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JANUARY 22, 1953

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

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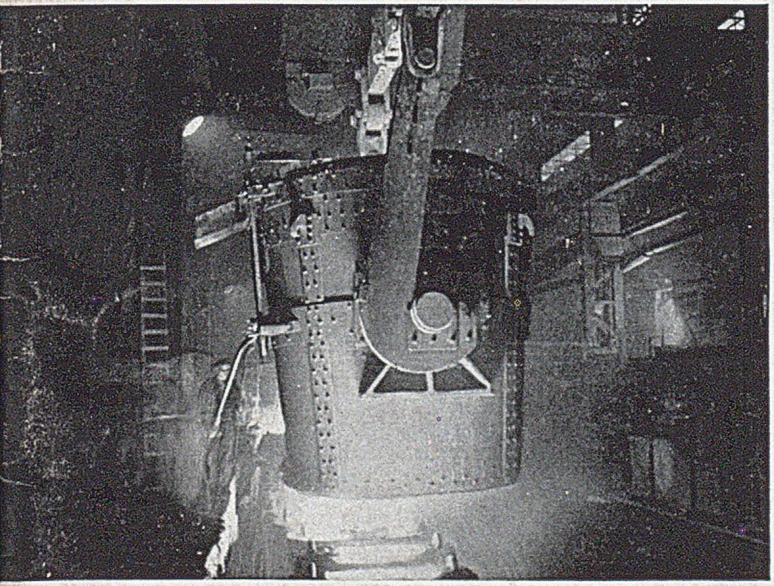

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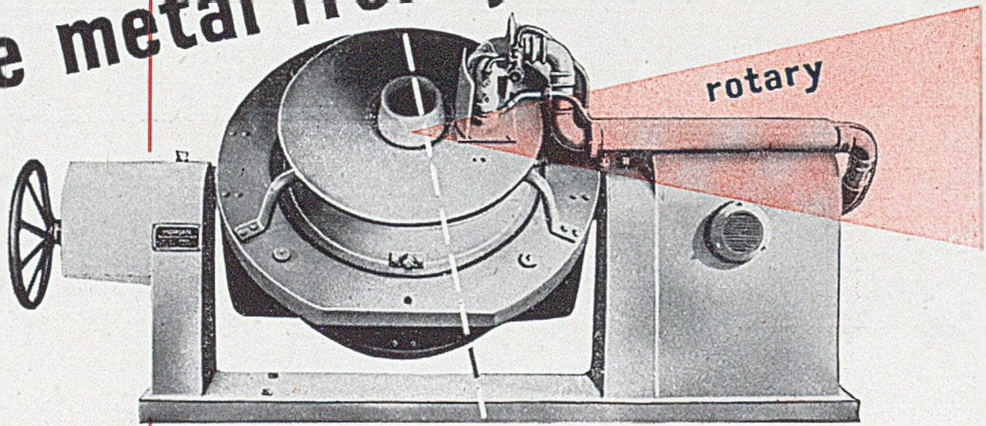

