Warrington; Mr. and Mrs. J. E. Smethurst (managing and co-director of the firm respectively); Mr. R. Bell (works director) and Mrs. Bell; Councillor W. L. Challinor; and Mr. C. D. McIntosh, architect of the scheme, and the staff.

Mr. J. E. Smethurst, in his address prior to the opening ceremony by the Mayor, told his audience of the tremendous strides made, and still being made, by the firm to improve the amenities of their workpeople. The firm had come a long way since the date of its establishment in 1725, and, with the co-operation of directors and employees, would no doubt progress still further. Mr. Smethurst, on behalf of the directors and workpeople, then presented the Mayor with a fountain pen as a small souvenir for his good offices in performing the opening ceremony. The youngest apprentice of the firm also presented the Mayoress with a bouquet of flowers.

The Mayor, in his reply to Mr. Smethurst, spoke of his willingness to assist at any time in anything that would benefit the town of Warrington and its inhabitants, and stated that it gave him the greatest pleasure, as one who had himself started his career on the foundry floor, to declare the buildings open.

Obituary

MR. JAMES REID, of Rutherglen, late of the Phœnix Tube Works of Stewarts and Lloyds, Limited, died on April 10. He was 77.

MR. THOMAS BROTHERTON, for 40 years with the Metropolitan-Vickers Electrical Company, Limited, Trafford Park, Manchester, 17, has died aged 64.

MR. JOHN PRENTICE MACKECHNIE, late of G. & J. Weir, engineers and founders, of Cathcart, Glasgow, died in an Oban hospital on April 2.

MR. FREDERICK HAROLD HURREN, managing director of Coventry Malleable & Aluminium, Limited, Coventry, has died after a short illness at the age of 68.

MR. HERBERT AUGUSTUS CULHAM, managing director of G. Hopkins & Sons, Limited, brewery, dairy, and general engineers, of Highbury, London, N.7, died recently.

MR. WILLIAM CECIL CRAVEN, a director of Gresham & Craven, Limited, ironfounders and manufacturers of railway appliances, of Salford (Lancs), died recently in London.

Imports of Vegetable Oils

The Ministry of Food, in consultation with the Board of Trade, directs attention to the fact that while imports of certain vegetable oils, including teaseed oil, are at present admitted under open general licence from selected countries, there have been recent instances of imports of oil described as "teaseed oil" which on analysis has been found to contain an admixture of other oils, such as groundnut oil, coconut oil, palm oil or palm kernel oil. Such mixtures are not covered by the open general licence and are, moveover, subject to restrictions on sale under the Oils and Fats (No. 2) Order, 1949.

1950 Census of Production

The scope of the Census of Production for 1950 and the information to be obtained have now been settled after consultation with the Census of Production Advisory Committee. The statutory form of return will contain sections relating to (1) working proprietors; (2) employment; (3) wages and salaries, etc.; (4) materials and fuel purchased; (5) work given out; (6) stocks at the beginning and end of the year; (7) output and merchanted goods sold; and (8) analysis of sales. The first five of the sections will be broadly as for 1949, except that for wages no quarterly figures, but only the year's total, will be required.

An important change in the questions for 1950 from those in previous censuses is that firms will be asked to give the total value of sales and of stocks of merchanted goods.

In the output section, firms will also be asked to state separately the total value of sales of their own manufactures, and the total payment received for work done. The analysis of sales section will be broadly on the same lines as for 1948, but will cover merchanted as well as manufactured goods.

A voluntary inquiry into capital expenditure is being undertaken by the Board of Trade and other departments among a sample of industrial firms, and it has been decided that, if this inquiry meets with a satisfactory response, no questions about capital expenditure need be included in the Census of Production for 1950.

Neepsend Steel's Acquisition

The entire capital of Hattersley & Ridge, Limited, stampers and forgers, of Club Mill Road, Sheffield, 9, has been acquired by the Neepsend Steel & Tool Corporation, Limited, Neepsend, Sheffield, 3. The deal includes the South African interests of Hattersley & Ridge. Mr. A. Hattersley, founder, chairman, and managing director of Hattersley & Ridge, has been appointed to the board of the Neepsend Steel & Tool Corporation, and he will remain managing director of his former company, the new chairman of which is Mr. J. C. Widdowson, a director of the Neepsend Corporation, and managing director of Jonas & Colver (Novo), Limited, crucible and alloy steel manufacturers, of Attercliffe, Sheffield, 9.

Mr. H. Plews and Mr. G. Green have been appointed to the board of Hattersley & Ridge, Limited, as representatives of the Neepsend Corporation, joining Mr. P. Murphy and Mr. G. Williamson, the remaining directors.

Engineers to Strike?

Ballot papers asking members to say whether they favour strike action or arbitration over their rejected claim for an increase of £1 a week have been sent out by the Confederation of Shipbuilding and Engineering Unions. Voting is to be conducted separately by each of the 37 affiliated unions. The ballot papers are returnable on June 30 and the result will be announced on July 13.

The decision to take a strike ballot was made despite intervention by the Ministry of Labour. Mr. Gavin Martin, secretary of the Federation, has said:—"If there is the necessary two-thirds majority in favour of strike action, which we expect to get, then we will strike."

Although the ballot is based on the Confederation's affiliated membership of 1,250,000, any strike would involve nearly 3,000,000 engineering and shipbuilding workers.

Another Steel Output Record

A record annual production rate of over 17 million tons was attained by the British steel industry last month. The British Iron and Steel Federation announced last Thursday that the weekly average output was 329,800 tons, equivalent to an annual rate of 17,147,000 tons. The previous monthly record was in February, output then being at an annual rate of 16,898,000 tons.

Steel output in the first quarter of this year amounted to 4,169,600 tons and was 207,000 tons above the output in the first quarter of 1949. The Federation states that the effect of holidays later in the year must, of course, be borne in mind, but the increase in output in the first quarter represents a substantial step to the achievement of the annual increase for which the "Economic Survey" budgets in 1950.

Pig-iron output in March was at an annual rate of 9,696,000 tons, which compares with 9,295,000 tons a year ago.

The latest steel and pig-iron output figures (in tons) compare as follow with earlier returns:—

	Pig-iron.		Steel ingots and castings.	
	Weekly average.	Annual rate.	Weekly average.	Annual rate.
1950—January ..	187,400	9,742,000	305,300	15,873,000
February ..	184,400	9,588,000	325,000	16,898,000
March ..	186,500	9,696,000	329,800	17,147,000
1st qtr. ..	186,100	9,677,000	320,700	16,679,000
1949—January ..	178,100	9,262,000	288,500	15,002,000
February ..	181,200	9,422,000	311,100	16,176,000
March ..	178,800	9,295,000	312,900	16,269,000
1st qtr. ..	179,300	9,324,000	304,800	15,850,000

Board Changes

ASSOCIATED ENGINEERING HOLDINGS, LIMITED—Mr. E. C. Russle has been appointed a director.

UNION STEEL & MANUFACTURING COMPANY, LIMITED, Wolverhampton—Mr. G. P. Smith has been appointed a director.

FAIRBAIRN LAWSON COMBE BARBOUR, LIMITED, engineers and ironfounders, of Wellington Street, Leeds, —Mr. J. C. Lawson has been appointed a director.

WALMSLEYS (BURY), LIMITED, manufacturers of papermaking machinery, etc., of Bury (Lancs)—Mr. Alan Green has been appointed a director of the company and of their subsidiaries, Ashworth & Parker, Limited.

