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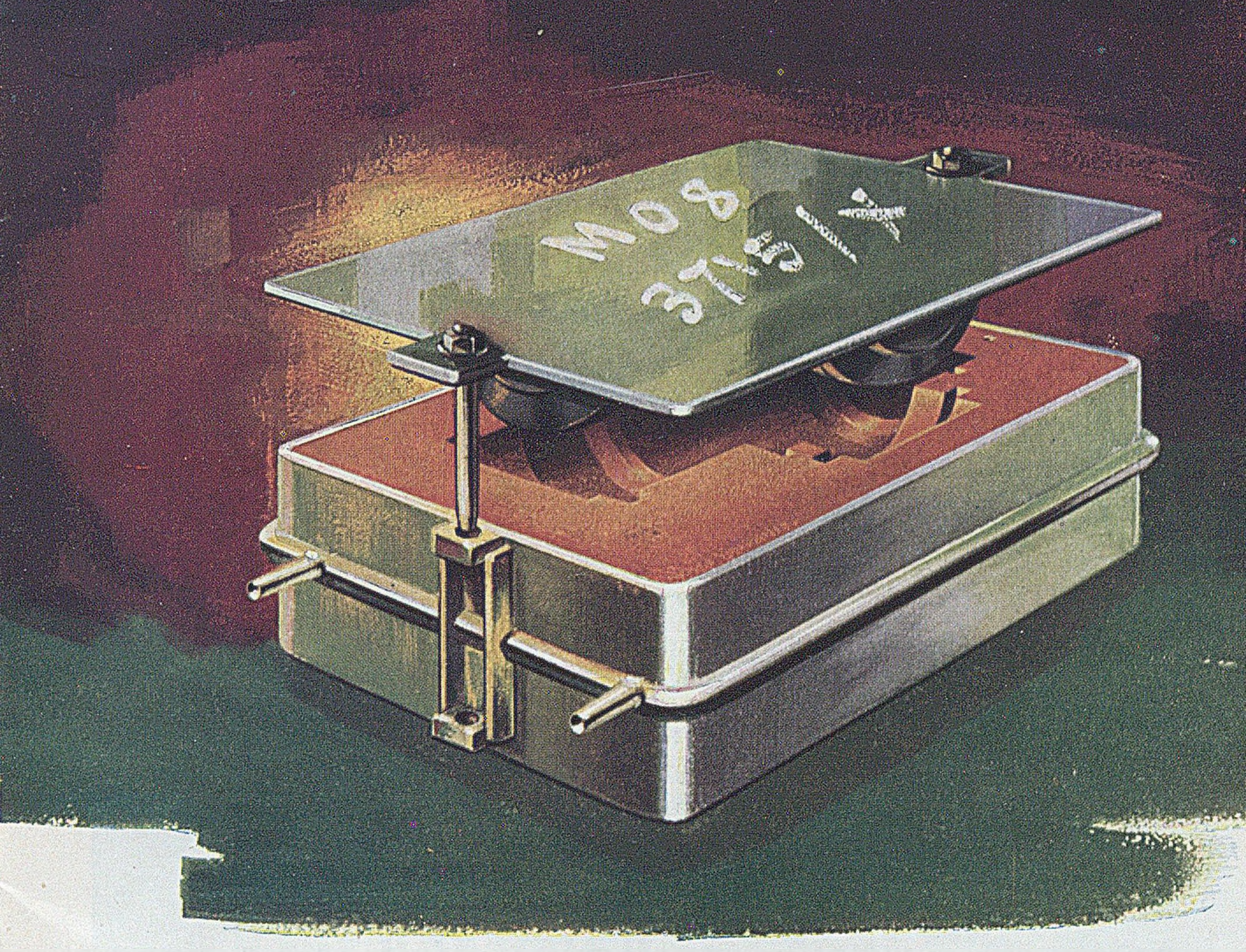

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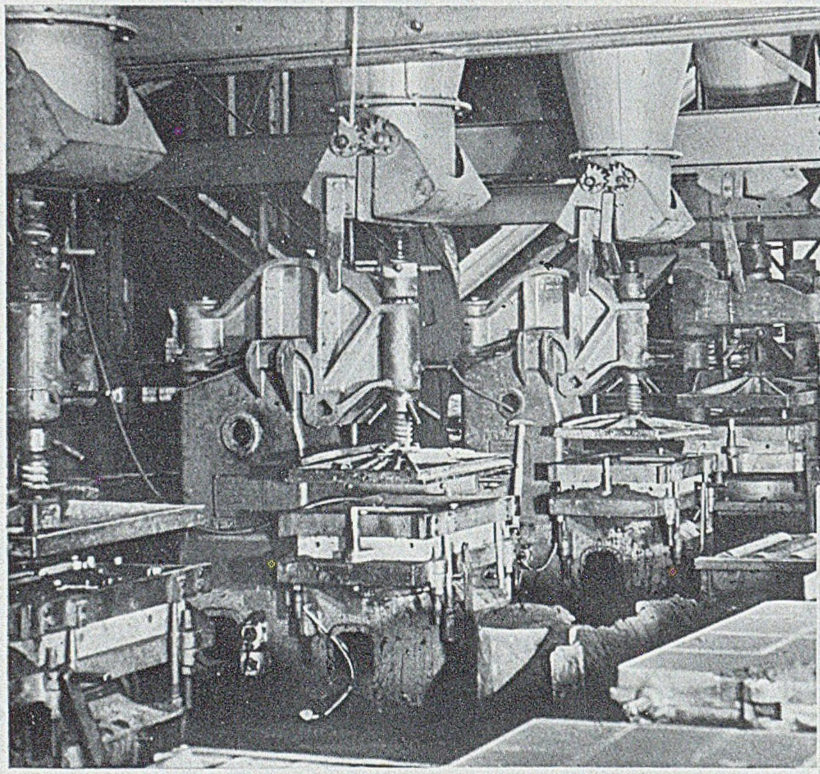

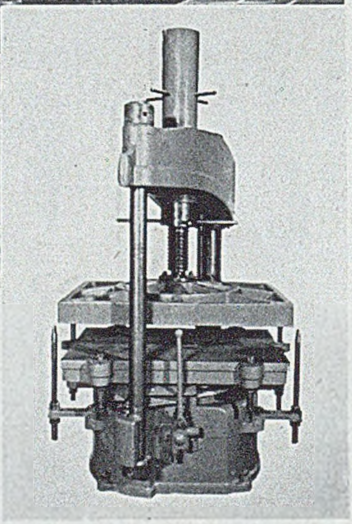

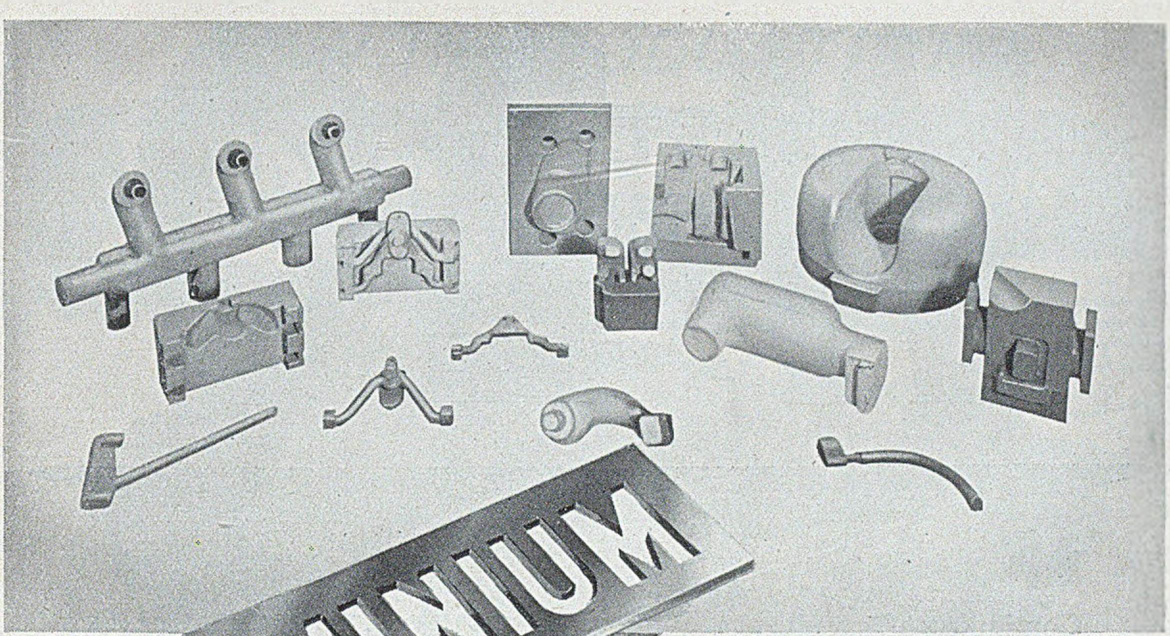

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Gardening Notes

"Just as the best thing in a garden is not any particular flower but the scent of all the flowers that are there, ..."—E. V. LUCAS

One perfect flower is not the most important feature of a garden but the all-pervading aroma which greets the visitor. So too is it with foundries everywhere. In one case, the metallurgical control is as near perfect as human endeavour can make it: in another the sales organisation evokes well-merited eulogies; whilst a third may be an outstanding example of the application of mechanical engineering to the production of castings. Yet each one of these can only be regarded as perfect blooms, and much more is required before the ideal is reached. Primarily, there must be an atmosphere of mild enthusiasm and content—conditions so difficult to establish and so easy to disturb. Next there must be balance, and neither metallurgical control, nor sales efficiency, nor mechanical excellence must rule the roost, but must be kept in step. Sometimes the "flower" is but an isolated bloom and not even a plant. We have known cases where excessive interest has been devoted by the manager to a bend test; to the stables and the gaining of awards at an annual parade; to just one aspect of cupola practice; to the canteen services and social services; to a new moulding machine or to the making of one particular casting. Such individuals are ill-suited for modern management.

It is realised that "out of balance" in manufacturing concerns is traceable to the interests and background of the "chief." Thus according to the training of the "chief," notable progress will be attained in one direction, often to the neglect of equally important activities. Looking back over the number of foundries visited, we can fill in general impressions, but in no case have we met perfection. Thus in one old family business we encountered a very happy group of workers, using the word in its correct sense. The sales organisation was very good, but there was no evidence either of metallurgical control or mechanical efficiency. A second foundry we have visited quite often, approaches perfection in both manufacturing and commercial efficiency, but amongst the staff there were many disgruntled faces. A third one, at the time of our visit seemed to be an adjunct of a huge research laboratory, which "bossed" the whole organisation.

This time of the year is appropriate for the head of any foundry figuratively to hang his organisation on a piece of string, rotate it slowly, and mentally accord marks for the various services which form part of the whole edifice. Doubtlessly he will find here and there his perfect flower, but he will still have much to do before he has created a perfect garden. Even when this has been done, there are still new varieties to be added, constant weeding, pruning and digging.

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Book Reviews

Industrial Lung Diseases of Iron and Steel Foundry Workers. By A. I. G. Laughlin, M.B., CH.M., F.R.C.P., *et aliter*. Published by H.M. Stationery Office, York House, Kingsway, London, W.C.2. Price £1 1s.

It is difficult to know whether this book, sponsored by the Factory Department (Ministry of Labour and National Service), should be reviewed by a person well-versed in medicine, or foundry practice. Because it is written by a medical man, and includes a chapter on foundry processes. it would appear to be a contribution to medical literature. Yet there is the general implication that foundry management should be conversant with the subject, in order that they may co-operate in the reduction of pulmonary diseases amongst foundry operatives. The first chapter, a review of the literature germane to the subject, is, from the foundry angle, more interesting than enlightening. For instance, the table on page 7 covering an examination of some 3,000-odd foundry employees in New York State, the knock-out men showed the lowest incidence of silicosis, whilst welders, fettlers and moulders headed the list.

From the foundry angle, the Swedish figures seem to be more realistic. Yet the whole basis of earlier studies is, to the reviewer's way of thinking, fundamentally wrong. Lumping up large and small foundries. and presuming that in both cases the workmen are subject to the same risk of industrial diseases, is not an intelligent way of tackling the subject. Until the problem is broken down to types of foundries, much time and effort will be wasted. The second chapter, an excellent one, well illustrates what the reviewer has in mind, for the opening phrase gives the extremely wide weight-range aspect. Individual firm's employment figures ranging from a man-and-boy concern to many hundreds make global classification almost useless. The next chapter gives background information as to the investigations made for the studies analysed in later chapters. The conclusions are a little difficult for the layman to follow, but the reviewer was surprised to find some incidence of pulmonary disease amongst patternmakers. There is a long chapter dealing with dust counts in a spun-iron-pipe foundry and the steps taken for improved conditions. One was the installation of a central vacuum-cleaning plant. It has 200 nozzles and clears out about 2 tons of dust per hr. There are detailed surveys of other types of shops, from various medical aspects. In addition, a large number of case histories are detailed and illustrated by radiographs. This book should be studied by the factory doctors, but the reviewer hesitates to recommend it to the ordinary foundry technician, as he feels that much misinterpretation may result. The officials of the factory department can be relied on to guide the industry from the wealth of data they have accumulated. Moreover, when originating legislation, they are sufficiently well-versed in foundry practice to differentiate between the health hazards existing in large and small concerns.

V. C. F.

F.B.I. Register of British Manufacturers, 1950-1951. Published by Kelly's Directories, Limited, and Iliffe & Sons, Limited, Dorset House, Stamford Street, London, S.E.1. Price 42s., post free.

This well-known and important work of reference follows the same make-up as earlier editions. The reviewer wonders whether the time has been reached for the inclusion of German as well as French and Spanish references. Increasing business with Yugoslavia suggests this would be advantageous.

The headings of "products and services" have been well and carefully selected, except the listing of castings. Surely to-day the classification "semi-steel" should disappear, whilst "precision castings" should be reserved to makers using modern adaptations of the lost-wax process. There is some beautiful display work amongst the advertising section, which should act as an incentive to those relying on black and white to come into line. The book has well maintained the high standard the publishers have set themselves.

Fundamentals in the Production and Design of Castings. By Clarence T. Marek. Published by John Wiley & Sons, Inc., New York, and Chapman & Hall, Limited, 37, Essex Street, London, W.C.2. Price 32s. net.

With the "new look" in the foundry world, designers are urged to collaborate with those who have to convert their ideas from the drawing board to the finished casting so that wherever possible simple and easy manufacture is achieved. In this book foundry processes are explained and an insight given to guide designers so that they can go to work with some idea of how the components will be made and what can be expected from them. All aspects of foundry work are dealt with from the design stage to X-ray inspection, including floor work, metal melting and laboratory control of sands. This book is intended for the layman but it will be found useful to those who are engaged in the industry.

J. W.

The Great Exhibition of 1851. Published on behalf of the Victoria and Albert Museum by H.M. Stationery Office, York House, Kingsway, London, W.C.2. Price 6s. net.

Mainly by illustration is the story of the 1851 exhibition told, but the extracts from Queen Victoria's diary are helpful in obtaining an appreciation of the difficulties which beset the organising committee. The section dealing with the actual erection is of real technical interest.

The Crystal Palace was prefabricated from cast-iron components. As they arrived on the site they were tested—presumably in transverse—inspected and painted. From the description in the book it is obvious that mass production and the use of labour-saving machinery were well known and appreciated. The reviewer supposes that, by modern standards, 6s. is an equitable price to pay for a 140-page paper-bound book, but he fears it will restrict sales.

New Patents Act. By Robert Lochner, barrister-at-law. Published by the National Union of Manufacturers, 6, High Holborn, London, E.C.2. Price 2s. 6d., post free.

A good service to industry has been done by the publication of this book, as the new Act makes radical changes in the law. The problem has been logically attacked by dealing seriatim with applications for Patents: the rights of the patentee, the public and the Crown. The reviewer has received the impression that speed is now of greater importance than in the past, yet there is still provision for the incorporation at a later stage of further developments. The book is very clearly written and the author deserves full commendation for dealing with a complicated subject in a simplified manner.

Chilled-roll Manufacture*

By K. H. Wright, F.I.M.

(*Continued from page* 40)

The first section of this Paper constituted a brief description of the main characteristics of the roll itself, and this section deals chiefly with the principles involved in the manufacturing methods, commencing with moulding and casting, and including notes on the chills employed, pouring methods, and melting furnaces. A modern pulverised-fuel-fired air furnace and its method of operation is described in some detail. The Paper concludes with paragraphs on inspection procedure, particularly as related to hardness testing.

MOULDING AND CASTING

FOR A CHILLED PLATE ROLL, the largest used in this country being 44½-in. dia. by 168-in. barrel length, Fig. 18 is typical of the moulding set-up. The necks and tenons are moulded in dry-sand, whilst the barrel is cast directly against the iron mould which has been previously coated with a thin refractory dressing to avoid " burn-on " of the metal. These iron moulds or chills are of varying lengths and diameters to suit the particular roll, and great care is necessary in their final preparation. They are made in close-grained hematite iron and are bored out to a smooth finish. Allowance is made for shrinkage and subsequent machining of the roll. Table II shows typical dimensions. Before the application of the refractory coating to the chill, every trace of rust or dirt must be removed otherwise an imperfect casting invariably results.

The roll is poured in the vertical position, the ingate entering at the bottom of the drag neck being placed tangentially to impart a vigorous spin or swirl to the metal. This spin ensures cleanliness and soundness of the working face, any entrapped foreign matter being forced to the centre of the rotating mass subsequently rises into the sink head. The placing of the ingate and the production of a satisfactory spin is of paramount importance in avoiding pinholes and laminations.

Surface Treatment of Chills

An added precaution in avoiding surface defects consists of machining fine saw-cuts in the chill mould face. These saw cuts vary in pitch and depth, average figures for a 30-in. dia. roll being 1¼ in. pitch, ⅜ in. deep and $\frac{1}{16}$ in. wide. Although these saw cuts are coated over by the refractory dressing this latter is permeable and thus they serve as channels for the gas generated at the mould face.

Rapid pouring is essential for two main reasons, first for the production of the vigorous spin, and secondly to avoid steep thermal gradients in different parts of the roll, a condition almost certain to lead to hot-tearing. Narrow limits of pouring temperature must be adhered to and a range of 5 deg. C. for a particular composition must not be exceeded. In the Author's practice, sheet rolls are poured at 1,310 to 1,315 deg. C. true temperature as measured by the immersion pyrometer. Reverting for a moment to pouring speeds, Table III shows typical downgate and ingate sizes in relation to pouring speed for rolls of varying dimensions.

To avoid excessive contraction strains on long rolls, the cope neck is part-moulded in a sliding sleeve which fits closely in the top of the chill. Almost immediately after casting, set pins holding this sleeve in position are loosened and the sleeve is then free to follow the shrinking metal, thus permitting unhindered contraction. A sleeved roll is shown in Fig. 19.

As the pouring temperature needs to be controlled within narrow limits, it is necessary to tap some 60 deg. C. higher to permit time for skimming operations. It has been ascertained that a 10-ton ladle will cool at an average rate of 2 deg. C. per min., and there is usually a drop of 30 deg. C.

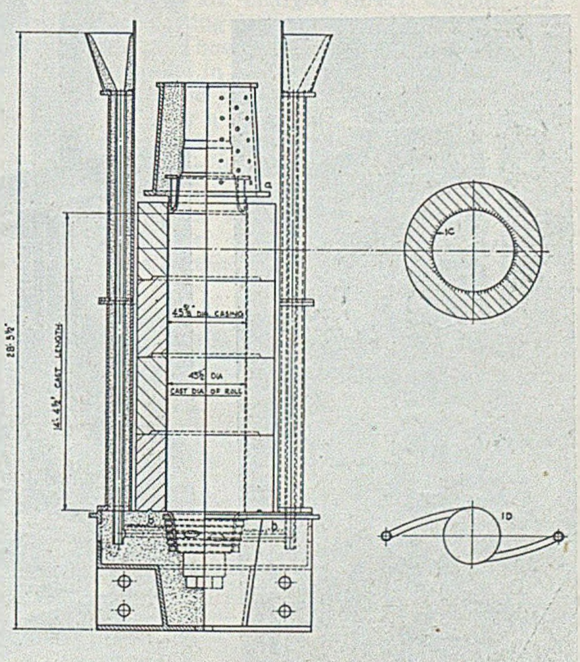


FIG. 18.—*Mould Assembly for a 44½-in. diam. by 168-in. Barrel-length Chilled Plate Roll.*

* A Paper read to the Birmingham branch of the Institute of British Foundrymen. Dr. Angus presiding. The Author is research manager of the Midland companies of the British Rollmakers' Corporation, Limited.