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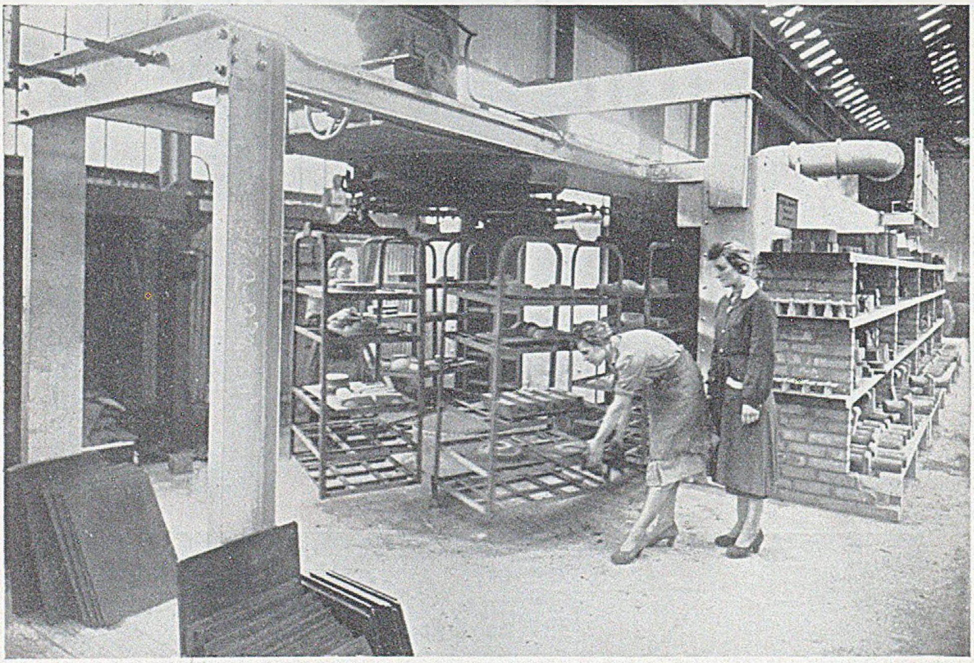

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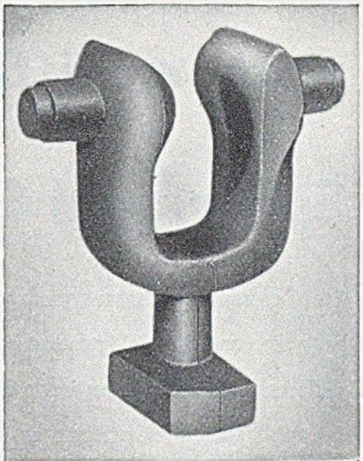

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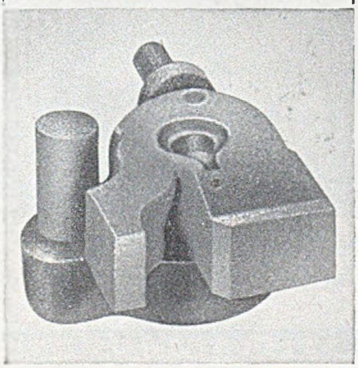

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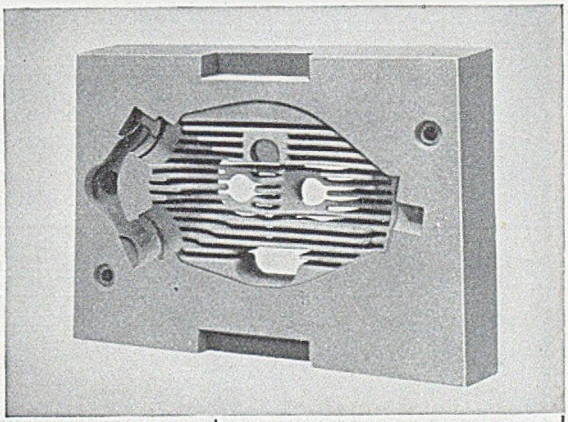

When Glyso is the bond the core makers skill is seen at its best.

Photograph by courtesy of Messrs. Central Foundry Co. Ltd.

Glyso Airbond, quick drying without stoving, or stove-dried in half the usual time.