CLIFFORD MOTOR COMPONENTS, LIMITED—Mr. A. Good has resigned as chairman of the board; he is succeeded by the deputy chairman, Mr. S. C. Joseph. Mr. Good remains an ordinary director of the company, while Mr. Joseph retains his position as managing director.

HENRY ROBB, LIMITED, shipbuilders and repairers, of Leith, Edinburgh—Mr. Henry Robb, jun., deputy managing director, has been appointed joint managing director. Mr. S. R. Tait, secretary, and Mr. W. H. Prowse, shipyard director, who have retired from the board, are succeeded on the board by Mr. J. B. Paterson, who has been chief accountant, as secretary, and Mr. W. Jenkins, yard manager.

NATIONAL CORPORATION SONDERBRONZE (special-brass) of Berlin-Oberschöneweide, exhibited, at the recently-held Leipzig Fair, a new type of brass which is being used for the manufacture of non-sparking tools. According to the manufacturers, this type of brass is a substitute for beryllium-copper which has been used previously for this purpose.

Parliamentary

Joint Consultation

The need for the development of joint consultation in industry was stressed by speakers of all parties in a House of Commons debate before the adjournment for the Easter Recess. MR. FERNYHOUGH (Lab.), who initiated the debate, said there were still too many employers who refused to take workers into consultation and others who were bitterly opposed to trade unionism.

The setting up, wherever possible, of joint consultative machinery in the factory or workshop was advocated by MR. MCCORQUODALE (Con.), who said, however, that consultative committees must not in any way usurp the function of the trade unions or of executive management.

Mr. McCorquodale said also that the committees must not be used as an ashcan where grievances or troubles could be tipped and then forgotten. His party, he said, believed that industry should provide three general rights to employees:—(1) Security of employment; (2) incentive to do the job well and to get a better one; (3) status as an individual, however big the firm or however mechanised the job.

Joint industrial councils were described by SIR PETER BENNETT (Con.) as an adjunct to good management and not a substitute for it. The councils had been a success in his factories. Employers and employed would get as much out of joint consultation as they put into it.

Mass Meetings of Workers

MR. GUNTER (Lab.) said that trade unionists were trying to operate a machine with the instruments of 25 years ago. Their job was to interpret to workers inside the factory the truth that, in the long run, better standards of life depended on more efficient production. It was not an easy task to allay the haunting fears of past years.

Another Labour speaker, MR. JACK JONES, former Parliamentary Secretary to the Ministry of Supply, said that the time had come to go farther than joint consultation. He advocated mass meetings of workers in the employers' time at which the position of industry could be explained in clear language by representatives of the employers and the trade unions. Employers who did this would get results which would stagger them, he said.

The MINISTER OF LABOUR said that he was proud to reply to a debate in the nation's supreme joint industrial council. Any attempt to impose joint consultation would fail at the beginning. Mr. Isaacs said that there was no other country in the world which had as good industrial relations as existed in Britain. Of the 54 industries that had been approached to establish joint consultation organisations, 51 had taken steps to set up machinery or already had the machinery in operation.

The Minister said that most people in speaking about joint consultation referred to talks between the top management and the rank and file, but workers of all descriptions should be included, or there would be sections of workers adopting a cynical attitude.

WE REGRET that in reporting the discussion at a meeting of the Slough section of the Institute of British Foundrymen in our issue of April 7 an error was made in the dimensions quoted. The relevant sentence which opened the discussion should have read:—

> Replying to Dr. Scheuer, the lecturer said that it was not attempted to cast a thin white-metal layer on to the steel shell, but it was more economical to cast on a layer about $\frac{1}{16}$ in. thick and then machine to the necessary 0.004 in. thickness. The copper-lead bearings were produced by powder metallurgy.

Company News

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

Staveley Coal & Iron Company, Limited:—Stockholders are notified by the directors that, because of an error in the published accounts for the year ended June 30, 1949, which were submitted to the annual meeting on October 26, the market value of the quoted investments was understated by an amount of £834,520. The company has large holdings of preference and ordinary stock in Doncaster Amalgamated Collieries, Limited, which were transferable in units of £1. During the company's year ended June 30, 1949, a sum of 6s. 8d. per £1 unit of stock was repaid in respect of such holdings.

This repayment was inadvertently treated as a reduction in the total number of stock units held and the market values were accordingly computed on the reduced number; in fact, the number of stock units, upon which the market value should have been computed, remained unchanged, but the nominal amount of each unit was reduced from £1 to 13s. 4d. It will be appreciated that neither the book value of the investments nor the profits shown in the company's profit and loss account or in the consolidated profit and loss account are in any way affected by this mistake.

The directors very much regret that this error, which has only just come to their notice, should have occurred.

Light Production Company, Limited:—The company announces that the offer made by Sheepbridge Engineering, Limited, has been accepted by holders of 10,000 preference shares and 61,377 ordinary shares in the Light Production Company, and that, despite the fact that the acceptances total less than nine-tenths in value of the ordinary shares offered to be acquired, Sheepbridge Engineering has elected to treat the offer as having been accepted in respect of the requisite majority.

The offer by Sheepbridge Engineering was to acquire the 10,000 7½ per cent. cumulative preference shares of £1 at 30s. per share, and the 75,313 ordinary shares of 5s. by the allotment of one ordinary share of 10s. in Sheepbridge for every two Light Production ordinary shares of 5s.

Shotts Iron Company, Limited:—The directors have received the Court of Session's approval of their petition for reduction of capital. They now propose to repay at par the capital of the preference and second preference shares on May 15 next with the accrued dividends at the rate of 5 per cent. per annum from October 1 last to May 15 next, inclusive. The capital repayment of 10s. per share on the £1 ordinary shares will be made on the same date.

Hadfields, Limited:—The directors state that negotiations are at present in progress for the "hiving-off" of certain of the subsidiaries whose activities do not lie within the iron and steel industry. They add that the volume of commercial sales was maintained during the year, and the orders on hand remain at a high level. The reorganisation and modernisation schemes made satisfactory progress during the year.

Drake & Gorham, Limited, manufacturing electrical engineers, etc., of Grosvenor Gardens, London, S.W.1:—The directors announce that a debenture, charged on the assets, has been given to the company's bankers as security for an overdraft limit of not exceeding £150,000 at any one time.

Scottish Shipbuilding Prospects

References to the high production costs facing the Scottish shipbuilding industry and prospects for the future have been made recently by several speakers. Mr. George Barrie, chairman of Barclay, Curle & Company, Limited, Glasgow, suggested that if the shipbuilders wished British owners to carry on replacing their war losses they must initiate a downward trend in costs. So many false Utopian ideas regarding what made for efficient production had been circulated during the last decade that they might have to await the pressure of economic circumstances before all concerned realised the need to make serious progress, he said.

Sir Maurice Denny, chairman of William Denny & Bros., Limited, Dumbarton, indicated that, although the shipbuilder in the matter of costs and time for construction was not yet master in his own home, there were at last most welcome signs that he would not be so much the creature of circumstances as he had been since the war.

Good prospects in the coming year in Greenock and Port Glasgow were forecast by Mr. Robert Greer, managing director of John G. Kincaid & Company, Limited, marine engineers, of Greenock, at the annual meeting of the Greenock Chamber of Commerce. He said that was provided that shipbuilders and engineers were left severely alone by the Government, and that there were no labour disputes.