Chilled-roll Manufacture

between furnace and ladle on tapping. Fig. 21 shows the pouring of a chilled roll, whilst Fig. 20 illustrates a large plate roll being removed from the casting pit after stripping of the chills.

Melting of Roll Metal

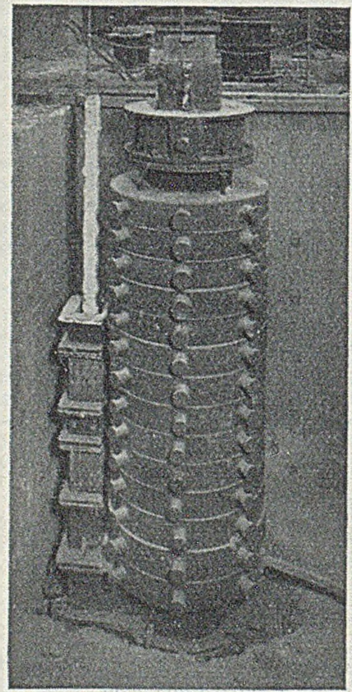
There are several important considerations which govern the choice of a melting furnace for roll metal. First and foremost is the necessity to make provision for a large quantity of metal of known chemical and physical characteristics, of homogeneous composition and at a sufficient temperature to permit the operations of skimming and metal transport to be conducted in safety. Secondly, the furnace must be capable of melting large pieces of scrap consisting of worn out and broken rolls and, thirdly, consideration should be given to general repair and maintenance problems peculiar to furnaces satisfying the first two requirements. The air furnace has been almost universally adopted for metal-roll manufacture, although a few electric furnaces are employed for certain specialties. Also, on the Continent, good chilled rolls are made from the Siemens furnace, but in order to avoid excess temperatures, gas regeneration is dispensed with. Certain classes of chilled rolls, for example, calender rolls and rolls for the foodstuffs industries, are often cupola melted, due to the necessity or desirability for high total-carbon contents, but few metal rolls are made from this melting unit except in the smaller size ranges.

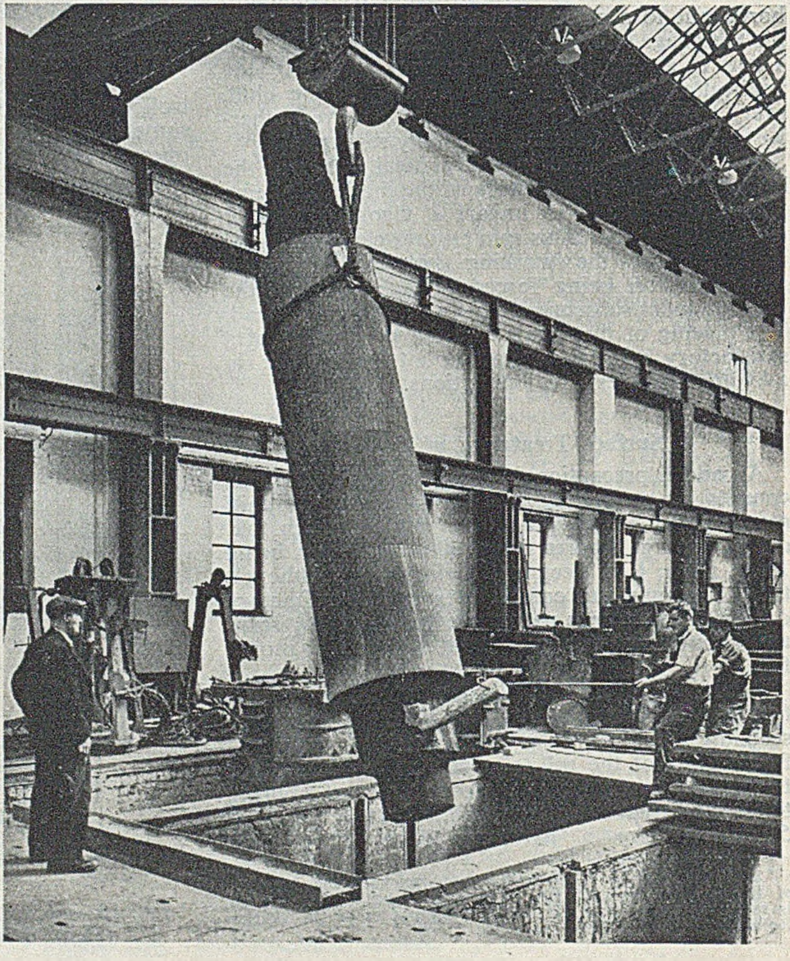
Air Furnaces

All air-furnaces are essentially acid types and consist of three main regions: (*a*) the combustion zone, (*b*) the hearth or crucible, and (*c*) the stack. Details of design vary considerably and have undergone many modifications with a view to effecting economies in fuel consumption, for air-furnace melting is considered inefficient in this respect even with the most modern types. The earliest furnaces were fired by hand, using lump bituminous coal charged into a large firebox situated at one end of the furnace. The products of combustion were drawn over a bridge separating the firebox and hearth, passed into the latter and were then reflected downwards on to the stock by a special roof construction known as a reverbatory. The draught necessary

FIG. 19 (*below*).—*Chill-roll Mould Assembly employing Sliding Cope Neck.*

FIG. 20 (*right*).—*Lifting a Chilled Plate Roll from Casting Pit.*





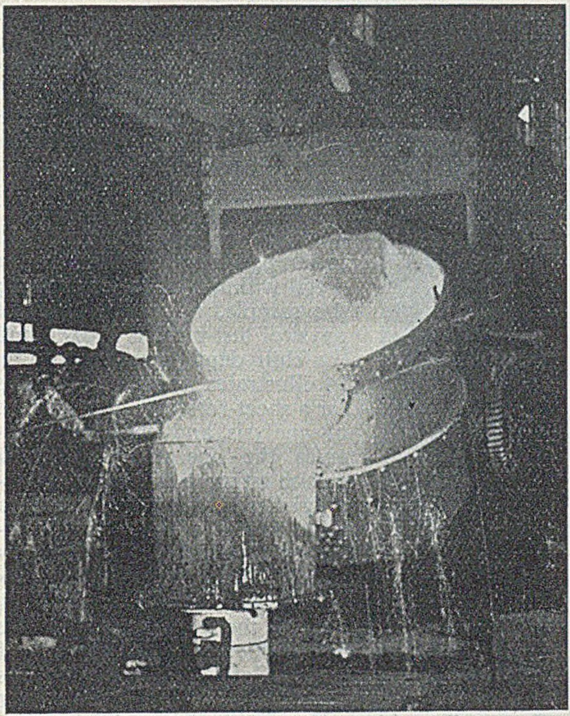


FIG. 21.—*Pouring of a Chilled-iron Roll.*

for rapid combustion was induced by the stack, atmospheric air being drawn through the fire.

It is easy to imagine how wasteful and inefficient such furnaces were. With a skilled fireman who paid strict attention to stack dampers, depth of fire and rate of firing, economies were possible. A fireman, however, who was lazy and permitted holes in the fire, allowing large volumes of excess air, not only wasted coal but, more serious than this (as coal was not a major expense in those days), often over-oxidised the charge and rendered it useless for the purpose of roll-making. Indeed, the success or failure of the early roll foundries depended to a large extent on the skill of the melter. Although to-day one is inclined to scoff at the stories of the roll caster who would not work because the wind was in the wrong direction, it is quite possible that an experienced man knew with a fair degree of certainty that down draught or lack of stack pull would result in a very erratic metal condition. It must be remembered that knowledge of combustion sciences was limited and rich ferro-alloys, which are used to-day were either very expensive or unknown. Thus, if preliminary tests showed the metal to be incorrect, the roll caster had to face long hours of exacting labour, adding white or grey iron as required.

The slope of the furnace hearth and position of tap hole varied from district to district. The Staffordshire reverbatory furnace has its tap hole situated at the side whilst the Welsh and German types tap at the stack end. Except in the most modern type of furnace, to which reference will be made later, side charging is almost universally employed, large doors permitting entry of roll scrap in pieces up to 3 tons in weight. Fig. 22 shows a Staffordshire type, hand-fired reverbatory furnace.

Modern Furnaces

Firing methods underwent a radical change with the introduction of powdered coal, the corporation with which the Author is associated pioneering this method for roll-making in 1927. Coal is purchased in the form known in the trade as "beans" and is pulverised in special high-speed mills to a specification which demands that 80 per cent. shall pass a 200-mesh screen. The pulverised coal is then either stored in a separate bunker system or blown direct to the furnace burners.

A short pre-combustion space allows correct mixing with forced secondary air and the intimate mixture of coal and air burns with extreme rapidity in the actual furnace hearth. The rate of flame propagation approaches that of gas firing and the fly-ash problem is minimised as much of this is fused immediately and falls to the slag layer.

As the amounts of coal and air input are metered and controlled to fine limits, combustion conditions are under control and capable of variation at will. In recent years the introduction of top charging through a removable-bung type roof has effected a great saving in man power and scrap rolls up to 7 tons in weight are charged direct without the necessity for blasting into pieces capable of being manhandled. These modern furnaces, one of which is illustrated in Fig. 23, are constructed under a crane gantry, the stack being connected outside the crane track by a brick flue. To give a picture of the fuel consumption, on the old, hand-fired furnaces coal to metal ratios of 1 : 1 were common. To-day a ratio of 6 to 8 cwt. coal to 1 ton of metal is achieved, coupled with the attainment of higher temperatures, faster melting, better control and easier working conditions.

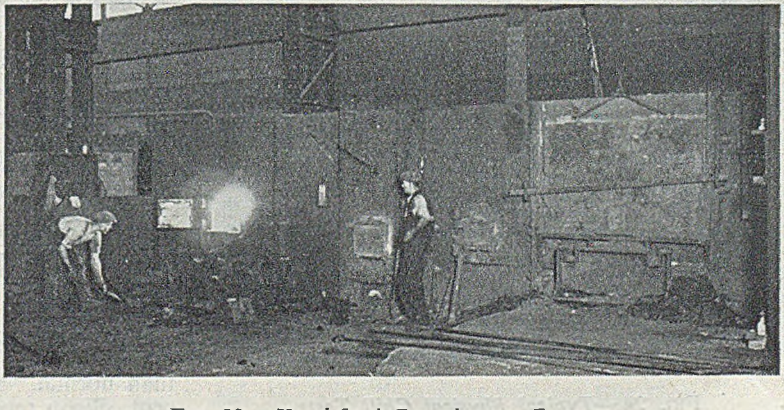


FIG. 22.—*Hand-fired Reverbatory Furnace.*

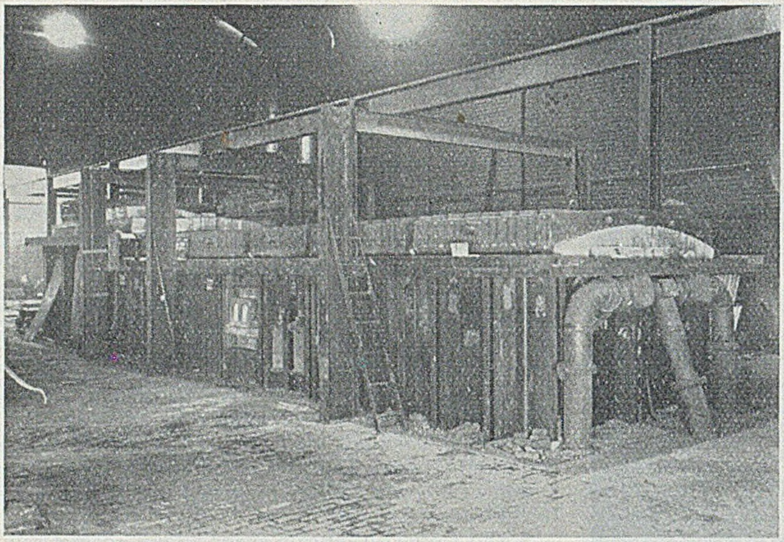


FIG. 23.—*Modern Pulverised-fuel-fired Furnace.*

Roll-making furnaces are equipped with a large tap hole, 6 in. in diameter, which permits the furnace to be drawn in a very short time. On a large furnace, 20 tons of metal are tapped in just over 2 min. No fluxing technique is employed, the slag consisting principally of ferrous silicate formed by the interaction of FeO and the silica-sand furnace bottom.

During the melting period, which is usually accomplished as quickly as possible, the maximum coal input into the furnace is maintained, but immediately the charge is melted down, the importance of temperature and oxidation control according to the type of roll being made, becomes of paramount importance. When the bath has attained the requisite working temperature, physical and chemical tests are taken.

Rapid and accurate analytical methods enable the metallurgist to learn the composition of the metal within 35 min. of drawing the sample, by which time the physical test-piece is broken and the chill depth measured. Fig. 24 illustrates typical chill tests for a sheet-roll heat. Correlation of analysis and chill depth enables the operator to form a precise estimate of the final characteristics of the roll and at this stage much of the "art" remains, for although the unskilled may measure two physical tests at an identical chill depth, the appearance of the grey back, the size of mottles, analysis (particularly in respect of Mn : S ratio) and the rate at which oxidation has or is progressing in the bath all have their effects. Correctives, if necessary, are added at this stage, usually in the form of rich ferro-alloys, hard iron, steel or iron ore according to whether increase or decrease in chill is desirable. After allowing sufficient time for completion of the reaction or solution of the alloys the testing procedure is repeated until satisfactory results are obtained.

Very small corrections in the ladle are permitted, but these are undesirable, particularly if inoculating agents are employed, as their effect is erratic in chill removal, varying according to the degree of oxidation of the metal. Final ladle tests are taken before casting. Reference has previously been made to melting manipulation and control. It is axiomatic that precisely the same conditions must be repeated from charge to charge if consistency of results are to be ensured.

To illustrate this point, assume that under normal melting conditions a figure of 0.70 per cent. silicon is required for a specific depth of chill. If a very soft charge had been employed and oxidation permitted until the test showed correct, a content of, say, 0.60 per cent. silicon would be found. On the other hand, suppose a hard charge had been employed initially and a final correction with ferro-silicon had been necessary, then a silicon figure of 0.90 per cent. would not be uncommon, all other elements being constant. This is one reason why rolls made by different firms tend to vary compositionally, as slightly different melting conditions apply to different furnaces and methods of firing.

The Author has actually analysed rolls made 25 yrs. ago which carried $\frac{1}{2}$ to $\frac{5}{8}$ in. chill with a silicon figure as low as 0.55 per cent. and a sulphur higher than normal. To-day a figure of 0.70 to 0.75 per cent. silicon represents normal practice.

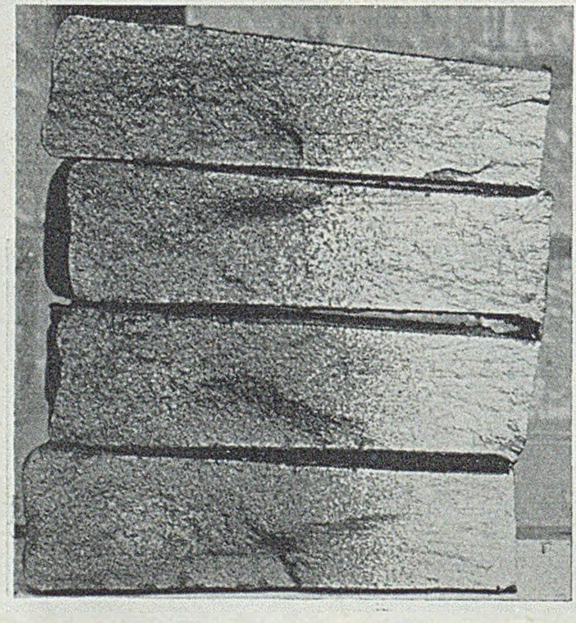


FIG. 24.—*Typical Physical Chill Tests.*

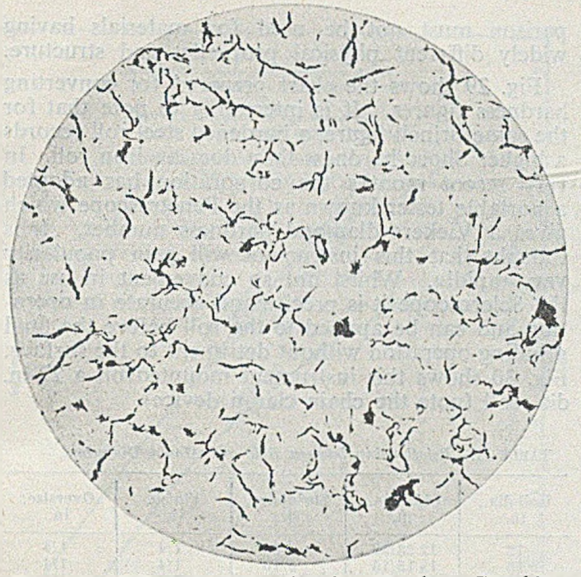


FIG. 25.—*Microstructure showing Random Graphite Distribution. Magnification × 50 dias.*

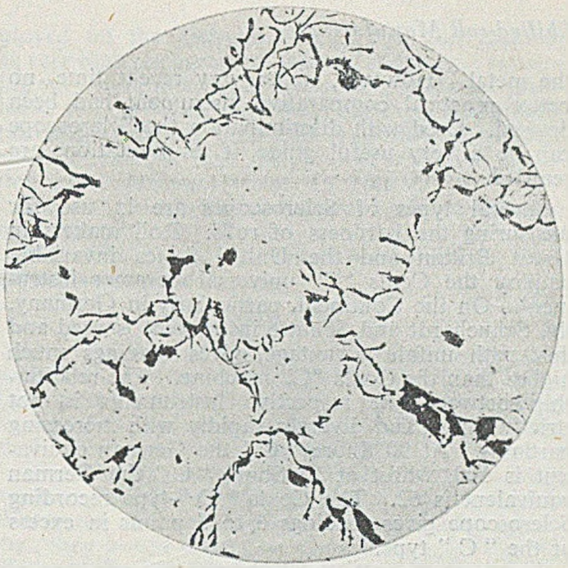


FIG. 26.—*Microstructure showing Chain Graphite Distribution. Magnification × 50 dias.*

Other Variables

Whilst it is reasonably certain that melting conditions are the factors mainly responsible for variations, one must not dismiss entirely the effect of the raw materials. A recent article[6] describing a Belgian foundry reported castings $\frac{1}{16}$ in. thick which had a grey fracture with a silicon figure as low as 0.40 per cent. These were made in the sixteenth century from ores contaminated with zinc. It is well known how potent some of the trace elements are on graphitising reaction and gases too can have a great influence in this respect. Those wishing to have a clearer understanding of these phenomena should study Williams' Paper[7] to the Iron & Steel Institute. It is the melting condition coupled with the rate of oxidation and slag analysis which can influence the graphite distribution in the roll core. Fig. 25 shows desirable type graphite in a 30-in. section whilst Fig. 26 shows the graphite in a chain formation in a similar section.

After casting, the roll remains undisturbed in its mould for a period of hours to days depending on its size. A 30-in. dia. sheet roll may be stripped in 2 to 3 days whilst plate rolls and fully hard rolls are cooled for periods of over one week. After removal of the ingate and carrying out general fettling, the casting is transferred to the machine shop for final machining and grinding. Figs. 27 and 28 show general views of these operations which are outside the scope of this Paper but will be of interest to the engineering minded.

Inspection and Testing

Perfect freedom from surface defects and correct chill depth are checked by visual inspection. Obviously X- or gamma-rays cannot be used on account of the mass of the casting. Supersonic methods of chill measurement have failed to give reliable results on iron rolls although this inspection method is valuable on cast steel rolls for the detection of internal unsoundness.