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12/C1/18

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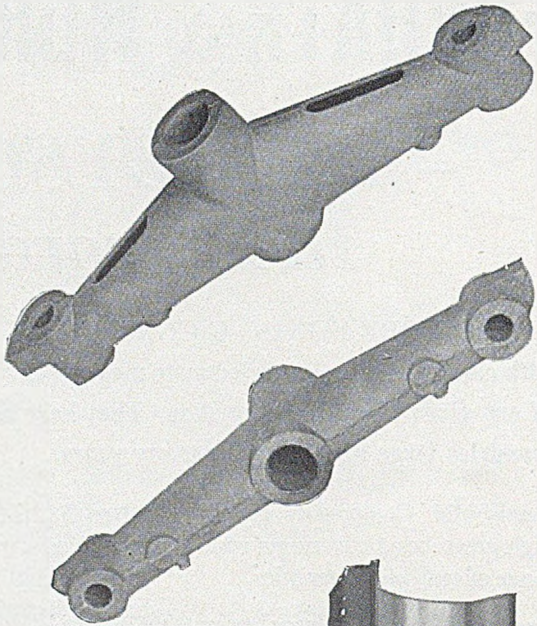
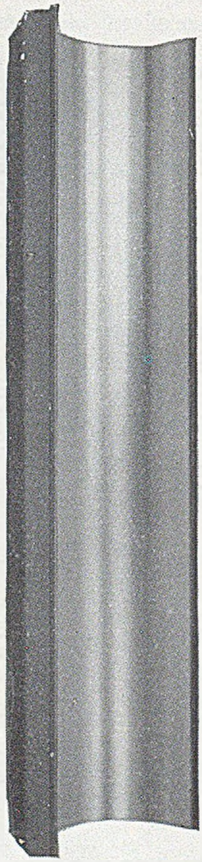
	Maximum Stress t.s.i.	Yield Point t.s.i.	Elongation per cent
Pearlitic	37 min.	27 min.	1 min.
Pearlitic/Ferritic	32 ,,	24 ,,	5 ,,
Ferritic	27 ,,	20 ,,	10 ,,

The process is the subject of patents and patent applications, and The Mond Nickel Company Limited has granted a number of manufacturing licences. For names of suppliers, write to:—



Pin lift arms in S.G. iron for moulding machine.



Ironer machine bed, weight 2 tons, in S.G. iron for single-roll machine. Properties include pressure-tightness in the steam heater passages with a high finish on the ironing face. *(By courtesy of D.& J. Tullis Ltd.)*

Castings by R. Taylor (Ironfounders) Ltd.

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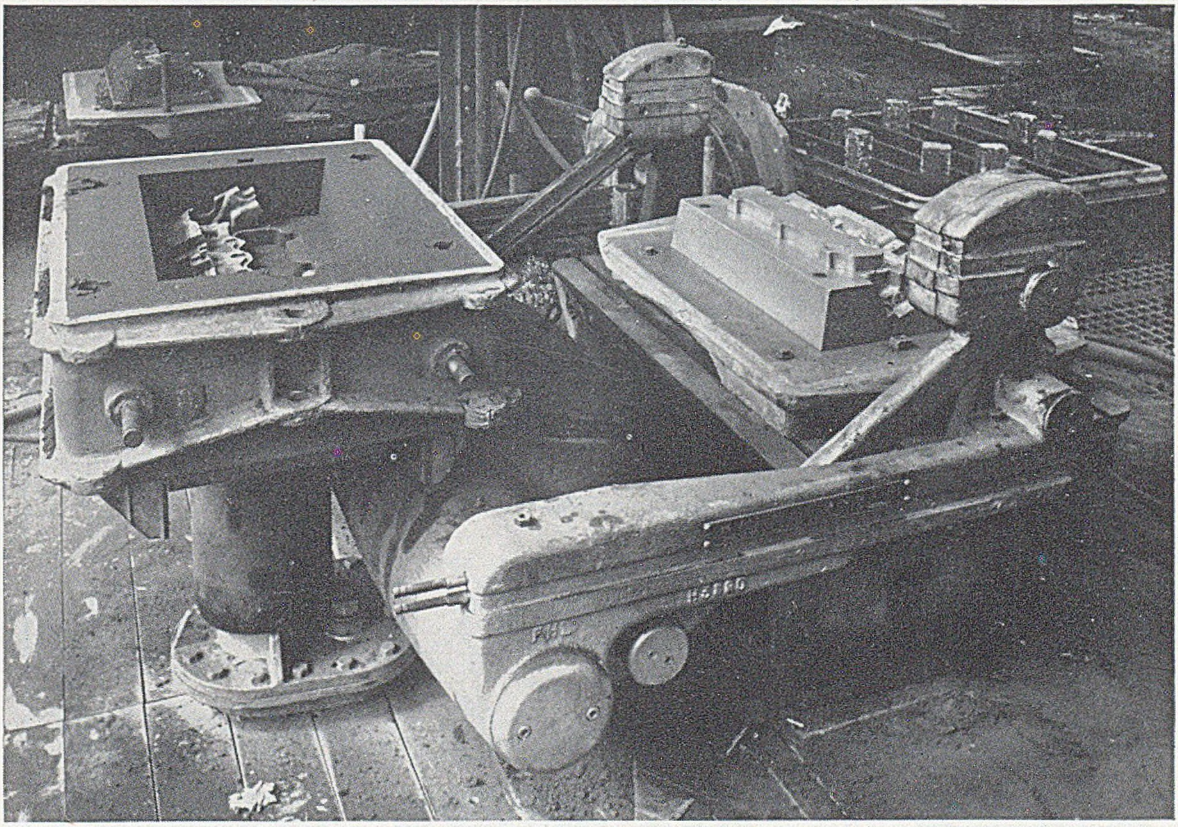