Writing in the "Burntisland and Hall Russell Shipyard Journal," Sir Wilfrid Ayre, chairman and managing director of the Burntisland Shipbuilding Company, Limited, and managing director of Hall, Russell & Company, Aberdeen, suggests that output of work per man-hour should be restored to its pre-war level and that steel prices should be stabilised. If these suggestions were put to practical use, Sir Wilfrid says that the shipbuilders would be able to offer firm prices to shipowners, who, understandably, consider present prices too high. Although British shipbuilders have held supremacy in the world, he warns that there is serious competition from foreign shipyards, and to ensure that this country does not lose the lead, shipbuilders must return to normal commercial practice.

The gross tonnage of new ships ordered from Scottish shipyards during the first quarter of this year exceeded the tonnage built during the whole of the preceding year, stated Mr. Charles Murdoch, chairman of the Scottish Board for Industry. In the quarter ended March 28, the 22 ships ordered totalled 179,550 tons, an increase of 32,610 tons gross over the 1949 figure of 33 ships of 146,940 tons.

Movement of Wholesale Prices

The following table, taken from the "Board of Trade Journal," shows the movement of wholesale prices of industrial and building materials, expressed as percentage increases on the average for the year 1930 = 100.

Group.	1949.				1950.		
	Mar.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Coal ..	301.7	305.3	305.3	305.3	305.3	305.3	305.3
Iron and steel	237.7	257.9	258.1	257.8	257.8*	257.8*	257.8
Non-ferrous metals	268.8	277.5	283.3	277.2	277.4	276.8	274.3
Chemicals and oils	192.6	191.5	196.3	196.5	196.6	196.8	196.6
Building materials	224.4	226.8	225.9	225.2	226.2*	226.8*	225.6

* The figure published last month has been amended. Amendments made earlier are not marked, but wherever figures given in earlier tables differ from those above, the latter should be used.

News in Brief

THREE MORE STEAM LOCOMOTIVES of the 2-8-2 type have been ordered by the Sudan Railways from the North British Locomotive Company, Limited, Springburn, Glasgow.

NOTICE has been given by the Minister of Supply that the certified increase in the price of manganese ore for the manufacture of blast-furnace ferro-manganese is 1d. per unit.

CASTINGS to the value of £150,000 have been ordered by a group of Diesel-engine manufacturers from E. & L. B. Pinkney, Limited, Middlesbrough. Most of the work is stated to be for export.

GOLD WATCHES have been presented to 285 employees who have 35 years' or more service with Birmingham Small Arms Company, Limited. Among the recipients was the managing director, Mr. James Leck.

BRITISH INSULATED CALLENDER'S CABLES, LIMITED, have, as a result of wartime research, aimed at minimising the use of lead, developed and placed upon the market a range of aluminium-sheathed impregnated pressure cables.

ACCORDING TO THE Annual Report of the Engineer Buyers and Representatives Association, two new branches will shortly be established, the first to cover South Wales and the West of England, and the second, Lancashire, Yorkshire and the North West.

A TANKER of 16,500 tons dw. has been ordered by McCowen & Gross, Limited, London, from Lithgows, Limited, Port Glasgow. The propelling machinery, consisting of Doxford oil engines, is to be supplied by David Rowan & Company, Limited, Cranstonhill, Glasgow.

METALLURGICAL ENGINEERS, LIMITED, of Granite House, Cannon Street, London, E.C.4, announce that they have acquired the British Empire and Commonwealth rights for the manufacture and sale of the "Recuperator K.G" hot-blast cupola, which is manufactured according to the Piwowarsky patents.

CONTINUING the programme of oversea demonstrations for which the Wickman mobile demonstration equipment was introduced last year, this unit left for the Continent on April 12. A programme of demonstrations has been arranged in France, Italy, Switzerland, Germany, Holland, Denmark and Norway by the Wickman agents for those countries.

MEASURES BEING TAKEN to deal with the shortage of factory inspectors were referred to by the Minister of Labour in a recent Parliamentary reply. Mr. Isaacs said that two open competitions for filling posts in the factory inspectorate would be held this year. Steps had been taken to lower the age limit for recruiting from 23 to 21, so that younger graduates might be candidates, and also to make these openings better known to interested candidates.

THE REGISTRATION FEE for buyers at the first United States International Trade Fair to be held in Chicago, August 7 to 20, is $5.00. The fee includes the International Trade Fair catalogue, reservations and hotel-accommodation service, badge, and credentials authorising unlimited access to and transportation between all the buildings of the Fair. Other facilities to be provided for buyers include customs, translation, transportation and monetary exchange services.

"MAZDA" fluorescent lighting has been installed in the iron foundry of Wilson Bros. Pipefitting, Limited, of Glasgow. Equipment supplied British Thomson-Houston Company, Limited, was put in by Wilson's own electrical department. Layout of the fittings is in three rows along the length of the building (178 ft.), the centre row having eight units and the two outer rows sixteen each. The latter are set in nine feet from the walls on each side, the three rows then being spaced at 13 ft. intervals from each other. Mounting height is 30 ft. throughout.

RECENTLY, a party of about 40 boys from Falkirk Technical School paid a visit to M. Cockburn & Company, Limited, Gowanbank Ironworks, Falkirk, where they were given the opportunity of getting to know something of what a job in industry involves. They spent an afternoon touring the works under the expert guidance of the production staff, during which time they were shown the operations involved, from the design in the drawing office to the despatch of the finished product to the home or export market, and were shown how various service departments functioned.

INTERNATIONAL MEEHANITE METAL COMPANY have recently formed a new branch of the Meehanite Research Institute in Italy and on March 28 to 31 the first Conference of the Italian Meehanite licensees was held at Stresa on Lake Maggiore. Thirty-six persons attended and many discussions took place on Italian foundry practice, including subjects such as electric-furnace irons *versus* cupola irons; the planning of cost control; calculation of gating and running speeds; reorganisation of a fettling shop; mechanisation control of a textile casting foundry; utilisation of borings as pig iron; nodular-graphite cast irons, and other similar practical matters. The present Italian Meehanite licensees are:—Ansaldo S.A.; Franco Tosi Sp.A.; Societa Nebiolo; Meccaniche Tessili Oggionesi Arturo Carniti; Montecatini-Soc. Generale per l'Industria Mineraria et Chimica, and Compagnia Italiana Westinghouse. Representatives from Meehanite licensees in England and Holland also attended the Conference.

International Standards Organisation

Mr. Caquot (France) has been elected president of the International Organisation for Standardisation (I.S.O.) in succession to Mr. Howard Coonley (U.S.A.). Mr. Caquot has had a distinguished career as a civil engineer. His achievements include the construction of the Madeleine Bridge at Nantes, the Lafayette Bridge in Paris, and the Pont de la Caille in Haute-Savoie. For his services to the allied cause during the 1914-18 war the British awarded Mr. Caquot the D.S.O. and the C.M.G.

Membership of the I.S.O. is confined to representatives of the national standards bodies throughout the world. The British Standards Institution represents the United Kingdom, and implements international recommendations by reference to them in the appropriate British Standards. In order to secure effective co-ordination of standards within the international field, the B.S.I. would be grateful if all those associated with international movements concerned with standardisation would get in touch with the British Standards Institution at 28, Victoria Street, London, S.W.1.

Amsterdam Foundry Congress

The Netherlands Journal *Metalen* has issued a special number covering the work of the International Foundry Congress held in Amsterdam last September. A second one will appear in the near future which will carry the balance of the proceedings. With the exception of one paper in French all the rest are in English. It is a most creditable production. It is published by Drukkerij-Uitgeverij, 'De Hoftstad, Scheepmakersstraat 1-3, 's. Gravenhage, Holland. The price is not stated.