On all specialty rolls, test rings are machined from the ends of the body portion which is purposely cast longer. These rings are subjected to depth hardness penetration tests, and micro-examination. Immediately prior to the final grinding operation the surface of the roll is tested for hardness using the Shore Scleroscope. All metallurgists are aware the Scleroscope does not give a scientifically accurate measure of the hardness of

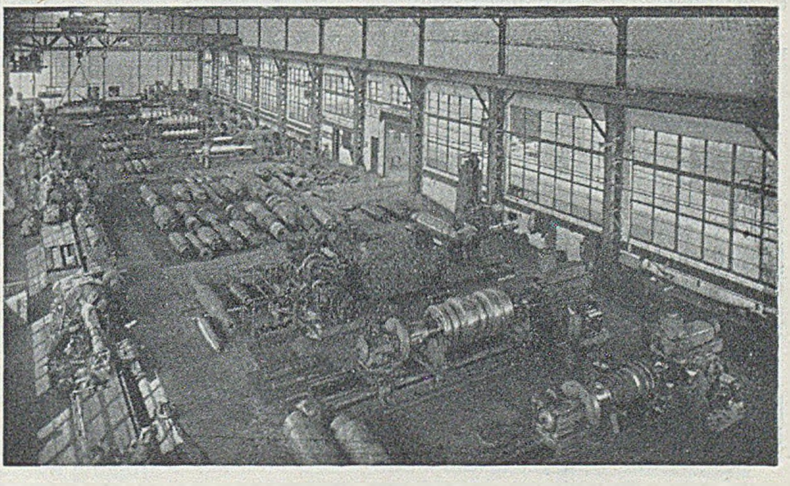


FIG. 27.—*General view of Roll Machine Shop.*

Chilled-roll Manufacture

the metal. However, up to very recent time, no better practical comparative instrument had been devised. Used with discrimination the Scleroscope can be a very useful guide, if its limitations are realised.

Several types of Scleroscopes are in use for measuring the hardness of rolls. Roll makers in Great Britain and the United States invariably employ the Coats "C" universal hammer instrument. On the Continent, particularly in Germany, the Schuchardt and Schutte instrument is used and this, with unfair advantage, gives readings much higher than the Coats "C" machine. The relationship between the respective instruments is not strictly linear and diverges rapidly with increasing hardness. At 90 Shore "C," the German equivalent is 100, whilst at 55 Shore "C" the German equivalent is 62. The Coats "D"-type recording Scleroscope gives readings 3 to 5 points in excess of the "C" type.

Scleroscopes should be cleaned and checked frequently by competent instrument mechanics. The diamond-tipped hammer, particularly, should be examined at very frequent intervals and where any doubt arises, the instrument should be checked against standard blocks of similar material having a hardness and structure comparable to the sample under test.

With scientific exactitude, it is impossible to make accurate comparisons between different types of hardness readings, for example, Scleroscope, Brinell, Vickers and Rockwell. The term "hardness" represents an aggregate of many properties including resistance to scratching, resistance to abrasion, resistance to plastic deformation, high modulus of elasticity, absence of elastic damping capacity, etc. No single type of test presents an accurate picture of all these properties and usually one in particular is given prominence in a specific test. For example, the Brinell test gives prominence to plastic deformation resistance whilst the Scleroscope gives emphasis to elasticity and damping capacity.

Furthermore, if a relative comparison is established on a certain class of material, the same comparison must not be used for materials having widely different physical properties and structure.

Fig. 29 shows the chart prepared for converting hardness figures. It is interesting to note that for the same Brinell figure, a hardened steel roll records a higher Shore hardness than does an iron roll. In very recent months the corporation has adopted a portable tester known as the Penetrascope which gives a Vickers diamond hardness number. It is thought that this instrument will gain popularity very rapidly. Whilst not so convenient in use as the Scleroscope it is precise and accurate in operation and can be applied to the roll before the final grinding operation without detriment to the surface. Fig. 30 shows this instrument mounted on a 22-in. dia. roll (note the chain clamp device).

TABLE II.—*Relationship between Roll and Mould Diameters.*

Roll dia., in.	Chill dia., in.	Shrinkage, in.	Finish, in.	Oversize, in.
12	12 23/32	7/32	1/4	1/4
18	18 15/16	5/16	1/4	1/4
24	25 1/32	13/32	3/8	1/4
30	31 1/8	1/2	3/8	1/4
36	37 7/32	9/32	3/8	1/4
42	43 5/16	11/16	3/8	1/4

TABLE III.—*Relationship Between Gate Size and Pouring Speed.*

Roll dia., in.	Barrel length, in.	Weight in tons.	Downgate dia., in.	Ingate size, in.	Time to pour in secs.
34	96	18	4½	4½ by 1½	90
27	80	9	4	4 by 1½	90
27	56	7	4	4 by 1½	80
22	54	4½	3½	3½ by 1¼	55
16	30	1¾	2	2¾ by 1	50

Conclusion

The roll metallurgist sees structures at × 50 magnifications for which in ordinary grey iron a magnification of × 500 would be desirable. On the other hand, test-bars and pilot castings cannot be made for rolls without great expense, and much of the experimental work must be the result of metallurgical thought, plus trial and error.

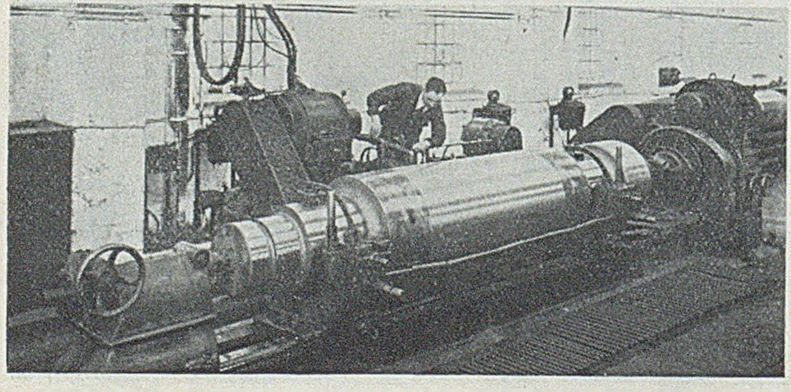


FIG. 28.—*Grinding the Barrel of a Chilled-iron Roll.*

The Author gratefully records his thanks to his directors for their kind permission in granting facilities to prepare and deliver this Paper and to his colleagues for their help in its preparation. He had permission to announce that the new roll foundry at Crewe was nearing completion. This would be the most modern of its kind in the world and it was hoped it would be possible for the I.B.F. Birmingham branch to arrange a visit there on some future occasion.

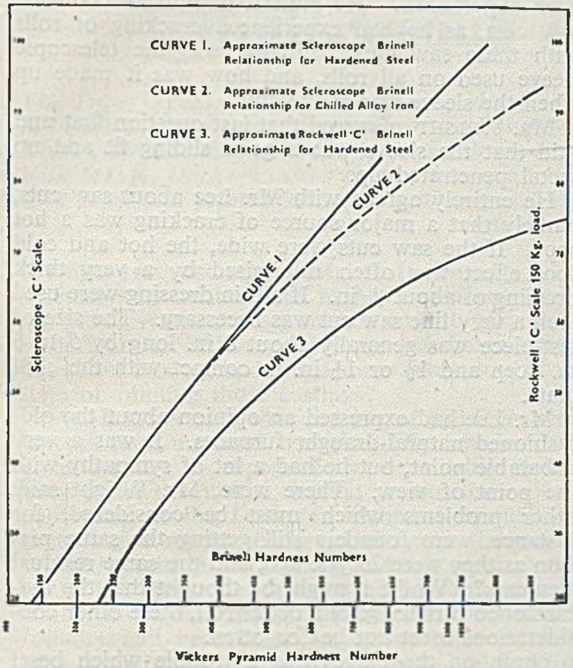


FIG. 29.—*Hardness Conversion Chart.*

REFERENCES

[6] Duat, R. 400-year old Belgian Foundry. *American Foundryman*, September, 1950.

[7] The Influence of Low Percentages of Certain Elements on the Microstructure of Pure Iron, Carbon Alloys and Cast Irons. W. J. Williams, M.SC., A.I.M. *Journal of the Iron and Steel Institute*, April, 1950.

* * * *

In the first section of this Paper, printed in last week's issue, we regret that the captions to Figs. 14 and 15 were interchanged. On page 36, col. 1, line 36, "hot steel" should read "hot sheet" and in some copies of the JOURNAL the "S" is missing from the expression M_s on page 39, col. 2, line 26. The Author informs us that the abbreviation in his original "harder V.F.P.'s" which we took to be "harder Vickers Pyramid hardness numbers" should be interpreted as "harder very fine pearlites" (page 37, col. 2, line 12).

DISCUSSION

DR. ANGUS in thanking Mr. Wright for his lecture said that he had no idea that chilled rolls were so old. He said he thought the way Mr. Wright had dealt with the subject from the metallurgical and manufacturing points of view, must meet with the admiration of everyone present, and he had much pleasure in opening the meeting for discussion.

MR. G. R. SHOTTON said while he knew very little of the subject there were one or two elementary questions. 1. In connection with the Siemens furnace, Mr. Wright had mentioned that gas regeneration was not used because of the necessity to avoid high temperatures. Why was this so important? 2. What did Mr. Wright use for making up the 6-in. tap-holes on furnaces? 3. Was trouble with graphitisation in any way due to lack of silicon?

MR. WRIGHT said air regeneration was not employed on the Siemens furnace for roll making, as very high temperatures resulted in the chill becoming very wild, in addition to increasing control problems; for tap-holes; coal dust, blacking, and finally rammed sand was used and graphitisation trouble was the result of high temperature and over oxidation, and inoculation would not cure it.

DR. ANGUS asked what happened when a reducing melt was obtained.

MR. WRIGHT replied that this was just as dangerous as over-oxidation.

Chill Life

MR. TWIGGER asked whether normalising was used, and what was the length of life of the chills. Did the chills get sufficiently hot to induce cracking on repeated heating and cooling? Was the life of the chills short, or more or less indefinite?

MR. WRIGHT said that normalising, or stress-relief annealing as he preferred to call it, was practised. Where the mill conditions were notoriously severe then they would normalise the rolls. As to the life of the chills, the quality of hematite used for them varied, and therefore the life of the chills varied, but he would think that for a 31-in. diam. chill, an average life possibly would be forty to fifty heats before it lost its shape or failed due to deep-seated cracks.

DR. ANGUS asked what percentage of silicon was used in the chill moulds.

MR. WRIGHT said about 1.4 per cent.; generally speaking the conditions which applied to ingot moulds applied to chill moulds.

MR. H. G. HALL congratulated Mr. Wright on his Paper, and asked him to elaborate his somewhat cryptic remarks regarding the manganese/sulphur ratio and the effect of melting conditions. In con-

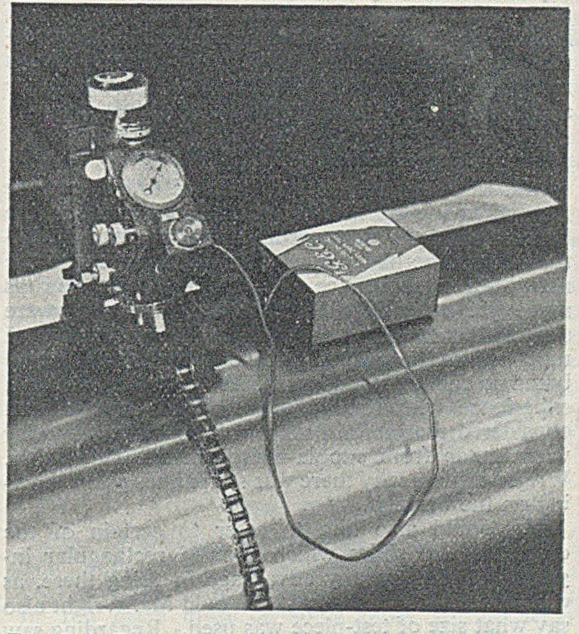


FIG. 30.—*Penetrascope mounted on a 22-in. diam. Chill Roll.*

Discussion—Chilled-roll Manufacture

nection with the German rolls, where Mr. Wright mentioned silicon contents as low as 0.25 per cent., how was control obtained with this low silicon content, he would have expected excessive oxidation?

Interpretation of Chill Tests

MR. WRIGHT said that possibly the subject of melting conditions should be the subject of a joint Paper between himself and Mr. Hall. Regarding manganese/sulphur ratio, if one found a 1-in. chill on the trial, then with a 1 : 1 manganese/sulphur ratio, one would expect approximately 1 in. of chill on the roll. With progressively increasing manganese/sulphur ratio, the difference between the chill on the test-piece and on the roll increased. The 0.25 per cent. silicon content was not applicable to German practice only, but to British and American also, and was necessary because the high nickel content also used acted as a graphitiser. He believed that the best martensitic roll one could make, supposing it were possible, would be one with 4 per cent. nickel, or thereabouts, very low chromium and a negative silicon figure. This of course was improbable, but served as an elaboration of the point.

MR. HALL said he always found it somewhat difficult to arrive at standard conditions on chill tests to decide whether the metal was suitable. What practice did Mr. Wright recommend in that respect? Did his men have a heated ladle, or did they take it from the 18-ton ladle or from the furnace, and how did they arrive at a comparison?

MR. WRIGHT replied that the chill test was taken in a hand bowl of the same size each time, and at a constant cooling speed, as the cooling speed in the molten state appeared to affect the resulting chill depth. Another precaution was to have the chill plate at a constant temperature for each test. The heated spoon was important in controlling the cooling rate in the molten state. He would always recommend casting the test-piece at a temperature as low as possible consistent with soundness.

Comparable Experiences

MR. LEE said he was very pleased to endorse the remarks made by Mr. Wright. In his opinion the best chilled rolls were made cast at a low temperature, and if he had his way, he would revert to the natural-draught furnace. In his experience, the rolls made years ago in natural-draught furnaces were superior to those made to-day. He always found mottling was a difficult problem, and most people based it on the manganese/sulphur ratio. He had experience with rotary furnaces and cupolas, and considered that certain sheet rolls were far superior when made from cupola-melted metal. Could Mr. Wright explain why there was sometimes grain showing on the barrels.

He would also like to refer to certain of the diagrams and slides which showed rectangular ingates. Was there any advantage in using these, as compared with round ones? Would Mr. Wright also say what size of test-piece was used. Regarding saw cuts, was the practice outlined still used or had this been superseded? He himself had an aversion for saw cuts, as he had experienced cracking of rolls with these saw cuts. Finally, was the telescopic sleeve used on all rolls, and how was it made up when the sleeve was in the chill.

MR. WRIGHT answered that last question first and said that the sleeve was a good sliding fit and no metal penetrated up.

He entirely agreed with Mr. Lee about saw cuts, namely that a major source of cracking was a hot spot. If the saw cuts were wide, the hot and cold spot effect was often minimised by a very thick dressing of about $\frac{1}{16}$ in. If a thin dressing were used then a very fine saw cut was necessary. The size of test-piece was generally about 8 in. long by 5 to 6 in. deep and $1\frac{3}{4}$ or $1\frac{1}{4}$ in. in contact with the chill plate.

Mr. Lee had expressed an opinion about the old-fashioned natural-draught furnaces. It was a very debatable point, but he had a lot of sympathy with the point of view. There were, Mr. Wright said, other problems which must be considered, for instance, were founders still getting the same pig-iron as they were 25 yrs. ago, and the same residual elements? Whilst it might be thought that the old-fashioned furnace gave a better roll, these other considerations must not be forgotten.

Grain on the barrel was a trouble which beset everyone at times, and he didn't know all the answers. He thought possibly if the oxidation was increased this might help. By this, he did not mean to burn the metal, just slightly increase the oxidation condition. Casting temperature should also be carefully watched. The use of rectangular ingates was purely a matter of choice, but he felt rectangular ingates did assist in the rapid formation of spin.

Possibility of Cupola Melting

MR. E. HUNTER referred to Mr. Wright's remarks that the cupola was used only when a high-carbon roll was required, and said elsewhere that normally a carbon content of 3 per cent. was employed. He would have thought it would have been possible to obtain metal of this composition from the cupola. Had Mr. Wright considered the use of a cupola and electric furnace?

MR. WRIGHT said that the limiting factor to the use of the cupola was scrap size. If one could get the roll scrap small enough, then he saw no reason why a cupola should not be used, providing it was of sufficient capacity to give the requisite tonnage of metal at the correct temperature. The use of the cupola and electric furnaces together had been considered and was actually practised in America particularly where high carbons were demanded.

At this point, the discussion was brought to a close, upon MR. SHORE proposing and Mr. Callaghan seconding a vote of thanks, which was warmly accorded.

THE EARL OF VERULAM, M.A., J.P., chairman and managing director of Enfield Cables Limited, and chairman of Enfield Rolling Mills Limited, and Sternol Limited, has accepted an invitation to become an additional patron of the Purchasing Officers Association.

Modernising an Iron Foundry

The Paper by Mr. L. W. Bolton and Mr. W. D. Ford on Modernising an Iron Foundry has now been presented to several branches of the Institute of British Foundrymen and each time has resulted in worthwhile discussion. What follows is a report of the November meeting of the East Midlands branch, with Mr. K. Docksey in the chair, when much additional interesting comment was made on this subject. The Paper was printed in our issue of May 25, 1950, *and previous discussions were reported on June* 1 *and December* 21, 1950.

OPENING THE DISCUSSION, Mr. L. Hearnshaw asked whether Mr. Bolton had in his experience found the use of synthetic resin to be a contributory cause of dermatitis. With regard to the gear-boxes weighing about 5 cwts., had the lecturer taken note of the time of running those castings?

MR. BOLTON said that the use of synthetic resin in core-sand mixtures was relatively new, and no great amount of experience was available on this question of dermatitis. At the present time a sub-committee of the Institute's technical council was preparing a report to the industry on the use of synthetic resin in the foundry and this report would no doubt give the latest available information. Rather more than half of the cores in the Author's foundry had been made in a synthetic-resin mixture for more than a year and there had been no case of dermatitis.

The gear-box castings were turned in 20 to 25 secs. (average 22 secs.).

MR. ROXBURGH said the lecturer had mentioned that he was using a continuous sand mill, and information as to the duration of the milling would be of value. Though no mention of the shatter test was made, he was convinced that this was very helpful for controlling ramming density in conjunction with the flowability of the sand in the moulding box.

Another point was whether Mr. Bolton experienced any trouble when he ran into hot sand during the day's operation, and did he take any precautions to deal with it, such as the addition of dextrine to the sand?

During a visit to the United States he learnt from two companies where phenol formaldehyde resin was being used for only a proportion of the core output, that they were quite free from the incidence of dermatitis, and they ascribed that to the fact the manufacturers had reduced the free formaldehyde to a minimum, therefore reducing the risk of the disease. Had Mr. Bolton any knowledge of dielectric loss heating furnaces for drying off small cores and could he give the outputs from his various machines, together with the labour employed?

Sand Properties

MR. BOLTON, in reply, said the continuous sand mill had a maximum capacity of 30 tons per hr. and was operated at about 20 tons per hr. He did not know how long sand remained in the mill, but it was probably less than a minute. He was aware that he did not develop the maximum bond from his clay addition, but he did produce a sand with consistent properties.

He found the shatter test extremely useful for routine control. Because the moulding sand was derived from cores, it contained a proportion of unburnt cereal. When he used only dextrine in the core-sand mixture, he sometimes experienced trouble from sand which was too tough to mould well and the shatter test was the only test which would indicate that his condition was developing. He maintained the shatter value at between 70 and 80. Since he changed over a proportion of the cores to starch in place of dextrine, he had experienced less trouble from tough sand.

The moulding sand was never quite cold and was often fairly hot yet he had had little trouble from drop-outs. It was possible that the residual cereal in the sand helped in this direction but there were two other factors—first-rate metal pattern equipment was provided and a good parting was obtained by spraying the patterns with a parting compound. Incidentally he had secured even better results recently from a new parting material which was now available in this country.