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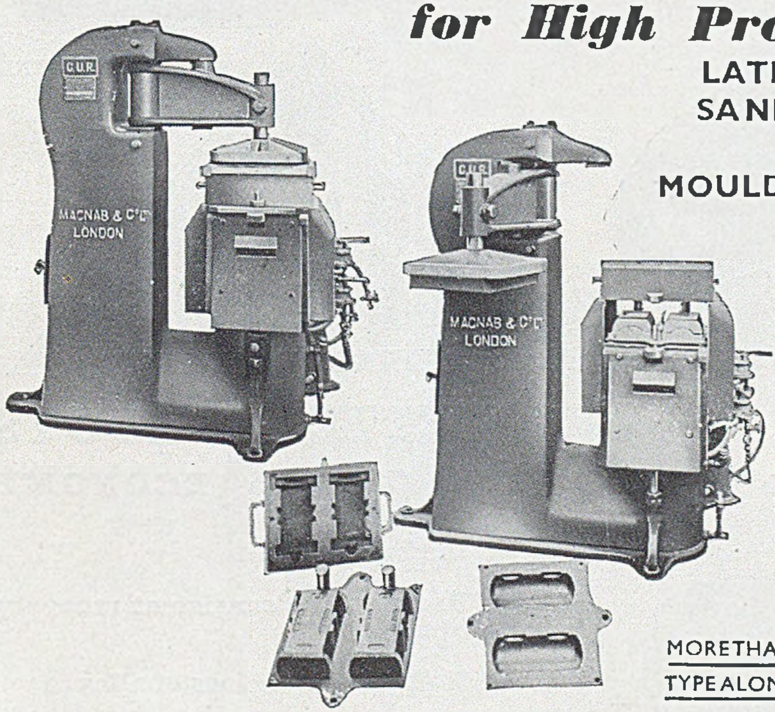

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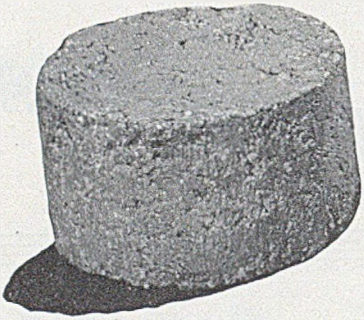

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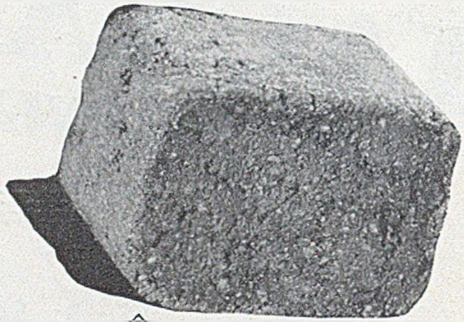
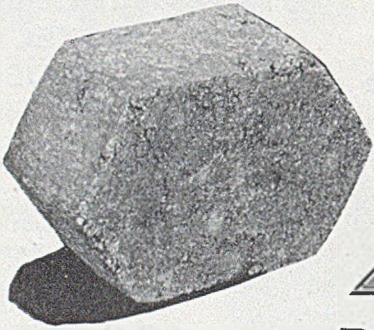