Company Results

(Figures for previous year in brackets.)

FORD MOTOR COMPANY—Dividend of 10%.

PARKINSON & COWAN—Dividend of 7% (same).

COLVILLES—Final dividend of 5%, making 13% (same).

TEXTILE MACHINERY MAKERS—Dividend of 6% (same).

HALESOWEN STEEL COMPANY—Final dividend of 15%, making 20% (same).

CRAVEN BROS. (MANCHESTER)—Final dividend of 10%, making 15% (same).

MANGANESE BRONZE & BRASS COMPANY—Final dividend of 20%, making 30% (same).

QUIRK, BARTON & COMPANY—Final dividend of 6% and bonus of 4%, making 12½% (same).

NEWTON, CHAMBERS & COMPANY—Final dividend of 10% on increased capital (10%), making 15% (same).

LANCASHIRE DYNAMO & CRYPTO COMPANY—Second interim dividend and bonus of 17½%, making 22½% (same).

AEROPLANE & MOTOR ALUMINIUM CASTINGS—Interim dividend of 12½% (same, when no further payment).

PARKER, WINDER & ACHURCH—Dividend of 5% for the half-year ended December 31, 1949, making 15% for the year (same) and bonus for the year of 20% (same).

BLAW KNOX—Trading profit for 1949, after provision for contingencies, etc., £350,898 (£195,718); net profit, after depreciation, tax etc., £109,982 (£84,564); dividend of 30% (same); forward, £372,213 (£294,603).

VULCAN FOUNDRY—Profit for 1949, after taxation, etc., £119,263 (£73,705); available, after pensions, general reserve, etc., £84,513 (£83,212); dividend of 5% and bonus of 1½% (same); forward, £54,301 (£53,000).

JOSIAH PARKES & SONS—Consolidated trading surplus for 1949, £116,721; net profit, after depreciation, etc., £79,486; to British taxation, £37,728; final dividend of 8½%, making 12½% (same); to reserve, £25,000; forward, £10,351 (£18,593).

BEYER, PEACOCK & COMPANY—Group profit for 1949, £355,594 (£282,333); net profit, after depreciation, taxation, etc., £145,706 (£131,781); retained by subsidiaries, £21,226 (£43,072); net profit of parent company, £124,480 (£88,709); dividend of 5% and bonus of 1% (same); to general reserve, £100,000 (£50,000); forward, £48,154 (£52,549).

WILLIAM GRAY & COMPANY—Trading profit for 1949, £476,801 (£422,455); net profit, after depreciation, taxation, etc., £188,321 (£151,256); tax adjustment for previous years, £13,001 (nil); to reserve, £25,000 (£10,000); deferred repairs, £20,000 (£12,000); capital losses written off, £75,000 (£100,000); additional depreciation, £50,000 (nil); dividend of 3½% (same); forward, £12,638 (£10,191).

JAMES H. LAMONT & COMPANY—Trading profit for 1949, £132,828 (£113,807); net profit, after depreciation, etc., £70,720 (£63,444); to taxation, £36,365 (£41,505); directors' fees, £900 (same); staff bonuses, £650 (£616); written off goodwill, £8,402 (£6,285); general reserve, £12,500 (£3,000); benevolent fund, £300 (£200); final dividend of 20%, making 25% (same); forward, £3,560 (£2,847).

ROBERT STEPHENSON & HAWTHORNS—Trading profit and sundry receipts for 1949, £103,207 (£116,174); net profit, after depreciation, etc., £82,316 (£93,430); tax provision no longer required, £57,396 (nil); to income tax, £30,000 (£39,000); profits tax, £11,500 (£13,000); deferred repairs provision, £50,000; general reserve, £35,000 (£30,000); dividend of 5% and bonus of 2% (same); forward, £14,676 (£12,051).

METROPOLITAN-CAMMELL CARRIAGE & WAGON COMPANY—Consolidated trading profit for 1949, £1,001,329 (£711,332); net profit, after depreciation, tax, etc., £423,479 (£285,005); excess taxation reserve, £3,116 (£25,927); transfer to provisions, £120,000 (£31,825); off patents and goodwill, £5,000 (£2,500); to general reserve, £142,283 (£161,332); dividend of 10%, tax free (same); forward, £184,314 (£125,033).

ENGLISH STEEL CORPORATION—Group trading profit for 1949, £2,971,987 (£2,740,197); net profit, after depreciation, taxation, etc., £1,023,376 (£1,081,595); sundry receipts relating to previous years, less tax, £154,833 (nil); to debenture sinking fund, £28,082 (£26,492); year's preferred ordinary dividend, £85,812; final dividend on the deferred shares of 7½%, making 17½%, free of tax (same)); forward, £1,831,731 (£965,362).

A. REYROLLE & COMPANY—Group trading profit for 1949, £1,356,954 (£757,589); net profit, after depreciation, etc., £587,675 (£303,598), of which £468 is retained in accounts of one subsidiary; to general reserve, £200,000 (£25,000); development expenditure account, £100,000 (£50,000); stores and work in progress reserve, £75,000 (£65,000); renewals, £75,000 (£40,000); dividend of 15% (12½%); forward, £162,270 (£158,480).

MASSEY-HARRIS—Trading profit for 11 months to October 31, 1949, £446,061 (£300,721 for 12 months); to depreciation, £10,168 (£8,031); interest, £10,100 (£4,806); debenture interest and fees, £13,063 (£14,250); directors' emoluments, £4,875 (£5,271); audit, £1,750 (£1,500); taxation, £233,000 (£146,700); preference dividend, £3,529 (£3,850); ordinary dividend of 15%, tax free, £28,500 (12%, tax free, £22,800); forward, £263,233 (£122,157).

RICHARD LLOYD—Trading profit for 1949, £82,578 (£86,048, plus £402 interest on tax-reserve certificates); net profit, after depreciation, tax, etc., £25,830 (£27,520); received for war-damage claim, £1,441 (nil); provision for taxation not required, nil (£8,000); to general reserve, £15,000 (£10,000); reserves and developments, nil (£15,000); special reserve, nil (£402); dividend of 13½% on capital increased by 50% bonus (20%); forward, £20,139 (£17,207).

BRUSH ELECTRICAL ENGINEERING COMPANY—Consolidated trading profit for 1949, £1,926,024 (£1,319,420); net profit, after depreciation, taxation, etc., £653,878 (£651,510); special provision on account of turbine reconstruction programme, nil (£150,000, leaving £501,510, or £315,272 prior to merger); to general reserve, £500,000 (£250,000); preference dividends, £30,250 (£21,024); interim ordinary dividend of 4% (nil); final ordinary dividend of 6% (10% on half present capital); forward, £54,278 (£18,220).

CROFTS ENGINEERS (HOLDINGS)—Group trading balance for 1949, £632,995 (£535,668); profit, after depreciation, tax, etc., £269,062 (£212,978); to general reserve, £150,000 (nil); stock reserve, £30,000 (nil); preference dividends, £13,750 (£1,146); final dividend of 20%, making 35%; profits of subsidiaries prior to acquisition, nil (£434,975); written off goodwill, nil (£5,000); dividends paid by a subsidiary prior to acquisition, nil (£67,883); forward, £15,577 (£17,265). The company was registered in November, 1948.