He was interested to hear that excess formaldehyde in synthetic resins could carry a risk of dermatitis. When he first experimented with resin core-sand mixtures, he tried some samples of resin which gave off clouds of formaldehyde as soon as the resin was put in the mixer. Even when the core-sand was warm, as it sometimes was, he had no formaldehyde smell at all with the resin now being used. Resin-bonded sands were very satisfactory for baking in a dielectric-loss furnace. That method was used by his company in one of its foundries and had proved extremely successful on cores of a limited range of sizes.

In considering output figures it must be borne in mind that "green" labour was employed and the men were not on piece work. There was, however, a shop production bonus. On the straight-draw machines using boxes 24 in. by 21 in. by 6 in. with one man on each machine and one man coring and closing, the anticipated production was 250 boxes from a pair of machines. On the slinger-type plant with boxes 5 ft. by 2 ft. 6 in. by 1 ft. and nine men including the chargehand, the output was 90 to 100 half-moulds per day.

Metal Control

MR. ROXBURGH, referring to metal control, said that with the carbon controlled at plus or minus 0.05 per cent. using refined iron and returned scrap, he felt there must be some other feature which entered into the control system.

Discussion—Modernising an Iron Foundry

MR. BOLTON, in reply, said that keeping carbon and silicon to within plus or minus 0.05 per cent. of the desired figures was not quite as simple as would appear. It was essential that each load of pig-iron was isolated until it had been analysed and released by the laboratory. No matter how reliable the suppliers, it was found necessary to use internally derived figures for analysis. It was also necessary to obtain pig-iron from suppliers who could give delivery of 10 to 15 tons of iron of one composition. The firm insisted that each load was all of one composition and it was kept separate until the composition had been checked. Pig-iron deliveries might have compositions over a fairly wide range but by blending one consignment with another, he was able to keep the charge analysis constant.

MR. HILL asked whether the lecturer had any trouble with the clay balling up and forming pellets in the sand? The difficulty of controlling the milling time in continuous milling was mentioned. It was possible to control milling time in batch mills quite efficiently by the intelligent use of a stop clock, and he suggested Mr. Bolton might try this method of control.

MR. BOLTON said he had had no trouble with clay pellets; this, again, might be because of the presence of cereal in the sand. After milling, the sand passed through a disintegrator and was then in very good condition for moulding. For controlling milling time on the batch mill, obviously a stop clock could be used, though personal experience of the use of such clocks in the foundry had not been too happy.

MR. S. P. RUSSELL asked whether there was any allowance made for the intake of air underneath the shake-out pits. There must be a considerable disturbance around the shake-out pit, if the suction was sufficient to change the air every 15 minutes.

MR. FORD, replying, said he had experienced no trouble from draughts around these fans. It was, he believed, common practice in America to pipe supplies of air to near the fan hood. His firm had not adopted this practice, and had not found it necessary. The velocity of the air dropped to a negligible amount at 10 ft. away from the hood.

The plant used exhausted fumes and dust upwards at an angle of 45 deg. and the velocity of discharge was sufficient to carry them well away from the foundry. It had been quite unnecessary in their particular circumstances to fit any form of dust collector.

Connor Runner

MR. RUSSELL, referring to the Connor runner, said there seemed to be general mystification as to why it worked. Had Mr. Bolton found the answer? It would appear from the illustrations that most of the runnner blocks showed shrinkage. Previous experience had shown that in many cases neither the casting nor the block had shown any shrinkage at all.

MR. BOLTON said he always liked to know how a thing worked, and when he first started to use the Connor runner, he was definitely feeding down out of the block. Then he found that sometimes there was apparently no feeding. He sectioned the block and found it was solid, and then the casting was sectioned and that too was solid. He was still of the opinion that the Connor runner acted very similarly to a pencil runner and the metal in the mould solidified almost at the same rate as that at which it entered. There was a sub-committee of the technical council doing some work on the rate of solidification of cast iron. He had suggested that with the apparatus available to that committee, the point might be proved and the metal shown to be actually hotter when it reached the mould cavity with a normal runner than with the block runner.

MR. L. MCDONALD asked whether exhausts were used to extract steam from the knock-out pits. On one plant he had trouble with steam and condensation and had had to install exhausting equipment. On one particular vibratory knock-out, the type which depended on an out-of-balance electric motor at either end, there was considerable trouble with breaking of the bolts which secured the vibrators to the end frame. The bolts passed through the end frame, and the grid-end flat. The bolts subsequently were isolated from the grid, and although this cured the trouble with vibrator bolts, other bolts sheared off and so high-tensile bolts were fitted with success. What was the Author's experience?

As to dust or fume exhausting, hood and duct design played a very important part, so far as efficiency was concerned. He thought the box-shaped hood of the grinding cabin illustrated could have been improved. What was the temperature of the casting at the knock-outs illustrated, and had any trouble been experienced with hot sand and metal on the belt?

MR. FORD, in reply, said he had found some need for ventilating the shake-out pits, but only for the short period that anyone was working in the pit itself. He had had no troubles in normal running, and he would not adopt continuous ventilation. He had experienced some trouble with bearings but he had, fortunately, had no trouble with breakage of bolts.

Referring to the question of the straight box-like shape of the grinding cabins, he employed only a 2-h.p. motor on the fans and the cabins worked quite efficiently. He doubted, therefore, if any great saving could be effected by improving the design of the cabins. The castings were knocked out at 600 to 700 deg. C., and as a result, there was no question of red-hot sand going up the knock-out belt. Ordinary rubber-and-canvas belts of heat-resisting quality were used, carrying $\frac{1}{8}$ in. top and $\frac{1}{16}$ in. back cover; that depth of the top cover was found to be important, in resisting the action of hot sand and metal.

MR. PERRY asked how long the aluminium patterns would be likely to last on continuous production under the sand thrower. Would it not be more economical to use iron patterns?

MR. BOLTON said that although the principle on which the equipment worked was very similar to the Sandslinger, it might not deliver sand against the pattern with quite the same velocity as the latter equipment. He had made some thousands of castings from the aluminium patterns and no measureable wear had taken place. From personal experience so far, he could affirm that he would expect to make several hundreds of thousands of castings before there was any serious wear. Aluminium was quite good enough for the job, and it did not appear necessary to have cast-iron pattern equipment on a set-up of the type used. He did not heat the metal patterns on small jobs, but on big castings it was essential on cold mornings to have the patterns warmed.

Coke Supplies

MR. SHEARER asked whether the lecturer had much variation in the quality of coke and what did he do about it?

MR. BOLTON said the quality of the coke was more important when steel-containing mixtures were melted than it was with the refined-iron mixtures he used. Carbon pick-up was not a serious problem in this case. He did insist on one particular brand of coke for the high-duty iron production. If forced to accept other grades he passed this coke to another foundry where the composition and temperature of the metal were not so important.

MR. J. BOLTON asked what type of fan was used? Was there any trouble from build up of small particles on the fan blades. When using high-pressure hot-water radiation for heating, was there any advantage over gas or electricity? For metal control, did Mr. Bolton think that this control of plus or minus 0.05 per cent. was essential? He noted in respect to vacuum cleaning that the original Paper had been slightly amended, the original stating that foundry dust was not injurious, and now Mr. Ford stated that foundry dust apart from the fettling shop was not injurious.

MR. L. BOLTON insisted that it was necessary to keep the close control on metal composition. If the carbon or silicon strayed more than 0.075 per cent. from the desirable analysis the foundry was likely not to meet the strength specification. There was also the liability of trouble from shrinkage if the carbon went too low. With the range of castings being made it was advisable to keep to the close limits quoted.

MR. FORD, referring to the subject of the fan, said the only way he could describe it was a normal centrifugal steel-plate fan of 48-in dia. blades, 23,000 cub. ft. per min. capacity, when running at a speed of 370 r.p.m. It was driven by a 7½ h.p. motor. As to the build-up of particles on the blades of the rotor, he had experienced no trouble. So far as high-pressure hot-water radiation panels were concerned, undoubtedly gas or electricity would be satisfactory, but they would need individual attention, if only in a small way, and he felt that control of the panels from one point—the boiler house—was a more satisfactory and simpler system. As to vacuum cleaning, he really intended to convey that there was little reason to suspect normal foundry dust of being harmful.

Casting Lead Battery Grids*

Lead alone is not satisfactory for battery plates and a percentage of antimony must be added. The following figures illustrate the properties of the alloys:—

Per cent. antimony.	Tensile strength.	Coeff. of expansion.	Density.
0	1,780	0.0000292	11.34
5	6,360	0.0000275	10.95
8	7,420	0.0000267	10.74

It is usual to use between 8 and 10 per cent. antimonial lead for grids because of the mouding properties of this particular alloy. Antimony has been found to have certain beneficial effects on the chemical properties of the lead and also allows liquefaction below the melting point of pure lead, and reduces the coefficient of expansion by about 8 per cent.

The moulds used for casting grids consist of two parts made of cast iron. Grooves are cut in the opposite faces of the mould, according to the design of the particular plates. Small grids are cast doubly and the larger singly. The moulds are evenly heated to 135 to 180 deg. C. to make the metal run freely, and are provided with suitable vents. A slight head of molten metal is required to make it run into all the recesses of the mould, and the molten metal must be at a high enough temperature to prevent premature solidification. Moulds are prepared for the casting process by smoking, spraying or dusting the faces after preliminary heating.

Casting

There are many types of automatic casting machines for casting these components, but they have certain disadvantages. For instance, the automatic machine does not allow for faulty casting. The automaton does not stop if it starts producing faulty grids and, since the coatings on the moulds are not very efficient, it will be readily appreciated that constant supervision for this type of machine is necessary. The hand-fed mould—called a "chill"—is used locally to good effect, and it is found that three operators can handle six chills on a turntable.

The melting pot containing the molten alloy is usually electrically heated and thermostatically controlled. During the casting of the grids, the molten metal is stirred from time to time, and the dross skimmed off. Good ventilation is necessary to carry off the fumes which may sometimes be seen over the melting pot and an extraction hood is used for this.

The most common flaws observed in grids are premature solidification of the metal in the mould, webs which appear when the two faces of the mould do not fit together perfectly, and mechanical injury in taking the newly-cast grid from the mould. The grids are trimmed after casting to remove rough edges and minor imperfections.

* Abstracted from an article appearing in the South African *Engineer and Foundrymen*.

Mechanical Handling

IN A PAPER which was presented jointly to the Institution of Mechanical Engineers and the Institution of Electrical Engineers, Mr. A. Roebuck, M.I.MECH.E., Mr. S. H. Carnegie, M.I.MECH.E., and Mr. E. G. Taylor, M.I.E.E., dealt with the report of the team sent to America to study mechanical handling. From this Paper we have extracted the following information and illustrations which are self-explanatory.

The report outlines four principles of good materials handling:—

(*a*) Eliminate manual handling wherever possible. When a high percentage of a machine operator's time is spent in handling the work, his productive output may be increased by mechanised handling.

(*b*) Avoid rehandling. First see if the handling operation can be eliminated. If not, try to combine two or more handling operations into one.

(*c*) Use equipment that sets a uniform pace. Handling equipment should maintain a steady rate for the operator. This can be done without unreasonable speed-up and is highly recommended in assembly operation.

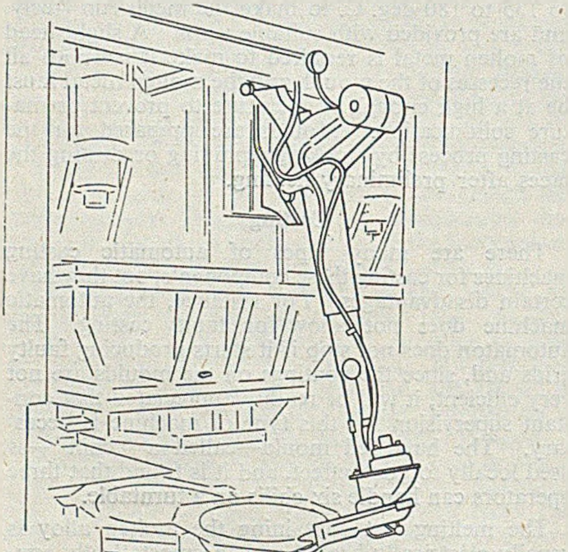


FIG. 1.—*"Iron Hand" Workpiece Extractor, which has in some instances increased production by as much as 20 per cent. The arm swings down and two "fingers" grip the edge of the article. When the workpiece has been extracted, the "fingers" open while the arm is swinging upwards, and the article is directed down a chute or onto a roller conveyor. The swinging and opening movements are operated by air pressure.*

(*d*) "Palletise" and use unit loads. Always try to handle large lots (unit loads). This is especially important in receiving stockrooms, as well as between departments. Inside a department or between machine operations it may be better to handle individual pieces or parts. The parts may be handled in large lots both at the beginning and the end of the line, but at intermediate operations it may be necessary to handle them individually. Handling between operations can nearly always be done mechanically at a profit.

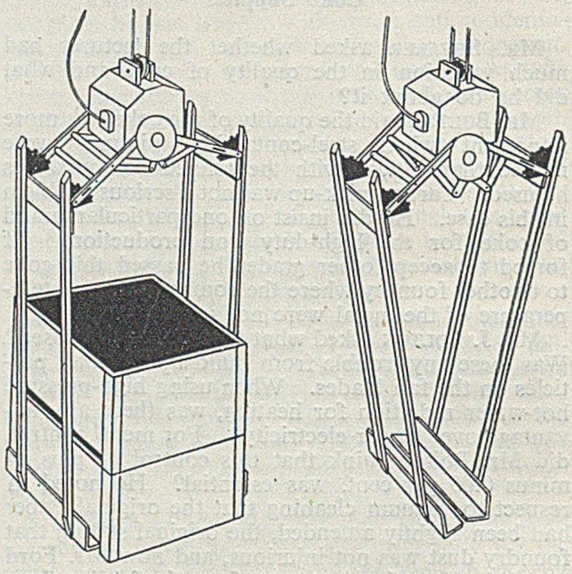


FIG. 2.—*Power Grab for handling Unit Loads. For handling Irregular-shaped Articles, Containers are provided (left).*

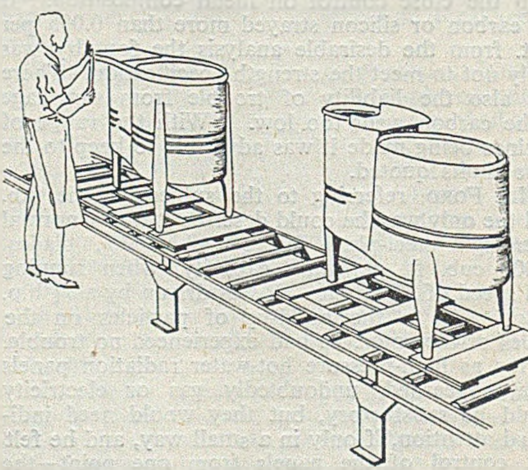


FIG. 3.—*Platform for an Irregular-shaped Assembly. As this consists of the Base of the Packing Case, handling from assembly line to despatch department is simplified.*

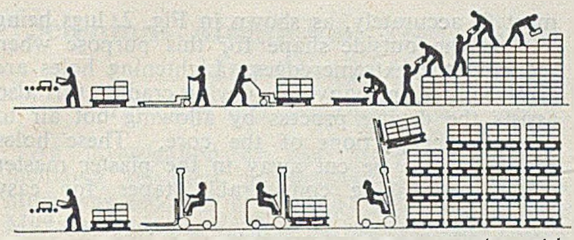


FIG. 4.—*Use of the Fork Truck. Pallets, together with the Fork Truck, eliminate the wasteful manual operation of stacking and unstacking piece-by-piece, shown in the upper diagram.*

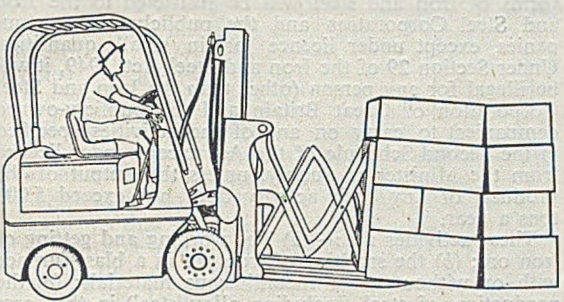


FIG. 5.—*Fork Truck with Pusher Attachment.*

The improved materials handling resulting from the application of these principles offers a greater opportunity to cut production costs and to increase productivity than any other single factor. This is no exaggeration. Materials handling accounts for 15.85 per cent. of the cost of production. This is obvious from the well-known fact that it is not unusual for 50 tons of material—and sometimes much more—to be lifted, moved, loaded, unloaded, reloaded, etc., for every ton of finished product produced.

In Britain attention is normally centred on the reduction in processing cost and time, and this must not be undervalued. But, so often, it is found to-day that more time and money may be saved by decreasing the time and cost of handling a material between processes than can be achieved by speeding up the actual processing time. Moreover, a decrease in the handling time may often allow a speeding up of the processing time, as the bottleneck in production may be in the accumulation of material which is either not disposed of quickly enough, or not fed to the subsequent processes fast enough, and an increase in the efficiency of handling may even increase efficiency of the process operations. In fact, "steady, uninterrupted flow of materials to and from each workman will, on average, raise productivity by at least 15 per cent. using existing productive machine equipment."

Team Work

Everywhere the team noted the awareness of all industrial workers (including workers on the shop floor) and their demand for time- and energy-saving arrangements and equipment for receiving, storing, servicing, both on machines and benches, and on assembly lines—including departments which might tend to be neglected, such as the handling in the finishing, packing, and despatching departments, and in the offices as well.

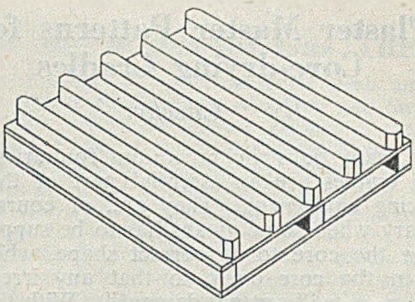


FIG. 6.—*Pallet for use with "Pusher" Fork Truck (shown in Fig. 5). The pusher device permits storage and warehousing with pallets, but allows the pallets to be retained when loading outgoing goods.*

Scale models have been found more satisfactory than drawings as a basis for discussions, and for reaching agreement with all levels of staff, and such models are made of factory buildings, machine tools, process plant, and materials-handling equipment. Three-dimensional models of new layouts have, of course, been employed in Britain to study alternative arrangements already drawn out, but they are not used to the same extent as in the United States. A model in a motor-car factory, to a scale of $\frac{1}{4}$ in. to 1 ft., showed all processing machines, trucks, etc., so that the people who had to put the shop into efficient production could discuss, modify, and finally approve the arrangement. This model even had parts of material in process shown on overhead chain conveyors, while a second storey, with a perspex floor, was in position over part of the ground floor.

This team work within the factory is extended outside. An impressive degree of collaboration exists between the manufacturer and his supplier. The materials are first inspected by the manufacturer's agent at the supplier's works and are afterwards delivered, according to schedule, in a pre-arranged "palletised" form. In many cases the unit loads are transported direct to the processing and assembly sections. In this way the double handling normally required in inspection and stores departments is eliminated.

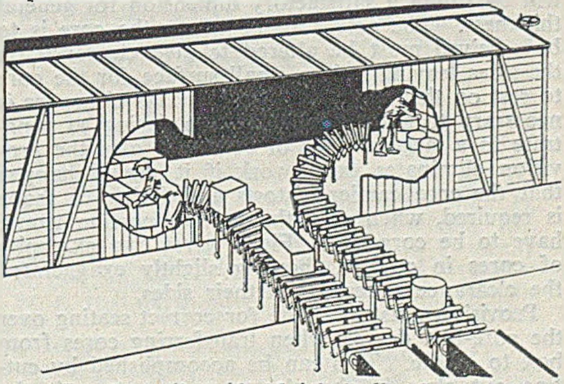


FIG. 7.—*Adjustable Mobile Roller Conveyor.*

Plaster Master Patterns for Core-drying Cradles

By " Checker "

For many jobs in repetition foundries, core-drying cradles are an essential part of the core-producing equipment. They are, of course, only necessary when some means has to be supplied for holding the core to its correct shape, while it is dried in the core oven, so that any irregularly-shaped cores will not get damaged. With this class of work, core-drying cradles for any one job may be needed in large numbers, so that the necessity of a master pattern is obvious.