MANGANESE



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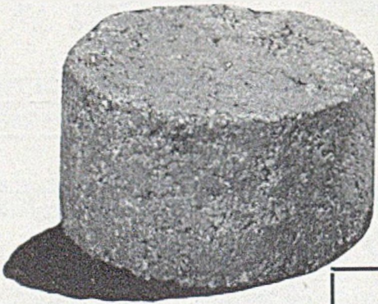

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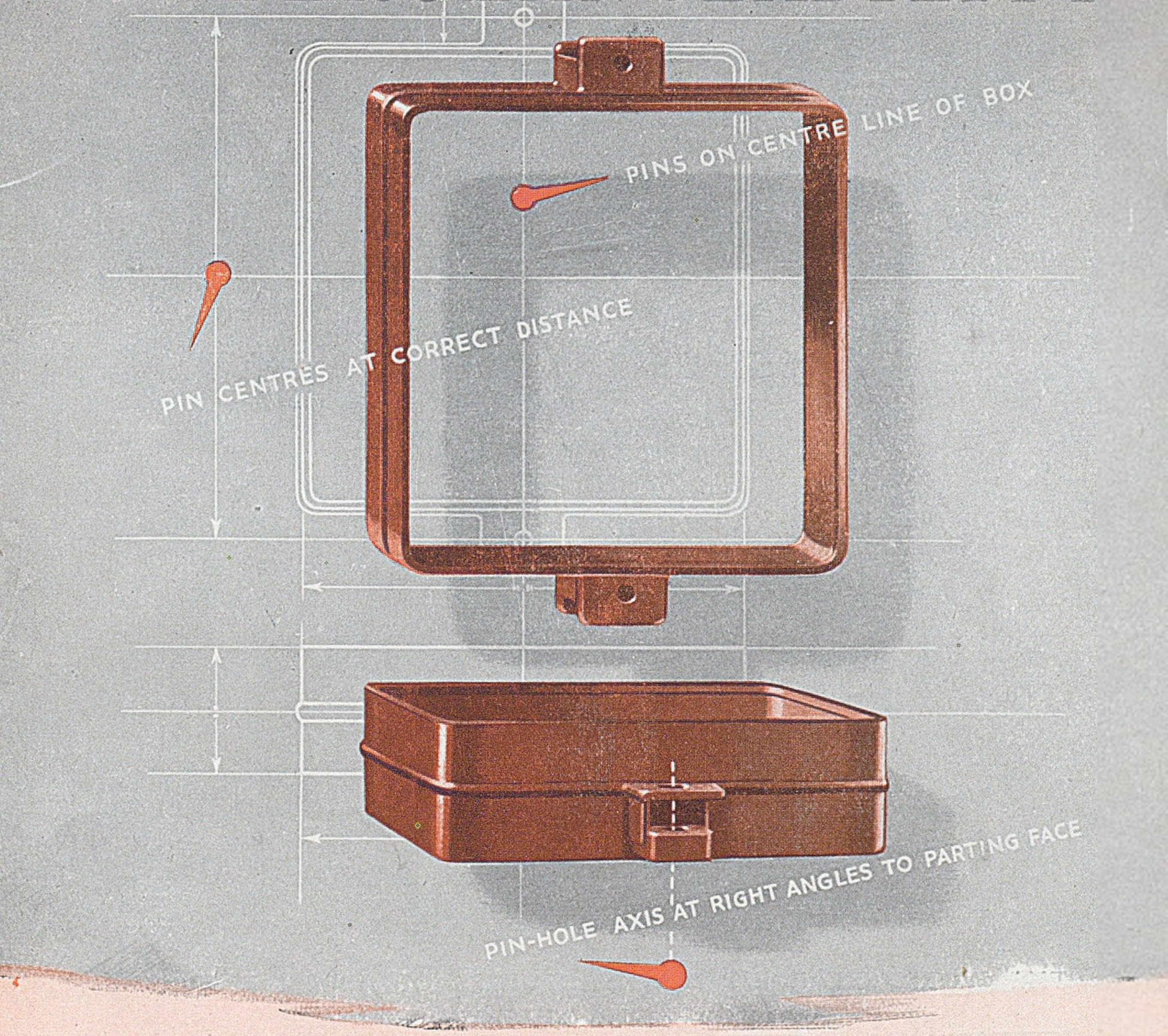