BELL'S ASBESTOS & ENGINEERING (made a public company in October, 1948)—Group profits, £182,294 (£181,551); net profits, after tax, etc., £70,903 (£85,855); reserve no longer required, nil (£3,584); minority interests, £3,356 (£2,665); leaving £67,547 (£86,774); dividends paid: 5½% preference £4,538 (same), 5% second preference £6,531 (£1,187), final ordinary dividend of 20%, making 35% (same), the interim dividend being paid on smaller capital); transfer to reserve, £20,000 (£5,000); forward (group), £114,681 (£108,233).

DERBYSHIRE STONE—Group trading profit for 1949, £246,156 (£187,945); balance, after depreciation, tax, etc., £107,071 (£69,675); transferred to tax equalisation reserve, £25,000 (nil); dividends to stockholders of Derbyshire Stone, £28,099 (same); balance of profit added to profits carried forward, £53,972 (£41,576)—by Derbyshire Stone nil (£2,633), by subsidiaries £55,756 (£38,943); reduction of profits carried forward by parent, £1,784 (nil); total forward, £227,397 (£173,425)—Derbyshire Stone £105,471 (£107,255), subsidiaries £121,926 (£66,170).

JAMES BOOTH & COMPANY—Consolidated trading profit for the year to December 31, 1949, £125,464 (£245,512); net profit, after depreciation, tax provision, etc., £46,245 (£105,582); provision for tax not required, £224,825 (nil); tax reserve certificates interest, nil (£15,029); making £271,070 (£120,611), of which £225,177 (£111,093) is attributed to the parent company and £45,893 (£9,518) to the subsidiary; to revenue reserves, £110,000 (£73,364); additional depreciation, £50,000 (nil); dividend of 20% (same); balance forward, £364,491 (£342,081), of which £222,939 (£211,422) is the parent company's.

Contracts Open

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

BELFAST, April 27—Brass and copper fittings, cast-iron pipes and fittings, compo pipe and pig-lead, flexible metallic tubes, iron castings, purifier grids, etc., for the City Council. The Gasworks, Ormeau Road, Belfast.

BELFAST, May 1—Supply and laying of about 2,227 yds. of 21-in. dia. spun-iron pumping main, for the City Council. The City Surveyor, Room 88, City Hall, Belfast.

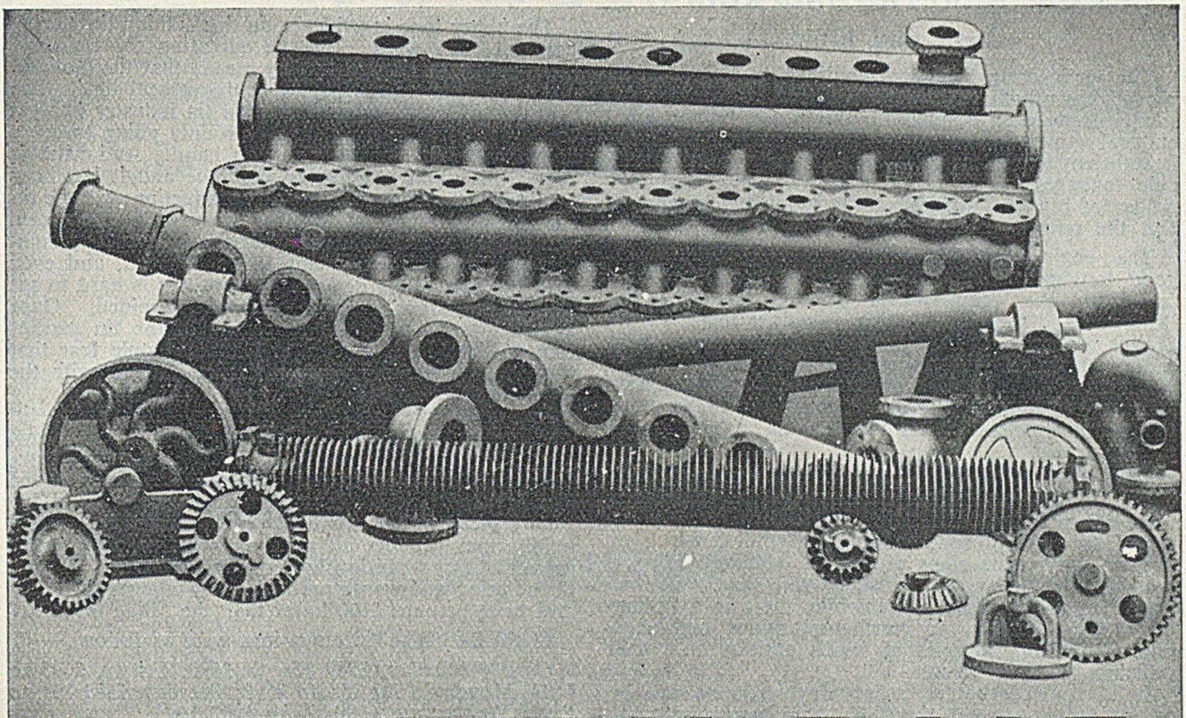
EGYPT, September 5—Supply and erection of a mint, including metallurgical furnaces, rolling mills, shears, presses, stamps, etc., for the Ministry of Commerce and Industry. The Chief Inspecting Engineer, Egyptian Government, 41, Tothill Street, London, S.W.1. (Fee, £2 1s.)

JOHANNESBURG, May 11—Heat-treatment plant, for the South African Railways and Harbours. (Reference: CRE (IB) 48795/50; Room 1086.)

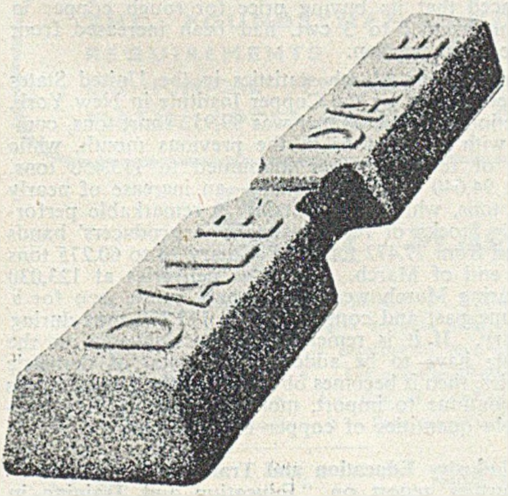
JOHANNESBURG, June 15—Six moulding machines, for the South African Railways' Stores Department. (Reference: CRE (IB) 48805/50; Room 1085.)

LUTTERWORTH, April 26—Contract No. 3: About 10,000 yds. of spun- and cast-iron water mains, mostly 4 in. and 3 in. dia.; Contract No. 4: Valves, hydrants, etc., for the Rural District Council. Pick, Everard, Keay & Gimson, engineers, 6, Millstone Lane, Leicester. (Deposit, £2 2s.)

REETH, June 12—Provision and laying of 47,694 yds. of 6 in. to 3 in. dia. spun-iron pipes, etc., for the Rural District Council. Mr. W. K. Rodwell, consulting engineer, 29, High Street, Wetherby. (Deposit, £5 5s.)



STANTON-DALE



REFINED PIG IRON

Designed to meet the demands of high quality castings, which are, strength, machineability and resistance to wear.

All these can be secured by using Stanton-Dale Refined Pig Iron in your cupolas.

The above illustration shows a group of castings made by Messrs. Goodbrand & Co. Ltd., Stalybridge, Cheshire.