For large-quantity production, metal equipment is usually supplied to the foundries, therefore much time can often be saved by making a plaster master pattern of the desired core-cradle, either by utilising the master core-box already made for making

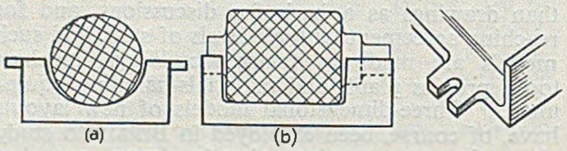


FIG. 1 *(left).—Two Examples, (a) and (b), of Core-drying Cradles showing the Clearance allowed round the Core.*
FIG. 2 *(right).—Slot in the Core-cradle Pattern for Locating with the Core-box Dowells.*

the metal core-box, or, if possible, from one half of the finished metal core-box. To produce the plaster pattern, a mould should first be made off the master, similar to that required when making a metal core-box. This mould should then be filled with plaster of paris, thoroughly mixed with water until it has reached a creamy consistency, and when sufficient time has been allowed for setting, the plaster cast should be removed from the sand.

This plaster pattern should next be reduced around its outside shape wherever possible to reduce its weight, and for this purpose all external bosses used for holding dowels can be reduced, also, any ribs need not exceed ½-in. thick, which will be found a satisfactory dimension for general thickness. The actual shape where the core is to be received must be altered to give clearance on the sides leaving only a small surface for the core to rest on throughout its length. This clearance is necessary to allow the hot air in drying to penetrate to a large surface of core, and also the provision eliminates extra work if it should happen that the core carrier distorts and fitting to shape is required, when only the bottom portion would have to be corrected. Fig. 1 gives two examples of cores in cradles, showing slightly exaggerated the clearance necessary at their sides.

Provision must be made for correct seating over the core-box dowels when transferring cores from box to cradle. This can be accomplished by cutting out slots in the plaster pattern to suit the core-box position of the dowels, over which they must fit accurately, as shown in Fig. 2, lugs being left on the outside shape for this purpose when reducing the extreme edges. Lightening holes are also required in many core-drying cradles, this also assists the drying process by allowing hot air to reach lower portions of the core. These holes should always be cut away in the plaster master pattern, arranging considerable taper for easy moulding.

Licensing of Iron and Steel Making

A communication from the Ministry of Supply points out that after May 15, 1951, the production of certain forms of iron and steel will be restricted to the Iron and Steel Corporation and the publicly-owned companies, except under licence or in small quantities. Under Section 29 of the Iron and Steel Act, 1949, it will be illegal for any person (other than the Iron and Steel Corporation of Great Britain and the publicly-owned companies) to carry on any of the activities specified in the Second Schedule of the Act except under licence from the Minister of Supply, unless the output of the products of any such activity does not exceed 5,000 tons a year.

These activities are:—(*a*) The working and getting of iron ore; (*b*) the smelting of iron ore in a blast-furnace with or without other metalliferous materials; (*c*) the production of steel (including alloy steel) in the form of ingots and (*d*) the changing of the cross-sectional dimension or cross-sectional shape of steel by hot rolling in a rolling mill.

The Minister is required to issue a licence, under Section 30 of the Act, subject to certain prescribed conditions, to any business which was carrying on any of the second-schedule activities on November 24, 1949 and which furnishes not later than April 15, 1951 the particulars specified in that section. Anyone desiring a licence under section 30 who has not already heard from the Ministry of Supply should submit to the Ministry not later than April 15, 1951 a statement of the particulars required under the section. A form for the purpose may be obtained from:—The Iron and Steel Division, Ministry of Supply, Room 633, Bush House (S.W. Wing), London, W.C.2.

Although any person whose production in respect of the second-schedule activities does not exceed 5,000 tons in any year is not required to obtain a licence, it will be of advantage to those businesses whose average annual output in 1946 and 1947 exceeded 2,500 tons, if a licence under Section 30 is obtained. In such cases a licence will authorise production up to double the average annual output in 1946 and 1947, and therefore, more than 5,000 tons in any year.

The president of Glasgow Chamber of Commerce, Mr. Harry Yates, said this week that the recent rise in shipping freight charges would increase the cost of imported iron ore by 17s. or 18s. a ton. This would mean a rise in the cost of pig-iron in Britain of possibly 35s. a ton.

Foundry Sands

During September, 1949, the British Cast Iron Research Association organised a Conference on the above subject. The December, 1950, issue of the Journal of Research and Development contains seven Papers, presented together with verbatim reports of the discussions. The matter included is of real importance to foundry managements, and readers are advised to take steps to procure a copy from the Association at Alvechurch, near Birmingham, for immediate study and future reference.

Selenium Aluminium Deoxidiser for Steel

Inclusion and Porosity Control

An investigation of new special deoxidisers, including selenium in conjunction with aluminium was reported in a Paper prepared by C. G. Mickelson for presentation at the Electric Furnace Steel Conference of the American Institute of Mining and Metallurgical Engineers, held at Pittsburgh in December, 1950.

At the present time, the use of aluminium in most grades of cast steel is necessary to eliminate pin-hole porosity, but it has been observed that certain heats had inferior ductile properties to those required. The use of the proper amount of aluminium resulted in the formation of crystalline inclusions which produced satisfactory physical properties for certain high-tensile steels. For certain specifications the yield and tensile properties remain the same, but the elongation and reduction of area are increased. It is known that the round type of inclusions are the most desirable for obtaining high ductile properties, and the use of selenium might well be used for obtaining the desired round inclusions to attain that end. Previous work has indicated that selenium used alone will not eliminate pinhole porosity in normal grades of steel, so it was decided to use this element in conjunction with varying amounts of aluminium, aluminium being added to control the porosity, the selenium to control the type of inclusions. Results showed that the ductile properties improved when the proper amount of selenium was added to the steel. Metallographic investigation disclosed that with the proper addition of selenium, the inclusions in steel containing either ½ lb. or 2 lb. of aluminium per ton of charge were changed from the elongated or crystalline type to the round type.

Additional experiments using 1½ lb. of aluminium with selenium additions varying between 0.075 and 0.10 per cent showed excellent results, the average physical properties ranging from approximately 29 tons per sq. in. yield to 45 tons tensile, 26 per cent elongation and 54 per cent reduction of area. With these promising results, experiments, states the author, were tried in the acid-electric melting shops and ductility considerably above that normally obtained on a similar grade of steel treated only with aluminium were obtained.

Mechanical Research Laboratory in Scotland

The value to Scottish industry of the mechanical research laboratory at East Kilbride was dealt with on January 9 in a Paper delivered in Glasgow to the Institution of Engineers and Shipbuilders in Scotland. Paper was prepared by the late Dr. G. A. Hankins, formerly director of mechanical engineering research in the Department of Scientific and Industrial Research, of which the laboratory will form part. The first buildings will be occupied this year, although temporary accommodation has already been found at Thorntonhall, where a start has been made on research work. At a later stage there will be a staff of about 600 employed.

Steels and Alloys for Gas Turbines

A Symposium on high-temperature steels and alloys for gas turbines arranged by the Iron and Steel Institute will be held in the Lecture Theatre of the Institution of Civil Engineers, Great George Street, London, S.W.1, on Wednesday and Thursday, February 21 and 22. The sessions, which will commence at 10 a.m. and 2.30 p.m. on both days, will be under the chairmanship of Mr. J. R. Menzies-Wilson, president of the Institute. The Fifth Hatfield Memorial Lecture, which will take place in association with the symposium, will be delivered by Air-Commodore Sir Frank Whittle, in the lecture theatre of the Institution of Electrical Engineers, Savoy Place, Victoria Embankment, London, W.C.2, on the evening of Tuesday, February 20, at 8.30 p.m. (admission by ticket).

Papers on Foundry Work

Of particular interest to foundrymen is Section V, "Special Casting Techniques," as Papers are to be given on "Centrispun High-alloy Steel Aero-engine Castings, Part I, The Centrispinning Process, and Part II, Physical and Mechanical Properties of Centrispun Die-castings," by A. E. Thornton and J. J. Morley; "Centrifugal Steel Castings for Gas Turbines," by J. Taylor and D. H. Armitage; "Investment Casting of Nozzle Guide Vanes," by H. E. Gresham and A. Dunlop, and "Precision Casting of Turbine Blades," by E. R. Gadd.

A dinner for those attending the symposium will be held at the Hyde Park Hotel, Knightsbridge, London, S.W.1, on Wednesday, October 18. For this function tickets cost £1 5s. Buffet luncheons will be available from 1.0 to 2.30 p.m. on both days in the York Hall, Caxton Hall, Caxton Street, London, S.W.1, at a charge of 6s. per person per day.

Attendance of non-members.—Non-members of the Iron and Steel Institute will be welcome at the meetings and functions, on the same terms as members, and may contribute to the discussions. In connection with the symposium and related functions, there will be a registration fee of 10s. per person.

Papers.—The Papers presented at the Symposium and the discussions during the meeting will be issued as a single bound volume (No. 43 in the special report series of the Iron and Steel Institute), the published price of which will be £3 3s. (post free). Orders received before the meeting, if accompanied by a remittance, will be supplied at the reduced rate of £2 2s. (post free) and those attending the meeting who purchase a volume beforehand will be provided with a set of advance copies of the Papers without extra charge. Advance copies will not be supplied separately.

Those intending to take part in the symposium should write for details to the secretary of the Institute, at 4, Grosvenor Gardens, London, S.W.1.

Mond Nickel Fellowships

The Mond Nickel Fellowships Committee has announced the following awards for 1950:—Mr. D. Alexander (University of Otago, New Zealand); Mr. F. R. H. Allon (John I. Thornycroft & Company Limited.); Mr. K. W. J. Bowen (Cambridge University); Mr. M. G. Gemmill (United Steel Companies', Limited); Mr. W. B. Hall (Nchanga Consolidated Copper Mines, Limited).

The Mond Nickel Fellowships Committee will at a later date invite applications for awards for 1951. Full particulars of the Fellowships can be obtained from the Secretary, Mond Nickel Fellowships Committee, 4, Grosvenor Gardens, London, S.W.1.

Homogenisation of Steel Castings

There is considerable divergence of opinion among manufacturers as to whether high-temperature treatments refine the structure and improve the mechanical properties of steel castings. The members of the physical properties sub-committee of the Steel Castings Division of the British Iron and Steel Research Association have studied this matter in some detail. Their main conclusions are given in this extract and full details are reported in SC/AB/60/50, "The Homogenisation of Steel Castings and its Effects on the Mechanical Properties," now available to readers on request to the Association (at 11, Park Lane, London, W.1).

The effect of homogenising treatments upon the tensile and Izod impact properties and upon the macro- and micro-structures of normalised plain carbon (0.2 to 0.4 per cent. C.) and hardened and tempered low-alloy (Mn, Mn-Mo, Cr-Mo, and Ni-Cr-Mo) sand-cast steels was examined. These steels were produced in basic electric arc or acid high-frequency furnaces and cast in the form of 1½-in. thick keel test-blocks or clover-leaf test-blocks with limbs 1½-in. dia.

It was shown that homogenisation for periods of up to 30 hrs. at temperatures between 900 and 1,200 deg. C., followed by the usual heat-treatment, had, in general, no appreciable influence on these properties of cast steels of good metallurgical quality. A slight downward trend in yield ratio was observed in some, but not all, of the plain carbon steels, but there was no direct relationship between this behaviour and the temperature or duration of treatment. The ductility, as measured by the reduction of area or elongation, and the impact resistance, which were the two properties which were expected to be most affected, showed no change after homogenising in this temperature range. Several of the steels were homogenised at 1,250 deg. C., and there was then generally an improvement in the reduction of area and Izod impact value, the elongation benefiting to a lesser degree, but the tensile strength remaining constant.

After homogenisation, the dendritic structure, shown by the normal etching reagents, usually tended to become less marked, although this did not apply to all steels. The treatment had no effect on the non-metallic inclusions or on the micro-structure of steels subsequently heat-treated, both features being representative of normal cast steels. There was, however, a tendency for the dark-etching cellular pattern frequently evident in the structure of heat-treated cast steels to be eliminated.

Certain castings of plain carbon (0.2 to 0.4 per cent. C.) steel of "sub-standard" quality (so described because the ductility in the normalised condition was lower than that expected from steels of such a composition), made in an acid electric-arc furnace, were given similar treatments at temperatures between 950 and 1,250 deg. C. The reduction of area and elongation values, previously unsatisfactory, were improved by homogenising treatment at 1,150 deg. C., to the extent that most of the castings afterwards conformed to the ductility requirements for these steels. Raising the homogenising temperature to 1,250 deg. C. further increased the elongation value, but the reduction of area decreased appreciably.

The yield ratio fell to a minimum after homogenisation at 1,150 deg. C., and there was some evidence that the Izod impact value was behaving in a similar manner. The dendritic structure, as shown by the normal reagents, again became more diffuse after homogenising at the higher temperatures. Intergranular chains of non-metallic inclusions present in many of the castings confirmed the inferior quality of the material, but were not entirely responsible for the poor ductility of the normalised castings. The homogenising treatment, which

(*Concluded at foot of next column*)

produced an improvement in properties, did not apparently affect these inclusions. The micro-structure of these steels became coarser as the homogenising temperature was raised to 1,150 deg. C., but appeared to be less coarse after homogenising at 1,250 deg. C.

Notes from the Branches

Middlesbrough

At the December meeting of the Middlesbrough branch of the Institute of British Foundrymen, Mr. A. Tipper, of Market Harborough, gave a very interesting Paper on "Developments in Core Binders and Core-sand Practice Since 1945." There was a good attendance of members at this lecture. The branch president, Mr. L. Johnson, introduced Mr. Tipper to the members as a recognised authority on his subject.

The many new developments in coremaking practice had been brought about by shortages of materials which had formerly been in general use and through closer contact with American foundry practice. Rising costs, too, had made manufacturers more conscious of the necessity of finding cheaper substitutes for materials necessary for this work. Mr. Tipper then described some of the equipment which he thought was necessary in a core shop. He felt that, besides a rotary drying system for the sand, a cooling system was also necessary, as this made for a great saving in time. In connection with sand mixing, Mr. Tipper said that there had been no major improvements in this part of core-shop practice. There was now an automatic means of measuring the sand charge and clocks for measuring the mixing time.

Mr. Tipper pointed out that the sand now supplied to foundries was washed and graded, and manufacturers were able to buy the type of sand best suited to their requirements. The amount of silica in the sand can be specified by the purchaser.

Core-drying was now much more efficient than it had been in the past. It could be done by oil- or gas-firing. The temperature to which it is heated can be controlled automatically. There were many advantages in having a re-circulation system, and most stoves could be modified by one or other arrangement in order to re-circulate the hot gases. This gave improved uniformity of temperature and reduced fuel consumption. For maximum core strength, slow baking was to be preferred.

A description was given of high-frequency drying methods which were of particular interest to those foundrymen using resin-bonded cores. The next part of the lecture covered some of the benefits arising from the use of different binders, such as oil, cereal and starch, and their effects on the life and strength of the cores, and the longer or shorter time taken to bake the cores.

Mr. Johnson, in opening the discussion, said a question, which aroused much interest, was whether resin-bonded cores could cause dermatitis. Mr. Tipper, in reply, said that a committee of the Institute had been working on this matter. Reports from the United States suggested that frequent washing was necessary and the use of a protective cream was recommended. Answers to other questions indicated that the lecturer was of opinion that resin cores were not particularly brittle, and some firms carried stocks of resin-bonded cores for future use. It was not dangerous to store resin in large quantities, as the types of resin used in making cores were water-soluble and non-inflammable.

The meeting closed with a vote of thanks to the lecturer.

Publications Received

Sweden. By N. S. Roberts, C.M.G., O.B.E. Published for the Board of Trade by H.M. Stationery Office, York House, Kingsway, London, W.C.2. Price 3s. 6d. net.

Following the usual pattern of these publications dealing with overseas countries, this one is perhaps a little more comprehensive than most. When we deal with overseas publications we usually—unless purely a comparison of results is indicated—convert metric and other standards to those which are familiar to our readers, and we suggest that this is a courtesy the publishers owe to theirs. It is not suggested that Appendix II should be altered but rather that such items as hectares, kilograms, litres, and metric tons and the like should be converted. Whilst the book has an excellent contents list, the inclusion of an index would be appreciated. The only mention of foundrywork is on page 18, when we are told that in 1948, 4,309 tons of malleable castings were imported and of this amount the United Kingdom supplied material to the value of 2,600,000 crowns. Despite these small criticisms, we deem this publication to attain the high level always to be associated with these overseas brochures.

Patronato "Juan de la Cierva" Investigacion Technica (Juan de la Cierva Foundation for Technical Research). Published by the Foundation from Serrano, 152, Madrid, Spain (?).

It will be noticed that there is a query after the address cited, for actually this is the headquarters of the Leonardo Torres Quevedo Institute for Scientific Apparatus. This is given because the reviewer failed to find anything more direct. However, the one given does refer to a major branch of the Foundation. This very handsome brochure is printed in English—and excellent English too. It tells of the various institutes and centres forming the Foundation, and illustrates both buildings (a few of which are gems of architecture), and a selection of the plant and apparatus installed. The activities undertaken are widespread and range from cement, forestry, and metallurgy to marine biology. The book gives the impression that Spain does not mean to lag behind in industrial research.

Directory of Coventry Manufacturers. Published by the Relations Department of the Coventry Municipal Information Bureau, 1, Union Street, Coventry.

In pre-war days, this type of publication contained much information about local conditions and costs and was frankly an invitation to manufacturers to establish themselves in the area covered. Now this has changed to a straight directory of manufacturers and their output plus information about the local banking and consular facilities. It is very well produced and nicely illustrated.

The Use of Zinc Pigments in Exterior Paints (Second Edition). Published by the Zinc Pigment Development Association, Lincoln House, Turl Street, Oxford.

This twenty-two page pamphlet is full of hints of a very practical character and thus will be of real use to those concerns which undertake their own building upkeep work. The pamphlet is divided into two sections, the first of which deals with the paint film and properties of pigments and the second the formulation of zinc-pigment paints.

Burnbank Apprentice Scheme

The further-education sub-committee of Stirlingshire reported in a minute on January 11 that the director of education had made reference to what he thought was some confusion in the minds of the members with regard to the Burnbank foundry, and the project of Allied Ironfounders, Limited. In this latter connection, he submitted a letter from the personnel and welfare officer of M. Cockburn & Company, Limited (Allied Ironfounders), drawing attention to the fact that Allied Ironfounders' apprentice training school at Falkirk had been in operation for a number of months and, in accordance with the agreed programme, that school would be ready to receive a further intake of boys in January. The new intake would, it was hoped, be drawn principally from the boys of school-leaving age who were due to leave schools in the Falkirk area in a few weeks' time. The letter stated that the education committee's co-operation in attracting lads to join the school was desired, as it was believed that they would have opportunities to benefit from training which were unequalled elsewhere. The school had experienced and trained instructors in attendance, and no effort had been spared to ensure that the apprentices would be given a thorough and effective practical and theoretical training.

As to the Burnbank project, the director of education also reported that, following a recent meeting he had written to the Scottish Education Department informing them that fitters, moulders, and patternmakers had accepted the apprenticeship agreement, and that the scheme of training for apprentices in the industry had now been accepted by the unions concerned, so that, in the circumstances, consideration of a starting date for the Burnbank foundry school should now be given, and asking if a meeting could be held with departmental officials to discuss possible schemes of work.

The director had been informed, however, that Mr. Ferguson, one of H.M. Inspectors who had represented the department on the previous discussions on the project, would not be available until March, owing to his absence from the country. As, however, it was hoped to start the school in September next, he was of opinion that arrangements based on certain suggestions made by the department should be put in hand immediately, and with this in view he suggested that a meeting of the joint advisory committee on the Burnbank foundry should be called as soon as possible and details of the position placed before them.

F.T.J. Prize Crossword Puzzle

The second crossword puzzle (December 21, 1950 issue), possibly because it was somewhat simpler than our previous one, was much more popular. There was a high percentage of entries carrying small mistakes. Our prize of two guineas goes to Mr. W. G. Murray of 33, Pinewood-avenue, Sidcup, Kent. Mr. Murray is a lecturer at the Borough Polytechnic, London, S.E.1. If any of our readers feel they would like to try their hand at composing one we shall be happy to consider it for publication.

A TRANSPORT SALES DEVELOPMENT DEPARTMENT has been established by T.I. (Group Services), Limited, to offer a full service to the public road and rail transport industries. Mr. E. Bryan, formerly technical sales manager of the T.I. subsidiary, Metal Sections, Limited, has been appointed director of the department, which will have its offices at Broadwell Works, Oldbury, Birmingham.

News in Brief

NEARLY 600 children, between the ages of four and 12, were entertained to a party at the Park Gear Works of David Brown & Sons (Huddersfield), Limited, on January 6.

THE INDUSTRIAL DEPARTMENT of Philips Electrical, Limited, which was previously operated from 122, Snow Hill, Birmingham, is now accommodated in the main branch premises at 28a and c, Ludgate Hill, Birmingham.

LONG SERVICE PRESENTATIONS were made to employees of the Brickhouse Foundry Limited, Great Bridge, Tipton, which was founded in 1858. A special award was made to Mr. S. Westwood, who joined the firm 56 yrs. ago. Eight employees were presented with silver cigarette cases.

EARLY IN 1950 the works section of the Lapointe Machine Tool Company Limited moved to a new factory situated on the Watford by-pass, the offices remaining at Edgware. On December 21, 1950, the offices were transferred also and all communications should now be addressed to:—Otterspool, Watford By-Pass, Watford, Herts.

A 30,000-KW. TURBO-ALTERNATOR has been ordered by Glasgow Corporation Transport Department from the Metropolitan-Vickers Electrical Company, Limited, for Pinkston power station. Negotiations are proceeding for the purchase of land near the station for the erection of cooling towers, etc.

TARGET of the Scottish Scrap Campaign Committee for 1951 is 20,000 tons of scrap metal. Announcing this last Monday, Mr. T. J. Smith, chairman of the committee, said that a survey was at present being made to find out any scrap which might have been missed in previous scrap collections.

SLOAN & DAVIDSON, LIMITED, architectural iron-founders, of Stanningley, near Leeds, have installed changing rooms, lockers and showers at their foundry so as to enable employees to travel to and from work in clean clothes. The new block also comprises a time office, garage, stores, and one of the most up-to-date, pattern-shops in the country.

AN ORDER for approximately 1,200 tons of manganese-steel castings for lining ball and rod mills at a large copper mine in Chile has been received by Edgar Allen & Company, Limited, Sheffield. The order originated in New York and some $US 260,000 are involved in the transaction. A portion of the castings will be made in the foundry of the French subsidiary company.

LAST YEAR, C. A. Parsons & Company Limited, Newcastle-upon-Tyne, received orders for turbo-alternators, ranging in size from 4,000 kW. to 100 kW. from Canada, South Africa, Southern Rhodesia, Australia and Mexico. A 15,000-kW. gas-turbine alternator for Dunston "A" power station and a 10,000-kW. gas turbo-alternator for the Nation Gas Turbine Establishment are at present under construction.

J. BLAKEBOROUGH & SONS, LIMITED, valve makers, of Brighouse, recently entertained to dinner 236 work-people and wives in the works canteen. The occasion was the presentation by Mr. R. A. Blakeborough, chairman and managing director, of awards to employees with over 25 yrs service. At the head of the list was Mr. W. Ward, aged 74, with 60 yrs service, a record in the 123 years of the firm's existence. The 236 people (19 per cent. of the present staff) had a total of 7,926 yrs to their credit.

IT IS REPORTED from Pittsburgh that the Great Lakes Steel Corporation, the Detroit area unit of the National Steel Corporation, has awarded the Freyn Engineering Company, a wholly-owned Chicago subsidiary of the Koppers Company, Inc., a contract for the design and construction of a 480,000-ton-per-year blast furnace. Approximately 1,200 tons of coke, 2,500 tons of ore and 500 tons of limestone daily will be charged into the completely integrated furnace, which will be located near Great Lake Steel Corporation's existing line of three furnaces at Zug Island in the Detroit River.

THE STEM AND FOREPART of a ship built by John I. Thornycroft & Company, Limited, for exhibition at the Festival of Britain, will shortly be erected on the south bank of the Thames. Another exhibit which will be on show at the Festival of Britain arrived in London last week. It is a Buddicom engine which was built in France in the 1840's to the design of the British engineer whose name it bears. Before a large crowd, this venerable veteran left the Gare St. Lazare in Paris under its own steam on January 4.

ZINC PRODUCTION at the Risdon works of the Electrolytic Zinc Company of Australasia, Limited, in the year ended June 30 last totalled 83,897 tons and was the highest yet recorded. This record production was achieved, it is stated, as a result of improved metallurgical efficiency, notwithstanding reduction of output for two months, due to interruptions in supply of raw material arising from the coal strike in the early part of the period. Sulphuric acid production at the works increased by 15,199 tons over the previous year while total deliveries of superphosphate were 61,590 tons, which was 44 per cent. greater than in the previous year.

Conference on Malleable Cast Iron

The British Cast Iron Research Association proposes to hold a conference on malleable-cast-iron production from March 14 to 17, at Ashorne Hill, near Leamington Spa. It is intended to cover as many features of the subject as possible and Papers will be given on melting practice, furnaces, annealing practice, including gaseous decarburisation, and annealing furnaces, metallurgical aspects, and mechanical aids in the malleable foundry. Speakers who are familiar with industrial practice in this country and a number of authorities on Continental practice, in addition to members of the Association's staff, have been invited to present Papers. Readers who are especially interested in malleable cast iron should make a note of the date.

Engineering Apprenticeship

Carrying the above caption, J. & E. Hall, Limited, of Dartford, Kent, have just issued what is certainly amongst the best appeals to youth to undergo systematic training for the various engineering crafts. It is written in clear English; it is well illustrated; it stresses the historic dignified background of the firm, thereby giving a sense of security, and a human appeal is evident by the short biographies of many of the boys now going through the shops. There are no references to wages nor are any statistics included, but the matter published is strictly of interest to youth. Firms envisaging similar campaigns could not do better than ask this great Dartford enterprise for a copy of the excellent brochure.

THE METROPOLITAN-VICKERS GAZETTE reports that the overseas demand for crack detectors is rapidly increasing. Some special units have been supplied for very large castings and it appears that the white magnetic fluid developed last year is being widely adopted.

Personal

MR. L. SHAWCROSS has been appointed North of England representative of the Carborundum Company, Limited, Manchester.

BRIG. J. V. TOPHAM has been appointed secretary of the British Engineers' Association in succession to SIR WILLIAM CHRISTIE, whose resignation takes effect this month.

MR. H. JINKS, who celebrated his 81st birthday in December, on Friday last retired after 62 year's service with William McGeoch & Company, Limited, brass founders of Birmingham.

MR. F. S. WHALLEY has relinquished the chairmanship of Vulcan Foundry, Glasgow, but retains his directorship. Brig. James Storar, vice-chairman, has been appointed to succeed him.

MR. FRANK V. BROOK, vice-chairman and managing director of Brook Motors, Limited, Huddersfield, has recently returned from a business trip to the Middle East, India, Malaya, Australia, and New Zealand.

MR. JAMES HUGILL, founder and proprietor of the Hugill Forge & Engineering Company, Limited, Stockton-on-Tees, has received a presentation from the employees on the occasion of the company's 25th birthday.

MR. H. L. SATCHELL, a director and manager of the Rugby works of the British Thomson-Houston Company, Limited, has been elected president of the Engineering and Allied Employers' Leicester and District Association.

MR. ALBERT JACKSON has been appointed deputy general works manager of the Appleby-Frodingham Steel Company (branch of the United Steel Companies, Limited). He was previously works manager (steel) of the company. Mr. Jackson, who has occupied several positions with the company, was in Germany in 1945-46, where he was on loan to the Control Commission. He worked on the technological investigation of iron and steel plants. He is president of the Lincolnshire Iron and Steel Institute.

British Standard Institution

New Standards for Creep Testing

Three British Standards (B.S. 1686, 1687, 1688: 1950) for creep testing have just been issued. They cover long-period high-sensitivity tensile creep testing, medium-sensitivity tensile creep testing and the determination of time to rupture under stress with or without measurement of creep strain.

The increasing use of metals at high temperatures during recent years has rendered it essential that satisfactory information should be available about the behaviour of metals at these temperatures. This automatically has given rise to a considerable increase in creep testing, and has in its turn shown the need for standard methods and equipment in order that proper comparisons may be made and correct interpretations given to the tests made by different authorities.

The standards originated in specifications that had been prepared specially to meet the needs of the aircraft industry and it had been originally intended that they should be published in the series of British Standards for aircraft materials and components. It became clear, however, that the field of application was so wide that the restriction of the standards to this series was not justified, and accordingly they have been published in the general series. Copies may be obtained from the British Standards Institution, Sales Department, 24, Victoria Street, London, S.W.1, price 2s. each post free.

House Organs

F.P.A. Journal, No. 11, 1950. Published by the Fire Protection Association, 84, Queen Street, London, E.C.4.

Ranking amongst the most interesting house organs regularly received in this office, this particular issue blends, as usual, accounts of the historic fires with modern outbreaks. One of the latter covered in some detail was in connection with the processing of aluminium at Banbury.

The Half Wheel, Vol. 2, No. 3. Issued by Barnards, Limited, Norwich.

This house organ is better edited than most, in fact it reaches a very high standard. With a little more attention paid to paragraphing of some of the articles it would be outstanding. One interesting feature is the story of four generations of the Davy family who have served as craftsmen in the carpenters' shop. They have a total 195 years' service.

Albion Works Bulletin, Vol. 4, No. 8. Issued by John Harper & Company, Limited, Willenhall.

This issue contains two accounts of visits made by members of the staff to Holland and Italy. They are not reports but just tell their colleagues of the general conditions obtaining. At the last meeting of the joint production committee the local member of Parliament was an interested guest.

Beetle Magazine, Vol, 3, No. 27. Published by British Industrial Plastics, Limited, Ideal House, Argyll Street, London, W.1.

This publications differs from the usual pattern of foundry house organs only in the matter of long-service records; but those will come. For the rest, it covers visits from overseas agents, presentations, births, deaths, marriages, and a quota of technology.

111. The house organ of the Hammond Lane Foundry Company, Limited, 111, Pearse Street, Dublin.

Being Irish, this issue illustrates not the 1,000th Parkham gas cooker coming off the lines but 1,111. The reviewer congratulates the Editor, Mr. Bryan Murphy, on his promotion to sales manager, and Mr. S. Warnock Aitken, on obtaining his diploma in engineering from Loughborough College.

Pera Bulletin, Vol. 3, No. 12, December, 1950. Published by the Production Engineering Research Association, Staveley Lodge, Melton Mowbray.

This bulletin seems to be giving increasing attention to the foundry industry, and in the issue reviewed no fewer than 28 abstracts dealing with the manufacture of cast products are included.

Broomwade News Bulletin, Vol. 13, No. 6. Issued by Broom & Wade, Limited, High Wycombe.

This issue details the firm's exhibits at the recent Public Works Exhibition and describes and illustrates a pneumatic nail driver the firm has designed.

Alloy Metals Review, December, 1950. Published by High Speed Alloys, Limited, Widnes.

This issue carries just one article on High Duty Alloy Cast Iron, by Mr. K. R. Van der Ben, whose work is well known in foundry circles.

Ruston News No. 2 (New Series). Published by Ruston & Hornsby, Limited, Lincoln.

This now takes the form of a four-page newspaper and covers the many sporting and social activities organised for the welfare of the staff.

Obituary

Mr. H. Jowett, aged 70, retired ironfoundry manager, of Bradford, died recently.

Mr. Alexander Collie Low, secretary of the Engineering and Allied Employers' National Federation, died on January 4.

Mr. William MacKay, late of the Fairfield Shipbuilding & Engineering Company, Limited, Govan, Glasgow, died on January 2.

Mr. Francis Cunningham, contracts manager with Harland & Wolff, Limited, until his retirement in 1949, died recently. He was associated with the Belfast shipbuilding industry for 51 years.

Mr. Lionel Hall Lawson, who has died at Bournemouth, was for a long period until his retirement associated with the management of Fairbairn, Lawson, Coombe, Barbour, Limited, Wellington Foundry, Leeds.

Mr. Herbert Francis, a former director of Kayser, Ellison & Company, Limited, Sheffield steelmakers, died recently. When he retired in 1946 he had been associated with the company for 67 years. He joined the board in 1918.

Mr. C. A. Holbrow, outside representative on the north-east coast for C. A. Parsons & Company Limited, Newcastle-upon-Tyne, until his retirement in 1934, has died at the age of 87. Mr. Holbrow had also worked in the electrical industry in Australia and Holland.

Mr. Hugh William Conway Liddiard, an engineer at the Rugby works of British Thomson-Houston Company, Limited, died on January 4 at the age of 55. He entered the company's service in 1914 and spent many years on the development of electric mine winders.

Major Owen Hart, a director of Derbyshire Stone, Limited, from 1936, when he was appointed the first chairman, who also served as the company's technical director, died last Sunday. Major Hart, who was also a director of other companies engaged in stone quarrying and roadmaking, had been unwell for some time.

Wills

Parrott, F. S., a director of Bedford Silica Sand Mines, Limited, and other firms	£15,224
Haighton, Richard, formerly managing director of R. Haighton, Limited, ironfounders, of Nelson (Lancs)	£2,172
Pulman, H. N., a director and general manager of M. W. Swinburne & Sons, Limited, iron and brass founders, etc., of Wallsend	£10,335
Gleghorn, T. R., formerly of Naylor, Benzon & Company, Limited, iron-ore merchants, a member of the Baltic Exchange from 1891 to 1930	£55,964
Milbourne, R. J., former chairman and managing director of C. & W. Walker, Limited, gasworks engineers and ironfounders, of Donnington, near Wellington (Salop)	£26,041
Witheridge, A. J., managing director of Arthur Shaw & Company, Limited, brass and iron founders, and of the Shaw Foundry Company, both of Willenhall (Staffs)	£25,971

Plea for Steel Industry

Speaking at Crewe last Monday, Mr. Harold Macmillan, m.p., appealed to Mr. Attlee to seek an eleventh-hour compromise on iron and steel nationalisation.

On the grounds of the gravity of the present situation, he asked the Government to postpone the vesting date and promised Conservative support to the passing of a short Act to give full statutory authority to a new iron and steel board, based on the framework of the old board, but with legal and official powers in place of the former voluntary system.

Scientific Advisors

Three new appointments to the Scientific Advisory Council are announced by the Minister of Fuel and Power.

Prof. Sir Cyril Hinshelwood, f.r.s., the distinguished scientist, has been Dr. Lee's Professor of Chemistry at Oxford University since 1937. His contribution to the progress of science has earned wide praise both at home and abroad, and he has received many honours and awards, including the Davy Medal of the Royal Society in 1943. Sir Cyril is a member of the Fuel Research Board and from 1946 to 1948 he was president of the Chemical Society.

Well know in industrial circles, Sir Claude Gibb, f.r.s., is chairman and managing director of C. A. Parsons & Company, Limited, the Newcastle-upon-Tyne engineers, chairman of A. Reyrolle & Company, Limited, manufacturing electrical engineers, of Hebburn-on-Tyne, and Parolle Electrical Plant Company, Limited, of Newcastle, and a director of other companies. For some time Sir Claude has been closely connected with the production of tanks and armoured fighting vehicles for the Ministry of Supply.

The deputy-chairman of the Gas Council, Col. Harold Charles Smith, is the third recruit to the Scientific Advisory Council. Chairman of Prince Regent Tar Company, Limited, and Wholesale Coke Company, Limited, he is also a director of several other concerns.

It is announced that Dr. E. S. Grumell and Dr. H. Hollings have retired from the council.

Glasgow's Share in British Council's 1951 Programme

Among the courses announced by the British Council in its 1951 programme is one on "Technical training in the United Kingdom with special reference to heavy engineering" which will be held in London and Glasgow from June 17 to July 3. One of its highlights will be the Festival of Britain Exhibition of heavy engineering in Glasgow, which has been designed in consultation with Dr. D. S. Anderson, director of Glasgow's Royal Technical College. Glasgow University, the Scottish Engineering Employers' Association, and the City Council have all contributed to the programme which will give engineers from oversea an opportunity to study the theoretical and practical training of all grades of personnel in the engineering industry. At the end of the course there will be a visit to a large factory in London which has its own technical training organisation.

Other courses during the coming year include "Water pollution" (London and Birmingham, May 21-June 2), "Industrial standardisation as developed in the United Kingdom" (London, August 27-September 8), and "Industrial medicine" (Manchester and Birmingham, March 1-20).

Included in the programme are 12 courses related to the Festival, and 13 specialist and 17 educational and general courses.

Steel Industry's Best Ever

Steel production in 1950 was at the record level of 16,292.700 tons, which compares with the previous best, in 1949, of 15,552,900 tons and the target set for the industry in the "Economic Survey" of 15,750,000 to 16,000,000 tons. Output in December, at an annual rate of 15,408,000 tons, showed a decline from the November highest ever rate (17.472,000 tons), production being interrupted by the Christmas holidays, but last month output was nevertheless at the highest rate ever achieved in the month of December.

The following table compares steel production in each of the last four years with the targets set by the Government in the "Economic Survey":—

Year.	"Economic Survey" target.	Actual.
1947	12,500,000	12,724,500
1948	14,000,000–14,500,000	14,870,600
1949	15,250,000–15,500,000	15,552,900
1950	15,750,000–16,000,000	16,292,700

Pig-iron output in 1950 amounted to 9,632,900 tons, as against 9,498,500 tons in 1949. Pig-iron output in December was at an annual rate of 9,801,000 tons, compared with 9.659,000 tons in December, 1949.

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—November ..	193,100	10,042,000	336,000	17,472,000
December ..	188,500	9,801,000	296,300	15,408,000
4th qtr. ..	191,900	9,981,000	321,200	16,704,000
1949—November ..	187,400	9,745,000	314,600	16,358,000
December ..	185,700	9,659,000	291,400	15,153,000
4th qtr. ..	185,800	9,663,000	305,100	15,865,000

Scottish Dolomite Deposits

Experts of the Steetly Company, Limited, who have been examining the dolomite deposits at Loch Eriboll, Durness, and Assynt, in Sutherland, and at Kishorn in Ross-shire, have drawn the general conclusion that the deposits are too variable in impurities to be worth further thought for the production of particularly high-grade magnesia. While the report is far from encouraging, Mr. G. J. Grant, convener, has pointed out that so far only surface deposits had been taken.

Two representatives of the dolomite group of the Scottish Council (Development and Industry), Prof. G. Hibberd, Professor of Mining at the Royal Technical College. Glasgow, and Mr. W. R. Flett, Lecturer in Geology at the college, will visit Eriboll and take samples of deeper deposits.

More Furnace Coke

A newly constructed battery of 22 coke ovens was put into production at the Cargo Fleet Ironworks, Middlesbrough, last Saturday and will provide a welcome addition to the supply of blast-furnace coke, which is so urgently needed at the present time. Constructional work began in April last and to carry it through to completion at the earliest possible moment, the work was carried on without interruption during the Christmas and New Year holiday periods.

Aluminium Industry Council

Mr. K. Hall, First Chairman

The primary object of the Aluminium Industry Council, which has just been established by the U.K. aluminium industry, is to provide the necessary liaison for consultation and discussions between all branches of the industry on matters of general policy. First chairman of the council is Mr. Kenneth Hall, whose name is well known in light metal circles. He has long been associated with Aluminium, Limited, of Canada, and he came to this country in 1936 on appointment as manager of the Birmingham works of the Northern Aluminium Company, Limited. At that works Mr. Hall installed the original forging equipment, including the first large air hammer of its kind to be used in the British light alloy industry.