PROMPT DELIVERY

THE STANTON IRONWORKS COMPANY LIMITED NEAR NOTTINGHAM

Raw Material Markets

Iron and Steel

The engineering foundries continue to be well employed, the production capacity of many of them being totally engaged on castings for the motor, tractor, agricultural implement, and allied trades. Business available is sufficient to replace outputs, which require all available tonnages of the low- and medium-phosphorus grades of pig-iron, together with supplies of hematite and the refined grades.

The engineering foundries are also taking up good tonnages of Derbyshire high-phosphorus iron, and with the requirements of the textile establishments and some of the light foundries there is little of this grade of pig-iron to spare; in fact, many users cannot obtain all the supplies they need.

Business at the jobbing foundries shows little, if any, improvement, and continuous efforts have to be made to secure sufficient orders to maintain production at present levels.

The light foundries, as a whole, are not very busy, although some of them are better placed than others. The chief sufferers are those mainly engaged on castings for the building trades, which at present show little signs of revival, although hope is sustained that some improvement will shortly be witnessed in this market. Meanwhile, there is a falling-off in the demand for Northamptonshire high-phosphorus pig-iron, supplies of which appear more than sufficient to satisfy needs.

It is reported that a furnace in Northants will be out of production for about 10 to 12 weeks from the middle of next month, for relining, but this should cause no serious hardship unless there is a heavier demand than at present.

The Control continues to veto consignments of the foundry grades of pig-iron and hematite for shipment abroad, and, judging by the present demand from home foundries for some of these grades, the wisdom of their decision is apparent. An improvement in other branches of the foundry industry would no doubt absorb those irons which are now in plentiful supply and it can be assumed that for this reason permission will only be given at present for the excess production of the refined grades over home requirements to be released for export.

A good demand continues for suitable parcels of cupola scrap in both cast iron and steel, although there are satisfactory supplies at hand at the foundries for current needs.

Coke supplies for cupola heating and core-oven purposes are coming to hand in satisfactory tonnages and the producers are generally able to satisfy demands. The calls from the foundries for ganister, limestone, and firebricks are fulfilled, and those foundries in need of ferro-alloys can usually secure the grades and quantities required.

Steel output is maintained. Small angles continue to be available from current rollings, but the demand for steel plates and sheets continues to be in excess of the supply. Stocks of bars of the heavier sizes produced by the re-rollers are restricting further purchases at present, and until these stocks in the hands of users and merchants are reduced business is likely to remain stagnant.

The result is that the heavy mills are not engaged to maximum capacity, but the continued demand for the smallest sections and bars rolled by the light mills is to some extent relieving the position and countering the shortage of orders for the larger sizes rolled by them.

Non-ferrous Metals

The better tone in evidence on the London tin market continued last week. But the quotation has remained below £600, which presumably means that the Government is not doing any selling at the present time. The problem of over-production in the tin industry has yet to be solved, and this year is certainly going to see a considerable surplus of metal on hand. And what is more, this trend is going to continue and it has been computed that by 1952 world production will be in the neighbourhood of 200,000 tons. That the world can absorb such a total on the basis of everyday commercial consumption is not to be believed, and even with the stockpiling demand thrown in it is hard to see how an onerous surplus could be avoided. Once again, it looks as if the reopening of the tin market was deferred for too long, and many people fear that the Government is making a similar mistake with the other metals.

At one time—and not so very long ago—tin was in short supply and it looked as if a very long period would elapse before the position achieved equilibrium. But, as often happens, matters have mended much more quickly than was expected, and now to-day we are faced with a situation, which, unless it is tackled boldly, may produce all sorts of troubles. Consumers are still buying cautiously for they are not at all sure of the price, and would probably only take up tin freely at a price perhaps £100 lower than the rating level.

Metal Exchange tin quotations were as follow:—

Cash—Thursday, £589 15s. to £590; Friday, £593 to £594; Monday, £597 15s. to £598; Tuesday, £589 10s. to £590; Wednesday, £590 5s. to £590 10s.

Three Months—Thursday, £591 5s. to £591 10s.; Friday, £594 to £594 10s.; Monday, £598 15s. to £599; Tuesday, £591 10s. to £591 15s.; Wednesday, £591 5s. to £591 10s.

The Ministry of Supply raised the United Kingdom price of copper by £9 to £162 per ton, delivered consumers' works, yesterday (Wednesday). The change followed an upward movement of 1 cent per lb. in the U.S. price. On the same day the Ministry also announced that its buying price for rough copper in slabs of from 2 to 3 cwt. had been increased from £120 to £126 per ton.

Details of the March statistics in the United States have been issued by the Copper Institute in New York. Production of crude copper was 89,952 short tons, compared with 81,216 tons in the previous month, while output of refined copper amounted to 113,450 tons, against 94,040 tons in February—an increase of nearly 20,000 tons, which was certainly a remarkable performance. Stocks of refined copper in producers' hands declined from 77,472 tons at February 28 to 60,275 tons at the end of March. Domestic deliveries at 123,030 tons during March were the highest figure seen for a long time past and compared with 112,770 tons during February. If it is remembered that deliveries to the stockpile have to be added to the total of domestic deliveries, then it becomes obvious that the United States must continue to import, month by month, very considerable quantities of copper from abroad.

Steel Industry Education and Training

A further report on "Education and Training in the Iron and Steel Industry" has been published by the British Iron and Steel Federation. The report covers the second of the industry's training conferences, held at Ashorne Hill, Leamington, this one dealing with the complex problems of training junior operatives and clerks.

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

(Delivered, unless otherwise stated)

April 19, 1950

PIG-IRON

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

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

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

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

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

Cold Blast.—South Staffs, £15 16s. 6d.

Hematite.—Si up to 2½ per cent., S & P over 0.03 to 0.05 per cent. ; N.-E. Coast and N.-W. Coast of England, £11 16s. 6d. ; Scotland, £12 3s. ; Sheffield, £12 9s. ; Birmingham, £12 15s. ; Wales (Welsh iron), £11 16s. 6d.

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

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

FERRO-ALLOYS

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

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

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

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

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

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

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

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

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

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

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

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

SEMI-FINISHED STEEL

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

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

Sheet and Tinplate Bars.—£16 16s. 6d.

FINISHED STEEL

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

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

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

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

NON-FERROUS METALS

Copper.—Electrolytic, £162 ; high-grade fire-refined, £161 10s. ; fire-refined of not less than 99.7 per cent., £161 ; ditto, 99.2 per cent., £160 10s. ; black hot-rolled wire rods, £171 12s. 6d.

Tin.—Cash, £590 5s. to £590 10s. ; three months, £591 5s. to £591 10s. ; settlement, £590 5s.

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

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

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

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

Brass.—Solid-drawn tubes, 15¾d. per lb. ; rods, drawn, 19¾d. ; sheets to 10 w.g., 20⅛d. ; wire, 20⅝d. ; rolled metal, 18⅞d.

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

Gunmetal.—Ingots to BS. 1400—LG2—1 (85/5/5/5), £101 to £115 ; BS. 1400—L.G.3—1 (86/7/5/2), £110 to £122 ; BS. 1400—G1—1 (88/10/2), £158 to £200 ; Admiralty GM. (88/10/2), virgin quality, £185 to £195, per ton, delivered.

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

Phosphor Bronze.—Strip, 27¾d. per lb. ; sheets to 10 w.g., 29⅝d. ; wire, 29½d. ; rods, 27½d. ; tubes, 32⅞d. ; chill cast bars : solids, 27½d., cored, 28½d. (C. Clifford & Son, Limited.)