Two years after going to Birmingham, he became managing director of the newly formed Indian Aluminium Company, Limited, and during the war Mr. Hall was responsible for the erection of aluminium reduction works, alumina works, and rolling mills, these being the first works to produce and fabricate virgin aluminium in India. Mr. Hall returned to this country in 1946 to assume the position of managing director of the Northern Aluminium Company. He is also a director of Aluminium Laboratories, Limited. In April, 1949, he was elected to serve as president of the Aluminium Development Association.

The address of the new council is 60, Calthorpe Road, Birmingham 15, and Mr. H. R. Murray Shaw is the secretary.

The Foreman's Responsibility in Industry

Leadership and tact are two of the essential qualifications of a foreman—the person who is in close touch with the men and women working in the shops, and therefore in a position to gain their trust and confidence. This argument was propounded by Sir Percy Mills, managing director of W. & T. Avery, Limited, speaking at Birmingham on the function of foremen in modern industry.

Top-level planning is not sufficient to ensure high productivity, he added. Workers must be properly instructed and enthusiastically led. The foreman has an important and integral part to play in management. He must know his job and be able to give orders without arousing resistance—in fact, he must be a leader, and not a driver. One reason why productivity is higher in the United States than in this country is because of the initiative and organising ability of the foremen.

Turning to management's responsibility for fitting foremen for what is now a specialised job, Sir Percy said: "We must educate foremen in the technicalities and the relationships necessary to their profession. We must provide facilities for them to train the young men and women who should be following them up. The foreman is a vital link in what is a vital matter for us all to-day—creditable productivity."

Increase of Premiums for U.K. Refined Metal

As from January 1, the Ministry of Supply selling prices for copper refined in the United Kingdom in special shapes and to special specifications are subject to additions per ton to the basis price per ton of copper (at present £202 per ton) as follow:—

Shape.	Previous addition.	Addition chargeable from Jan. 1, 1951.
	£ s. d.	£ s. d.
Ingots	1 0 0	1 0 0
BILLETS—H.C.		
3 in. dia., but under 4 in. dia. ..	4 10 0	6 10 0
4 in. dia. and over	4 0 0	5 10 0
BILLETS—D.O.—CONTAINING UP TO 0·08 PER CENT. PHOSPHORUS.		
2½ in. dia., but under 3 in. dia.	7 0 0	8 10 0
3 in. dia., but under 4 in. dia. ..	6 0 0	7 10 0
4 in. dia., but under 5 in. dia. ..	5 10 0	6 10 0
5 in. dia., and over	4 10 0	6 0 0
BILLETS—CONTAINING UP TO 0·5 PER CENT. ARSENIC.		
3 in. dia., but under 4 in. dia. ..	5 0 0	7 0 0
4 in. dia., but under 5 in. dia. ..	4 10 0	6 10 0
5 in. dia. and over	4 0 0	6 0 0
BILLETS—CONTAINING UP TO 0·5 PER CENT. ARSENIC AND UP TP 0·08 PER CENT. PHOSPHORUS.		
2½ in. dia., but under 3 in. dia.	7 10 0	9 0 0
3 in. dia., but under 4 in. dia. ..	6 10 0	8 0 0
4 in. dia., but under 5 in. dia. ..	6 0 0	7 0 0
5 in. dia. and over	5 0 0	6 10 0
V.C. CAKES—H.C.		
200 lb. and over, not less than 3 in. thick	1 7 6	4 0 0
Less than 200 lb. and not less than 2½ in. thick	1 12 6	4 10 0
V.C. CAKES—CONTAINING UP TO 0·5 PER CENT. ARSENIC.		
200 lb. and over, not less than 3 in. thick	1 17 6	4 10 0
V.C. CAKES—D.O.		
200 lb. and over, not less than 3 in. thick	4 12 6	5 10 0
V.C. CAKES—CONTAINING UP TO 0.5 PER CENT. ARSENIC AND UP TO 0·08 PER CENT. PHOSPHORUS.		
200 lb. and over, not less than 3 in. thick	5 2 6	6 0 0
V.C. 750 lb. wirebars	3 0 0	5 10 0
Mossy copper	3 10 0	4 10 0
SUNDRIES.		
Billets cut to specified lengths less than 45 in.	0 4 0	0 7 6
Cupping of billets	0 7 0	0 7 0

Increased premiums on special shapes of electrolytic copper imported from Canada and the United States, announced by the Ministry of Supply, also came into effect on January 1.

U.S. Steel Output

This week's steel output in the United States, according to figures issued by the American Iron and Steel Institute, is expected to be within a few thousand tons of the all-time record established early last November. This week's production is put at 1,980,800 tons, which compares with 1,963,400 tons last week and the all-time record of 1,986,000 tons.

Effect of Midweek Sport on Productivity

For a long time the Scottish Fuel Efficiency Committee has been in the vanguard of the drive to ban midweek sport, and last week its chairman, Sir Patrick Dollan, sent a telegram to the Prime Minister which read: "Best incentive for more production in industry and saving by consumers would be a drastic ban on all commercial sports during working hours Monday to Friday." In a letter he had addressed to the Minister of Fuel and Power he wrote: "We feel it is a bit hypocritical on our part to request housewives and industrial consumers to save coal while midweek sports are allowed the maximum liberty to play matches whenever they think it is suitable."

Sir Patrick was threatening when he spoke in Glasgow. Pointing out that the Government had asked his committee to organise a long-term saving campaign during the next month, he added: "But we are taking no action at all on this request until we get the promise of some action from London. We are just not going to play." For years they had been organising fuel-saving campaigns and persuading the housewives to make more and still more sacrifices, but if the Government was going to allow commercial sporting interests to do what they liked the committee would make no further call on the householders. "In effect, unless the Government does something about it the committee is throwing in its hand."

Ideas about the effect of midweek sporting events on productivity are highly conflicting. There are those who say that midweek sport causes little absenteeism, and there are also those who believe that the psychological effect of banning midweek fixtures would result is a greater loss of production. On the other hand, Sir Patrick Dollan's views on the subject are widely supported.

Sulphuric Acid and Sulphur Rationing

Licences issued by the Board of Trade under the Control of Sulphuric Acid Order, 1950 (S.I. No. 2087), and the Control of Sulphur Order, 1950 (S.I. No. 2084), to consumers of crude, recovered, and processed sulphur, and to producers of sulphuric acid operate as from January 1.

In the case of sulphur, the licences specify the amounts of sulphur which may be consumed for acid-making or delivered to consumers for other industrial purposes. As regards sulphuric acid, whether produced from crude sulphur or from other sulphur-bearing materials, such as pyrites and spent oxide, the acid producer is licensed to supply to specified customers a certain quantity based on his deliveries to them during the period April to September, 1950. In general, consumers of crude, recovered or processed sulphur or of acid produced from crude sulphur are restricted to two-thirds of their takings in the basic period. Consumers of acid derived from materials other than sulphur are not so far materially affected.

The requirements of all consuming industries are being further studied as a matter of urgency, and the Government departments concerned will be considering what adjustments in these rationing arrangements are necessary in the interests of the national economy.

Pig-iron and Steel Production

STATISTICAL SUMMARY

The following particulars of pig-iron and steel produced in Great Britain have been extracted from the Statistical Bulletin for November, issued by the British Iron and Steel Federation. Table I gives the production of pig-iron and ferro-alloys in October, with the number of furnaces in blast; Table II, production of steel ingots and castings in October, and Table III, deliveries of finished steel. Table IV summarises activities during the previous six months.

TABLE I.—*Weekly Average Production of Pig-iron and Ferro-alloys during October. (Thousands of Tons.)*

District.	Furnaces in blast, 28.10.50	Hematite.	Basic.	Foundry.	Forge.	Ferro-alloys.	Total.
Derby, Leics., Notts., Northants, Essex	25	0.8	18.2	24.4	1.0	—	44.4
Lancs. (excl. N.W. Coast), Denbigh, Flints and Cheshire .. / Yorkshire (incl. Sheffield, excl. N.E. Coast) ..	6	—	7.4	—	—	1.4	8.8
Lincolnshire ..	14	—	24.3	—	—	—	24.3
North-East Coast	23	8.6	37.8	0.2	—	1.4	48.0
Scotland	9	0.9	13.5	2.2	—	—	16.6
Staffs., Shrops., Worcs. and Warwick ..	9	—	9.4	1.6	—	—	11.0
S. Wales and Monmouthshire	8	4.4	20.2	—	—	—	24.6
North-West Coast	7	16.0	—	0.2	—	—	16.2
Total ..	101	30.7	130.8	28.6	1.0	2.8	193.9
September, 1950	101	27.7	126.0	28.8	1.3	2.9	186.8†
October, 1949 ..	102	28.7	120.4	30.5	1.6	2.7	183.9

† Incl. 100 tons of direct castings.

TABLE III.—*Weekly Average Deliveries of Non-alloy and Alloy Finished Steel. (Thousands of Tons.)*

Product.	1948.	1949.	1949. Oct.	1950. Sept.	1950. Oct.
Non-alloy Steel :—					
Heavy rails and sleepers	8.9	9.8	9.1	10.7	11.3
Heavy and medium plates	36.1	39.2	42.3	42.7	41.3
Other heavy prod.	34.7	36.1	38.2	41.1	40.0
Light rolled prod.§	} 59.7 {	46.4	49.0	52.4	52.6
Hot-rolled strip ..		17.1	18.4	21.9	22.1
Cold-rolled strip ..	4.8	4.9	5.1	6.1	5.9
Bright steel bars ..	6.1	5.8	5.8	7.4	7.3
Sheets, coated and uncoated	26.3	27.6	28.4	32.1	32.4
Tin-, terne- and blackplate ..	13.5	13.7	14.0	14.4	14.2
Tubes, pipes and fittings	15.1	18.5	21.1	20.2	21.4
Wire	12.8	15.0	15.8	18.0	17.7
Tyres, wheels, axles	3.9	4.1	4.8	3.9	3.1
Forgings‡‡	2.4	2.4	2.6	2.2	2.3
Castings	3.5	3.6	3.7	3.3	3.8
Total	227.8	244.2	258.3	276.4	275.4
Alloy Steel† :—					
Tubes and pipes ..	0.4	0.6	0.5	0.7	0.7
Bars, plates, sheets, strip and wire ..	4.7	4.7	4.7	6.0	5.8
Forgings‡‡	0.5	0.7	0.8	0.6	0.6
Castings	0.7	0.7	0.8	0.8	0.9
Total	6.3	6.7	6.8	8.1	8.0
Total deliveries from U.K. prod.‡ ..	234.1	250.9	265.1	284.5	283.4
Add from other U.K. sources	11.3	11.7	10.8	8.0	8.0
Imported finished steel	3.4	7.7	5.8	3.7	2.1
	248.8	270.3	281.7	296.2	293.5
Less intra-industry conversion	35.0	39.1	39.9	40.5	42.3
Total deliveries ..	213.8	231.2	241.8	255.7	251.2

† Excl. high-speed steel. ‡ Incl. finished steel prod. in the U.K. from imported ingots and semi-finished steel. ‡‡ Excl. drop forgings. § Excl. wire rods and alloy-steel bars, but incl. ferro-concrete bars.

TABLE II.—*Weekly Average Production of Steel Ingots and Castings in October. (Thousands of Tons.)*

District.	Open-hearth. Acid.	Open-hearth. Basic.	Bessemer.	Electric.	All other.	Total. Ingots.	Total. Castings.	Total ingots and castings.
Derby., Leics., Notts., Northants, Essex ..	—	3.2	11.3 (basic)	1.3	0.2	15.3	0.7	16.0
Lancs. (excl. N.W. Coast), Denbigh, Flints., and Cheshire .. .. / Yorkshire (excl. N.E. Coast and Sheffield) ..	1.0	23.2	—	1.6	0.5	25.3	1.0	26.3
Lincolnshire	—	31.3	—	—	0.2	31.3	0.2	31.5
North-East Coast	1.5	62.5	—	0.9	0.5	63.9	1.5	65.4
Scotland	4.3	42.8	—	1.7	0.7	47.7	1.8	49.5
Staffs., Shrops., Worcs. and Warwick	—	16.3	—	0.8	0.6	16.4	1.3	17.7
S. Wales and Monmouthshire	8.8	50.6	5.7 (basic)	0.9	0.1	65.6	0.5	66.1
Sheffield (incl. small quantity in Manchester) ..	9.7	27.5	—	8.4	0.6	44.3	1.9	46.2
North-West Coast	0.6	3.1	5.2 (acid)	—	0.1	8.8	0.2	9.0
Total	25.9	200.5	22.2	15.6	3.5	318.6	9.1	327.7
September, 1950	25.6	261.9	20.0	15.2	3.5	317.4	8.8	326.2
October, 1949	26.5	243.2	19.4	14.4	3.4	298.1	8.8	306.9

TABLE IV.—*General Summary of Pig-iron and Steel Production. (Weekly Average in Thousands of Tons.)*

Period.	Iron-ore output.	Imported ore consumed.	Coke receipts by blast-furnace owners.	Output of pig-iron and ferro-alloys.	Scrap used in steel-making.	Steel (incl. alloy). Imports.†	Steel (incl. alloy). Output of ingots and castings.	Steel (incl. alloy). Deliveries of finished steel.	Steel (incl. alloy). Stocks.‡§
1938	228	89	—	130	118	16	200	—	—
1948	252	172	200	178	174	8	286	214	1,028
1949	258	169	199	183	188	17	299	231	1,275
1950—May*	248	172	199	186	204	10	319	240	1,326
June	243	170	194	182	199	12	313	246	1,352
July	243	166	191	175	176	13	276	226	1,152
August*	239	175	194	177	181	5	279	199	1,187
September ..	229	179	198	187	207	8	326	256	1,160
October	266	183	201	194	202	5	328	251	1,097

* Five weeks. † Weekly average of calendar month. ‡ Stocks at end of years and months shown. § Excl. reinforcement wire material for drop forgings, bolts, nuts and washers as from July, 1950

Raw Material Markets

Iron and Steel

Since the turn of the year, there has developed a much more insistent demand for pig-iron for the foundries. Most of these establishments have entered into heavy commitments, fulfilment of which is absolutely dependent upon regular and ample supplies of pig-iron. Unfortunately, conditions do not permit the employment of any additional blast furnaces and, indeed, it has recently been suggested that there may have to be a switchover from foundry to basic iron to meet the needs of the steel plants. In any event, prospects of any improvement in the deliveries of pig-iron to the foundries are remote, and there are still more acute apprehensions concerning future supplies of foundry coke.

The assembly of semi-finished steel in tonnages sufficient to keep the mills in full operation is the re-roller's biggest headache. Except in very small quantities, foreign semis are now almost unobtainable and the extra burden imposed on home producers has strained their resources to the utmost limit. Steelworkers are taking special care of the needs of the sheet mills, but re-rollers engaged on small bars and light sections also have impressive bookings and they are now almost wholly dependent on deliveries of home-produced billets, which are in constant demand. Wherever possible defective billets, crops, and even re-rolling scrap are being used.

The new defence programme is being speeded up and its scope extended: but as yet these plans have not involved any appreciable rise in steel consumption. From other sources, however, there has been an intensification of demand, which may to some extent be inspired by fears of restrictions when the rearmament plans get into full swing. Acceptance of export orders has not ceased, but is now discriminatory. The immediate purpose is to release more steel for the home market, and it would appear that the more urgent industrial requirements are being met. But the actual and potential demands for steel are far in excess of capacity and bookings extend over the whole of the first half of the year.

Non-ferrous Metals

The Ministry of Supply announced on Tuesday the postponement from February 1 to March 1 of the Order prohibiting use of zinc and copper for making certain articles. No decision has yet been made whether firms will get additional metal during the extension. Semi-fabricated metal and partly-processed articles on hand on March 1 may be used up to June 30. The Ministry's announcement has caused widespread satisfaction. The concessions came after a meeting between the Minister of Supply and Midland M.P.s, and after the Ministry and Board of Trade representatives had heard the views of manufacturers put to them by the Birmingham Chamber of Commerce and various trade associations.

Although it is not likely that the decision by the United States Government to suspend stockpiling of zinc for six months will have any immediate effect on the supply position outside the U.S.A., the news was favourably received on this side, if only because any news about zinc supplies which is not positively bad must almost certainly be better than the present-day situation here. The zinc situation in America is certainly very acute, and the shortage of supplies had reached a point where something had to be done if a really serious breakdown in operations was to be avoided.

At any time now the Ministry of Supply will issue a schedule of maximum prices for scrap copper, brass, and lead. These will be listed, it is understood, on the basis of "ex works," so that carriage to destination will be an extra for the buyer's account. Merchant's commission is likely to be fixed at 2 per cent. Most people will welcome the inception of these upper limits for secondary metals as the situation has for many weeks now been most unsatisfactory. Since it became known that a scheme of maximum prices was contemplated, values have ruled at a more reasonable level, but consumers would be glad to see more metal coming along. It is perhaps unfortunate that apparently no decision has been reached to impose a maximum price on ingots, for there is a risk that brass material may be run down into pigs and sold at inflated prices. However, all will agree that a very good start has been made in checking the upward spiral of non-ferrous values.

London Metal Exchange official tin quotations were:—

Cash—Thursday, £1,275 to £1,280; Friday, £1,200 to £1,205; Monday, £1,175 to £1,180; Tuesday, £1,175 to £1,180; Wednesday, £1,215 to £1,220.

Three Months—Thursday, £1,265 to £1,270; Friday, £1,200 to £1,210; Monday, £1,180 to £1,185; Tuesday, £1,175 to £1,180; Wednesday, £1,205 to £1,210.

New Catalogues

Blackheart Malleable. It was a happy thought to envelope a brochure just issued by Hale & Hale (Tipton), Limited, of Dudley, in a maroon dust jacket. The book is bound in a stiff black binding, with "Modern Malleable by Hale" carried out in gold, the first part of the title appearing through a window of the jacket. The object of the brochure is stated "to show something of the Hale foundries and give further useful information about the production and uses of blackheart malleable iron." This objective has been well achieved. In addition to this, however, there is much information about Permalite—a high-duty alloy. The section on metallurgy of malleable iron cannot be accorded full marks because the word "microphotograph" is used instead of "photomicrograph," and no magnifications are indicated. Beyond this, the reviewer has nothing but praise for the layout, illustration and letterpress of this brochure.

Insulating Refractories. The phrase "technical" is apt to be loosely applied when referring to trade literature. In the case of the "Kimolo (Moler) Technical Handbook No. 1, just issued by Cellactite & British Uralite, Limited, of Terminal House, 52, Grosvenor Gardens, London, S.W.1, the reader is given a veritable feast of technology. The handbook covers the subject of diatoms and the bricks made therefrom. It treats mathematically the heat losses through furnace walls and graphically illustrates the results obtained from the use of the products described. Arithmetic appears again on page 19 to show the potentialities of these insulating bricks as money savers. The reviewer found the brochure very timely in view of the urgent need to prevent heat losses and so conserve fuel stocks. It is presumed that it is available to our readers on writing to Grosvenor Gardens.

MR. C. LEONARD WILSON, formerly a director of Wilsons & Mathiesons Limited, has been elected chairman and managing director. Mr. W. Nicholson previously secretary and manager is now a director and general manager, and Mr. B. E. Collins, secretary, and Mr. F. E. Holroyd have joined the board.

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

(Delivered, unless otherwise stated)

January 17, 1951

PIG-IRON

Foundry Iron.—No. 3 Iron, Class 2:—Middlesbrough, £10 10s. 3d.; Birmingham, £10 5s. 6d.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent P, £12 1s. 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 10s.; South Zone, £12 12s. 6d.

Scotch Iron.—No. 3 foundry, £12 0s. 3d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £13 2s. 6d.; South Zone, £13 5s.

Refined Malleable.—P, 0.10 per cent. max.—North Zone, £13 12s. 6d.; South Zone, £13 15s.

Cold Blast.—South Staffs, £16 3s. 3d.