Nickel Silver, etc.—Ingots for raising, 1s. 9½d. per lb. (7%) to 2s. 7¾d. (30%) ; rolled metal, 3 in. to 9 in. wide × .056, 2s. 3½d. (7%) to 3s. 1¾d. (30%) ; to 12 in. wide, × .056, 2s. 3¾d. to 3s. 2d. ; to 25 in. wide, × .056, 2s. 5¾d. to 3s. 4d. Spoon and fork metal, unsheared, 2s. 2d. to 3s. 0¼d. Wire, 10g., in coils, 2s. 8¼d. (10%) to 3s. 7¼d.; (30%). Special quality turning rod, 10%, 2s. 7¾d. ; 15%, 3s. 0¼d. ; 18%, 3s. 4½d.

Personal

MR. NELSON HARWOOD, Principal of Chesterfield Technical College for the past 12 years, has received presentations on his retirement.

MR. R. H. BUCKLAND, works manager of Leys Malleable Castings Company, Limited, has been appointed a director of the company.

MR. G. R. SANKEY, deputy managing director of Joseph Sankey & Sons, Limited, Bilston (Staffs), has been appointed Sheriff of Staffordshire.

MR. L. STANIFORTH, warehouse manager for William Jessop & Sons, Limited, steel manufacturers, of Sheffield, has retired after 42 years' service with the firm.

MR. F. FOSTER of George Foster & Sons, Pty., Limited, engineers and ironfounders, of Sydney, Australia, has arrived in this country for a six-months vacation.

MR. R. BAILEY, stores superintendent with George Salter & Company, Limited, springmakers, of West Bromwich, has retired after 47 years' service with the company.

MR. JAMES FAICHNIE, foreman moulder for 53 years at the works of M. Cockburn & Company, Limited, Gowanbank Ironworks, Falkirk, has retired, and has received a number of presents from his colleagues.

SIR HENRY DALE has been appointed adviser to the B.B.C. on scientific programmes for one year commencing on July 1. In this capacity, his advice will be sought on the co-ordination and content of science broadcasts and on speakers and topics to be chosen.

MR. T. R. WALKER has resigned his secretaryship of the Sheffield Branch of the Institute of British Foundrymen, which he has held for nearly 23 years and will be succeeded by Mr. J. H. Pearce (of the English Steel Corporation), whose address is 31, Causeway Head Road, Dore, Sheffield.

PROF. GILBERT COOK, Regius Professor of Civil Engineering and Mechanics at Glasgow University, has been re-elected president of the Institution of Engineers and Shipbuilders in Scotland, with MR. C. CONNELL and MR. C. H. WRIGHT as vice-presidents.

MR. H. P. HUGHES, M.I.B.F., late foundry manager and metallurgist with Thomas Robinson & Son, Limited, Rochdale, has joined the technical staff of British Electro Metallurgical Company, Limited, of Grange Mill Lane, Wincobank, Sheffield, as foundry consultant.

MR. G. W. KEITH, assistant manager of the electrical department of the Sunderland Forge & Engineering Company, Limited, Pallion, Sunderland, has been appointed manager in succession to MR. E. AIRD, whose retirement after 50 years' service with the firm was noted in our last issue.

MR. A. S. MACLELLAN, a director of Glenfield & Kennedy, Limited, hydraulic engineers and founders, of Kilmarnock, and of William Dixon, Limited, pig-iron manufacturers, of Glasgow, is to have the honorary degree of Doctor of Laws conferred upon him by Glasgow University.

MR. D. R. JOHNSON, sales executive of Bryce Fuel Injection, Limited, of Staines, one of the Associated British Oil Engines Group, has been appointed vice-president of Associated British Oil Engines Incorporated, of New York, the new American sales company set up by A.B.O.E. last year.

MR. D. SLORACH has been appointed secretary to the Scottish Board for Industry in succession to MR. A. G. M. GRASSICK. Mr. Slorach is a founder member of the Sheffield group of the Royal Statistical Society, and, with others, founded the Sheffield Society of Technical Inspection. At one time he was a member of the Executive Council of the National Trades Technical Societies, and in association with this body he directed the Sheffield Scientific and Engineering Exhibition.

CLASSIFIED ADVERTISEMENTS

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

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

SITUATIONS WANTED

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

INVESTMENT (Lost Wax).—CASTING EXPERT, A.I.M., M.I.B.F., desires position of responsibility; energetic, enthusiastic, and capable of controlling mixed personnel.—Box 360, FOUNDRY TRADE JOURNAL.

METALLURGIST / ENGINEER (23), University education, commercial, executive, lecturing experience, now employed as Foundry Metallurgist, experienced laboratory organisation, ferrous and non-ferrous foundry control, heat treatment, electrodeposition, metallography, photography, seeks change to Executive Personal Assistant, Senior Metallurgist, etc.; Midlands preferred.—Box 350, FOUNDRY TRADE JOURNAL.

PATTERNMAKER, wood (46), seeks steady job with Foundry; home counties.—Box 356, FOUNDRY TRADE JOURNAL.

QUALIFIED METALLURGIST (B.Sc. Lond. Ext., silver medallist London City and Guilds), desires change; 25 years' experience laboratory, iron and steel foundries, open hearth and ancillary plant, converter, cupola and foundry management.—Box 352, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT

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

A BRITISH Concern of International standing, who supply Metallurgical Specialities to Foundries, require a GENERAL MANAGER for their Canadian branch, recently established in Toronto; applicants, whose age should not be over 45, must have had a metallurgical or chemical background, a successful career, and the ability to organise and sell; permanent residence in Canada would be essential; the position demands initiative and hard work, but has great scope.—Box 348, FOUNDRY TRADE JOURNAL.

APPLICATIONS are invited for the post of ENAMEL SHOP FOREMAN; candidates should be between 25-35 years of age, and possess wide experience in stove enamelling, bonderising, and the testing of solutions.—Applications should be addressed to the PERSONNEL OFFICER, Hoover, Ltd., Merthyr Tydfil.

SITUATIONS VACANT—*Contd.*

APPLICATIONS are invited for the post of MACHINE SHOP FOREMAN; candidates should be between 25-35 years of age and possess general machine shop knowledge of power and hydraulic presses, drills, millers, automatics, and resistance welding.—Applications should be addressed to the PERSONNEL OFFICER, Hoover, Ltd., Merthyr Tydfil.

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

ENAMEL SHOP SUPERINTENDENT required in the London area to take complete control of a large enamelling plant; applicants must have a complete experience of both sheet and cast-iron enamelling, and be used to all modern equipment, including continuous furnaces. —Write, stating age, experience, and salary required, to Box 3411, c/o CHARLES BARKER & SONS, LTD., 31, Budge Row, London, E.C.4.

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

FOUNDRY FOREMAN required, to take full charge of modern Non-ferrous Foundry, Central Scotland; excellent prospects, suitable salary, and bonus for right man.—Address 1244, WM. PORTEOUS & Co., Glasgow.

RATE FIXER/ESTIMATOR required for Foundry in South-East England; applicants must have a knowledge of estimating from drawings for quotations and rate fixing for hand and machine moulding.—Apply, stating full particulars, age, wage required, and experience, Box 346, FOUNDRY TRADE JOURNAL.

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

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

TUATIONS VACANT—*Contd.*

METALLURGIST required; to take charge of melting, Iron and Steel Foundry (North-East Coast).—Applicants should give age, education, qualifications, salary, etc., Box 364, FOUNDRY TRADE JOURNAL.

HEAD FOUNDRY FOREMAN required for Gloucestershire Foundry producing high grade engineering castings in grey and high duty iron up to 5 tons, by machine and loose pattern; experience of Sandslinger an advantage; number employed 80.—Reply, stating age, experience, and salary required, Box 358, FOUNDRY TRADE JOURNAL.

YOUNG converter Man for Tropenas converter; willing to serve in South Africa; single man preferred.—Apply Box 354, FOUNDRY TRADE JOURNAL.

ACCOMMODATION

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

MACHINERY WANTED

REQUIRED immediately, one 5-ton capacity Geared Ladle.—NEWCAST FOUNDRIES, LTD., Silverdale, Staffs. Phone 308.

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

WANTED.—A No. 1 or No. 2 "Acme Junior" Continuous Core Drying Stove, in good condition.—Full particulars, please, to SAUNDERS VALVE Co., LTD., Cwmbran, near Newport, Mon.

URGENTLY WANTED.—All types of Foundry Plant, including Sand Mills, Cupolas, Blowing Fans, Hand and Pneumatic Moulding Machines, Sand Mixers.

S. C. BILSBY, A.M.I.C.E., A.M.I.E.E.,
Cresswells Engineering Works, Langley Green, nr. Birmingham. Broadwell 1359

WANTED

MODERN FOUNDRY PLANT, of all descriptions. WE WILL PAY CASH.

FRANK SALT & CO., LTD.,
Station Road, Blackheath, Birmingham.
BLA. 1635.

WANTED

CUPOLAS of all sizes, also Cupolettes; cash waiting.

FRANK SALT & CO.,LTD.,
Station Road, Blackheath, Birmingham.
BLA. 1635.

MACHINERY FOR SALE

FORGE BLOWERS. 230 volts a.c or 400 volts, 3-phase, 50 cycles, £16 10s.; 110 or 220 volts, d.c., £12 10s.—UNIVERSAL ELECTRICAL, 221, City Road, E.C.1.

FOR SALE.—Two Coleman No. 24A, Davenport type, Moulding Machines; jarr roll over; pattern draw 12 in.; 1,100 lbs. working capacity; suitable for boxes up to 40 in. by 24 in.; price £450.—Box 288, FOUNDRY TRADE JOURNAL.

FOR SALE

TITAN Core Blower, 300 lbs. sand capacity, with clamping table approx. 28 in. by 28 in.; with 2 h.p. motor, suitable 400 volts, 3-phase, 50 cycles.

THE MIDLAND MOTOR CYLINDER CO. LTD.
Smethwick 1431

FOR SALE

MOULDING MACHINES; McNabb latest type Jolt Squeeze Pattern Draw Machines; two at £120 each.

TABOR Squeeze Pattern Draw Machines; 14 in. by 16 in.; £45 each.

AJAX 18 in. Jolt Roll-over; £35.

FURNACES: Morgan Bale-out; oil-fired; 400 lbs.; new; £85.

Morgan Centre Axis; coke-fired; 600 lbs.; "S" type; £145.

Morgan; 600 lbs.; "CA"; gas-fired; as new; £148.

Morgan Lip Axis; as new; £175.

Morgan Centre Axis; C.A.; oil-fired; as new; £185.

CUPOLAS: 31 in. dia., new, with brick lining, and Keith Blackman a.c. Fan; £185.

36 in. Cupola, with all accessories, by Jackman, with Keith Blackman Fan and Motor; £250.

Bargain week :—

All ex-stock for quick clearance.

Vertical Continuous Core Stove, by Bagshawe, with all equipment at quarter new price.

Several nearly new Ballard Gas- and Coke-fired Core Stoves cheap.

25 Morgan Bale-out Furnaces, with burners and all equipment; sizes 200-lb. to 10-cwt., at £25 to £50 each.

Large Double Disc Sanding Machine, as new, for pattern shop; £45.

Large Vertical Milling Machine, in perfect order; cost £1,000, our price £50.

Brand new Broomwade 80 cu. ft. Compressor, with vee drive; 100 lbs. pressure; £145.

50 brand new Broomwade Air Receivers; all sizes, cheap.

Approx. 1,100 brand new A.C. Motors (please state requirements).

Firebricks, all sizes, for cupolas, ex-stock.

"Hilltop" Hand - Squeeze Pattern-Draw Moulding Machine; as new; £45.

Cummings Furnaces, several, as new, with A.C. Fans, at £65.

Approx. 75 brand new Keith Blackman Cupola Fans.

Catalogues free on request; your enquiries for all foundry plant receive careful attention.

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

MACHINERY FOR SALE—*Contd.*

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FOUNDRY PLANT AND MACHINERY OF ALL TYPES
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New shot blast cabinets complete with Dust Extractors, etc., size 5ft. x 3ft.
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ALBION (TWW) WORKS
BLOWING & EXHAUSTING FANS

BLOWING FANS :

SEVERAL NEW ELECTRIC FORGE BLOWERS, 125 c.f.m., 3 in. w.g., 2½ in. inlet, 2 in. outlet, wound for 400 volts, 3-phase, 50 cycles.

SEVERAL NEW KEITH BLACKMAN BLOWING FANS, 10,000 c.f. hour, 13 in. w.g. 1 h.p. Motor, 400/3/50. Blast gate and starters.

TWO "SIROCCO" MOTOR DRIVEN BLOWING FANS by Davidson, 6 in. inlet by 3⅜ in. outlet. 1½ h.p. Motor, 400/3/50 cycles, 2,800 r.p.m., 490 c.f.m., 6 in. w.g.

TWO MOTOR DRIVEN BLOWING FANS by Keith Blackman, 12 in. inlet, 7½ in. by 4½ in. outlet. Driven by 2 h.p. FLAMEPROOF MOTOR, 400/3/50, 1,450 r.p.m., 450 c.f.m., 12.6 w.g.

TWO MOTOR DRIVEN BLOWING FANS by Air Control Installation, 5 in. inlet by 4⅜ in. by 3⅜ in. outlet. 2 h.p. Motor, 440/3/50 cycles, 2,850 r.p.m.

MACHINERY FOR SALE—*Contd.*

ONE MOTOR DRIVEN HIGH EFFICIENCY BLOWING FAN by Keith Blackman, 10 in. inlet, 6 in. by 5 in. outlet. Driven by 8 h.p. TOTALLY ENCLOSED MOTOR, 400/3/50 cycles, 3,000 r.p.m., 1,200 c.f.m., 16 in. w.g.

ONE KEITH BLACKMAN MOTOR DRIVEN CUPOLA BLOWING FAN, Type S.6, with 18 in. inlet, 12 in. outlet, driven by approx. 40 h.p. S.C. Motor, 400-440/3/50, 2,900 r.p.m., 5,000 c.f.m. at 26 in. w.g., 6,000 c.f.m. 24 in. w.g.

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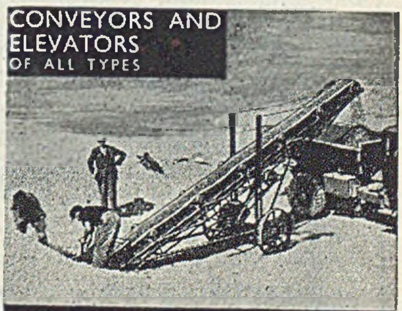

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