Hematite.—Si up to 2½ per cent., S. & P. over 0.03 to 0.05 per cent.:—N.-E. Coast and N.-W. Coast of England, £12 0s. 6d.; Scotland, £12 7s.; Sheffield, £12 15s. 6d.; Birmingham, £13 2s.; Wales (Welsh iron), £12 0s. 6d.

Spiegeleisen.—20 per cent. Mn, £17 16s.

Basic Pig-iron.—£10 11s. 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., 27s. 6d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 29s. 6d. 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., 15s. 6d. per lb.

Metallic Chromium.—98/99 per cent., 5s. to 5s. 3d. per lb.

Ferro-manganese (blast-furnace). — 78 per cent., £30 5s. 11d.

Metallic Manganese.—96/98 per cent., carbon-free, 1s. 7d. to 1s. 8d. 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.—Ship plates (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, £37 7s. 3d.; nickel-chrome, £55; nickel-chrome-molybdenum, £61 13s.

Tinplates.—I.C. cokes, 20 × 14, per box, 40s. 11d., f.o.t. makers' works.

NON-FERROUS METALS

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

Tin.—Cash, £1,215 to £1,220; three months, £1,205 to £1,210; settlement, £1,220.

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

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

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

Other Metals.—Aluminium, ingots, £124; antimony, English, 99 per cent., £250; quicksilver, ex warehouse, £58 15s. to £59; nickel, £406.

Brass.—Solid-drawn tubes, 21⅝d. per lb.; rods, drawn, 28¼d.; sheets to 10 w.g., 26d.; wire, 26⅝d.; rolled metal, 24¾d.

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

Gunmetal.—Ingots to BS. 1400—LG2—1 (85/5/5/5), £255 to £265; BS. 1400—LG3—1 (86/7/5/2), £265 to £275; BS. 1400—G1—1 (88/10/2), £340 to £350; Admiralty GM (88/10/2), virgin quality, £340 to £350, per ton, delivered.

Phosphor-bronze Ingots.—P.Bl, £350 to £360; L.P.Bl, £270 to £285 per ton.

Phosphor Bronze.—Strip, 34d. per lb.; sheets to 10 w.g., 35⅞d.; wire, 36d.; rods, 33¼d.; tubes, 38¾d.; chill cast bars: solids, 34½d., cored, 35½d. (C. Clifford & Son, Limited.)

Nickel Silver, etc.—Ingots for raising, 2s. 3¼d. per lb. (7%) to 3s. 2½d. (30%); rolled metal, 3 in. to 9 in. wide × .056, 2s. 9¼d. (7%) to 3s. 8½d. (30%); to 12 in. wide × .056, 2s. 9¼d. to 3s. 8¾d.; to 25 in. wide × .056, 2s. 11½d. to 3s. 10¾d. Spoon and fork metal, unsheared, 2s. 6¼d. to 3s. 5½d. Wire, 10g., in coils, 3s. 3d. (10%) to 4s. 2¼d. (30%). Special quality turning rod, 10%, 3s. 2d.; 15%, 3s. 6¾d.; 18%, 3s. 11d. All prices are net.

Forthcoming Events

JANUARY 22

Institute of Metals

London Local Section :—" Friction and Lubrication of Solids," by F. P. Bowden, SC.D., D.SC., PH.D., F.R.S., at the London School of Hygiene and Tropical Medicine, Keppel Street, London, W.C.1, at 6 p.m.

Sheffield Society of Engineers and Metallurgists

" The Abbey Works of The Steel Company of Wales, Limited," by W. F. Cartwright, at the Royal Victoria Station Hotel, Sheffield, at 6.15 p.m.

JANUARY 23

Institute of British Foundrymen

Coventry Students' Section :—" An Introduction to Precision Castings," by J. W. Humphreys, at the Coventry Technical College, at 7.15 p.m.

Institution of Mechanical Engineers

" The Training of Craftsmen," by J. Loxham, M.I.MECH.E., at Storey's Gate, St. James's Park, London, S.W.1, at 5.30 p.m.

JANUARY 24

Institute of British Foundrymen

Birmingham Branch :—" The Running and Feeding of Castings," by H. B. Farmer, at the James Watt Memorial Institute, Great Charles Street, Birmingham, 3, at 7.15 p.m.

Purchasing Officers' Association

Tees-side Branch :—" 25 Years of Iron Founding," by C. Preston, at the Cleveland Scientific and Technical Institution, Corporation Road, Middlesbrough, at 7.15 p.m.

JANUARY 25

Institute of Metals

Birmingham Local Section :—" The Use of Oxygen in Steelmaking," by D. J. C. Brandt, B.SC., A.R.S.M., at the James Watt Memorial Institute, Great Charles Street, Birmingham, 3, at 6.30 p.m.

Sheffield Local Section :—" Cast Corrosion-resisting Alloys," by M. M. Hallet, M.SC., F.I.M., at the Grand Hotel, Sheffield, at 6.30 p.m. (Joint meeting with the Sheffield Society of Engineers and Metallurgists.)

Incorporated Plant Engineers

South Yorkshire Branch :—" Lubrication," by G. D. Jordan; " Producers," by L. Cawthorne, and " Norwegian Electric Steel Works," by G. E. Simm, at the Grand Hotel, Sheffield, at 7.30 p.m.

Institution of Production Engineers

London Graduate Section :—Visit to Philips Electrical, Limited, New Road, Mitcham, Surrey, at 2.30 p.m.

JANUARY 26

Institute of British Foundrymen

Falkirk Section :—" Manufacture and Application of Alloy Cast Iron," by D. Fleming, at the Temperance Café, Lint Riggs, Falkirk, at 7 p.m.

JANUARY 27

Birmingham Branch :—Annual dinner and dance, at the Botanical Gardens, Edgbaston, Birmingham, at 7.15 p.m.

Wales and Monmouth Branch :—" Report of the Grey Ironfounders' Productivity Team," by A. Kirkham, at the Engineers' Institute, Cardiff, at 6 p.m.

East Midlands Branch :—Visit to J. Perry & Sons, patternmakers, Leicester. " Castings for Internal-combustion Engines," by C. R. van der Ben and H. Haynes, at the College of Technology and Commerce, The Newarke, Leicester, at 6 p.m.

Institution of Mechanical Engineers

North-Western Graduates' Section :—Visit to National Gas and Oil Engine Company, Limited, Ashton-under-Lyne, Lancs.

Institution of Production Engineers

Yorkshire Graduate Section :—Visit to John Stirk & Sons, Limited, Ovenden Road, Halifax.

North-Eastern Graduate Section :—Visit to Vickers-Armstrongs Naval Yard, Walker-on-Tyne, at 10 a.m.

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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.

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FOUNDRY MANAGER, recently returned from abroad, offers his services. Iron, steel, non-ferrous. Mass production. General engineering. Thorough, practical and technically experienced man. Suitable to progressive firm.—Box 458, FOUNDRY TRADE JOURNAL.

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ASSISTANT METALLURGICAL CHEMIST, age 21/25, required for Engineering and Foundry Laboratory in Lincolnshire. Experience of cast iron and non-ferrous analysis essential. Knowledge of foundry practice preferred. State standard of education, experience, and salary required.—Box 506, FOUNDRY TRADE JOURNAL.

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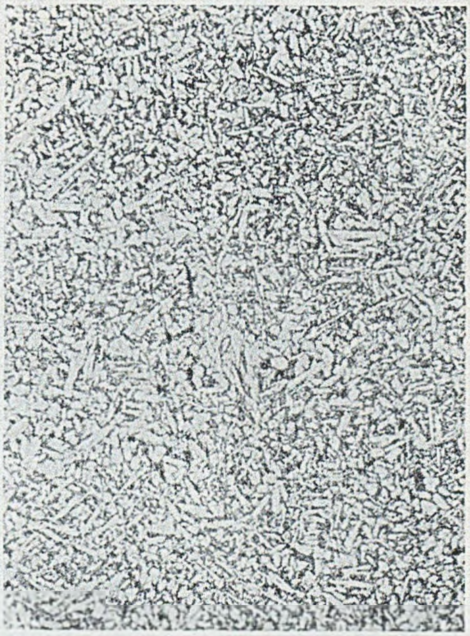

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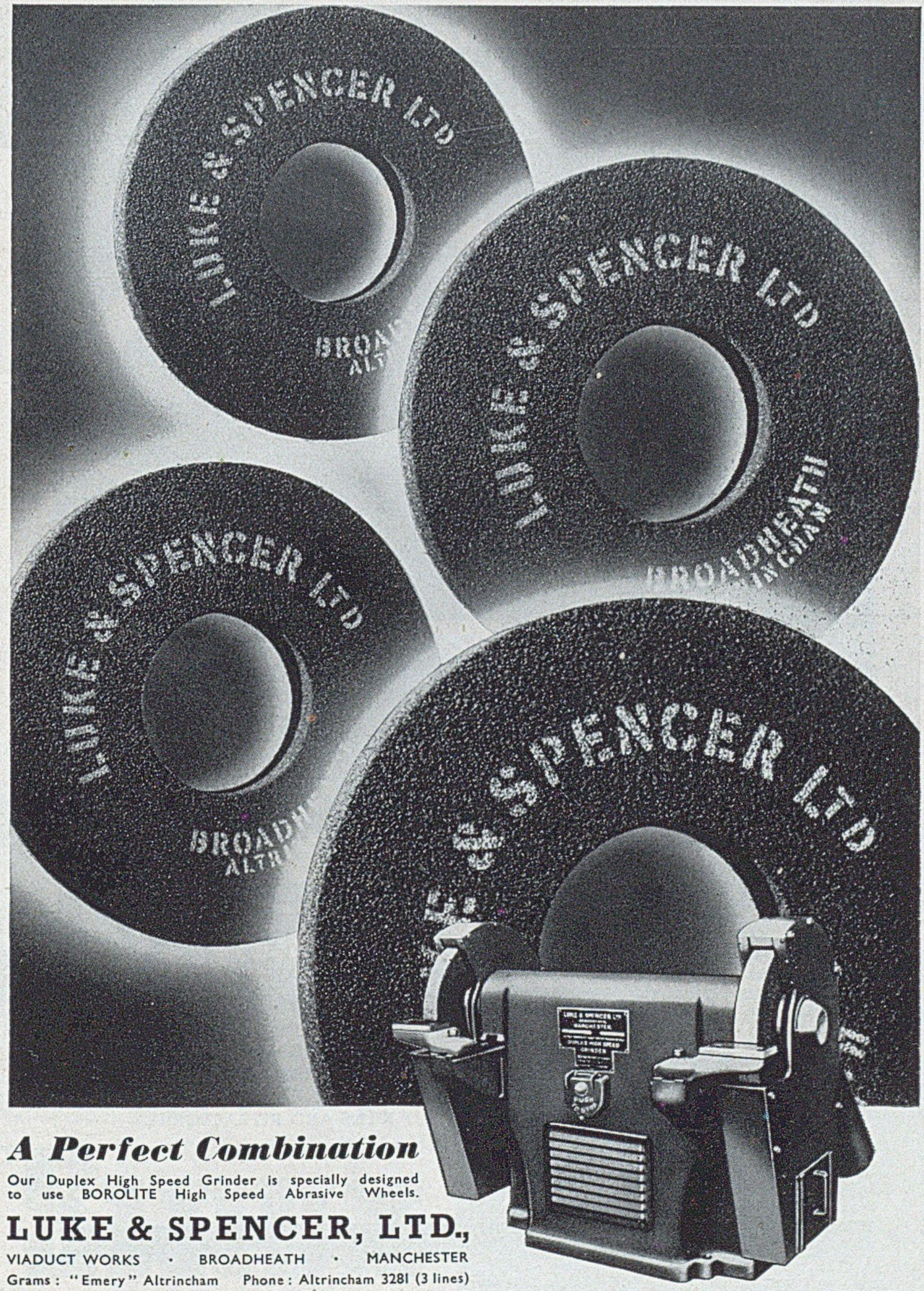
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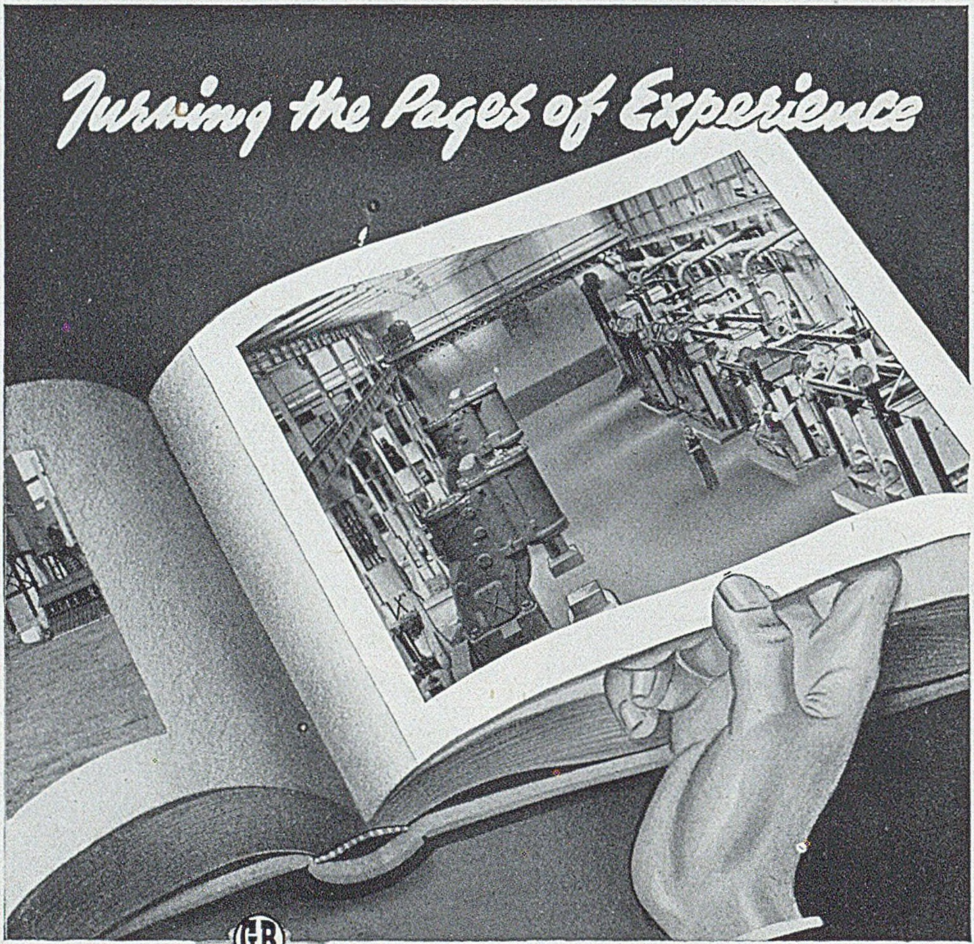
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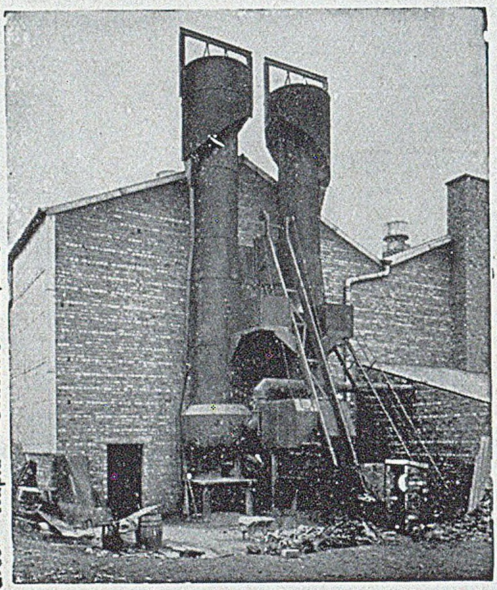

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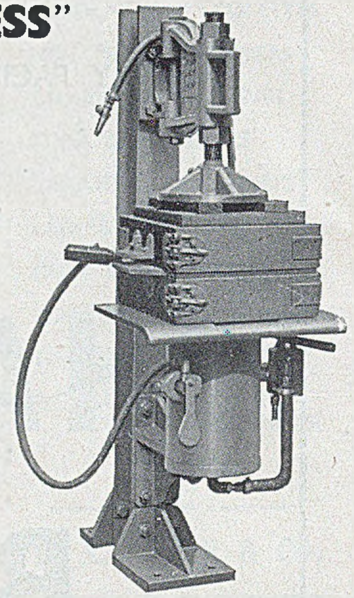

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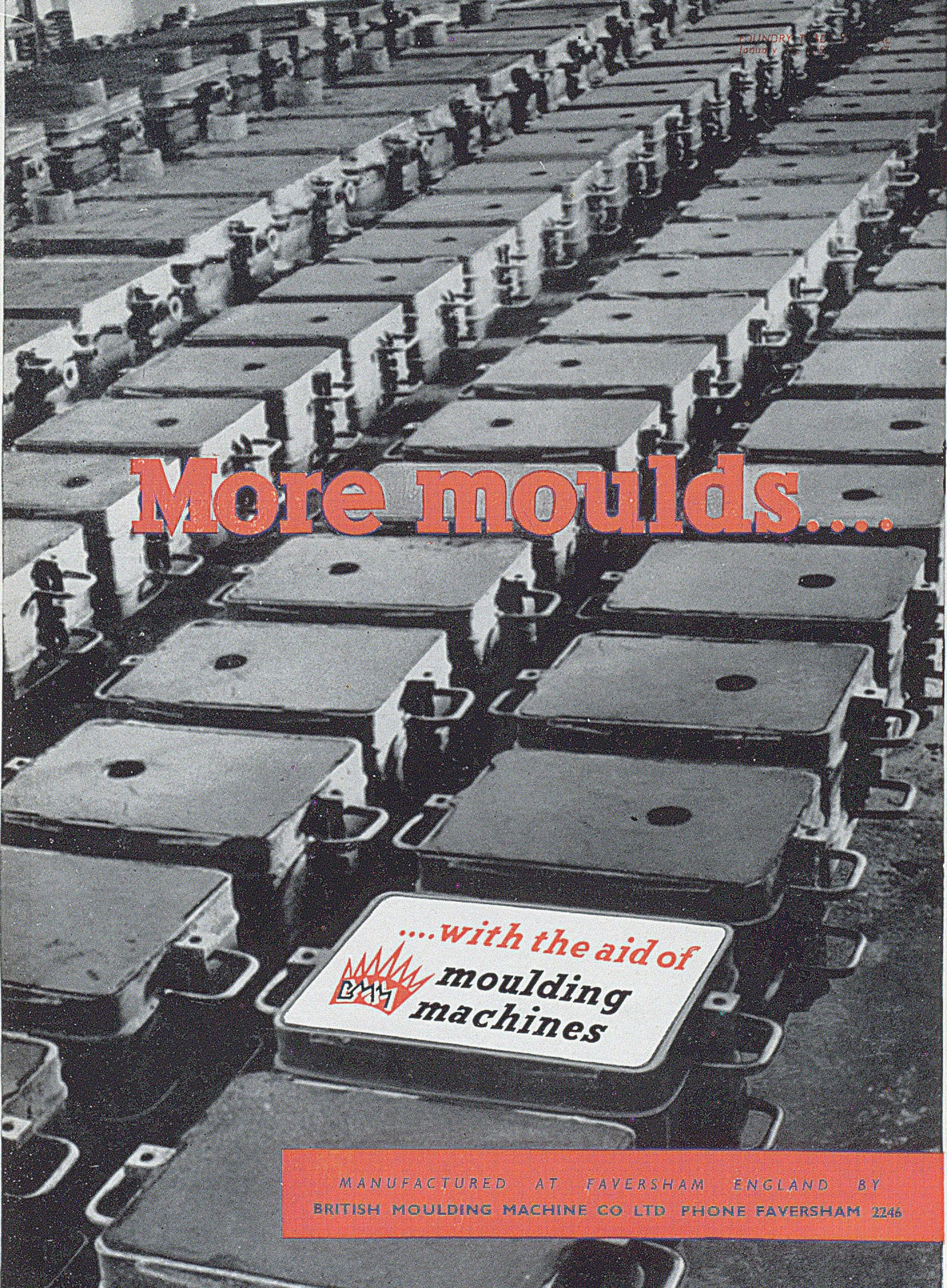

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