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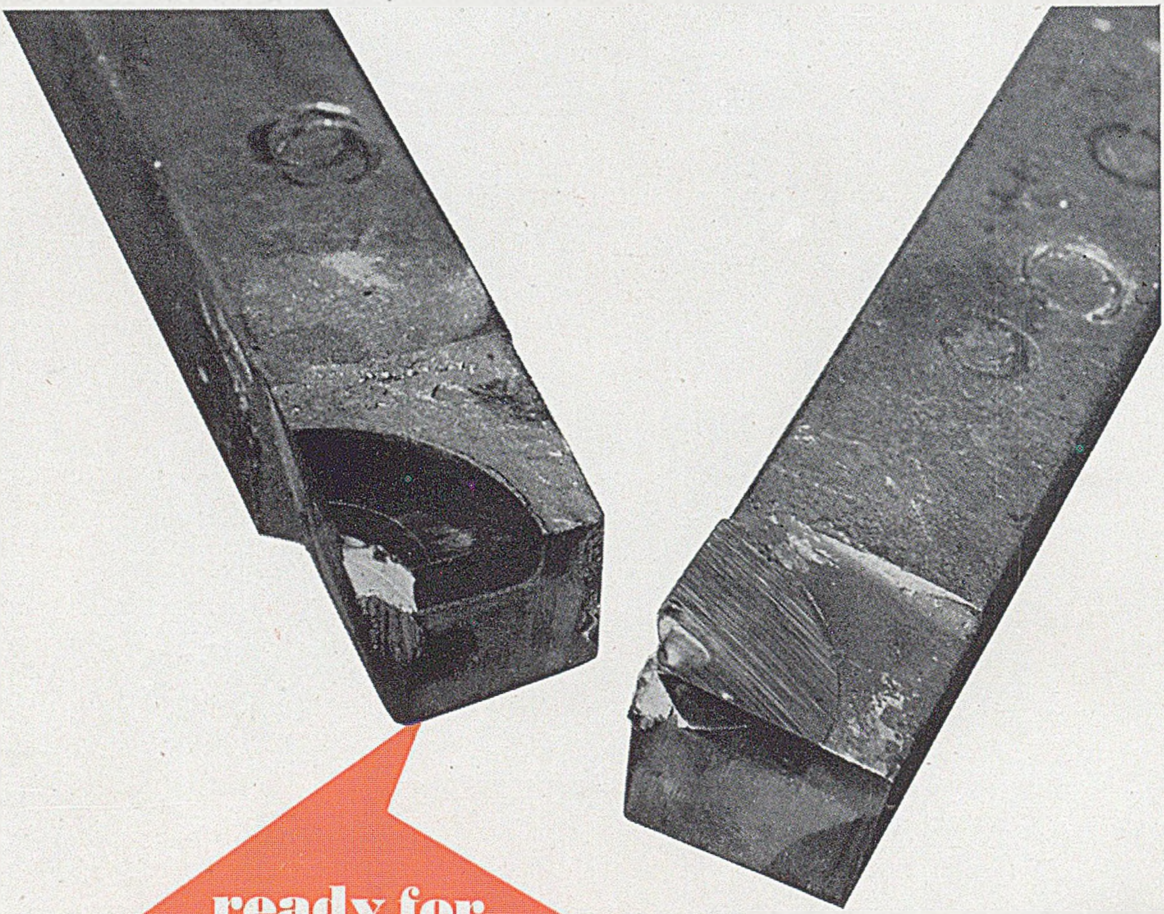

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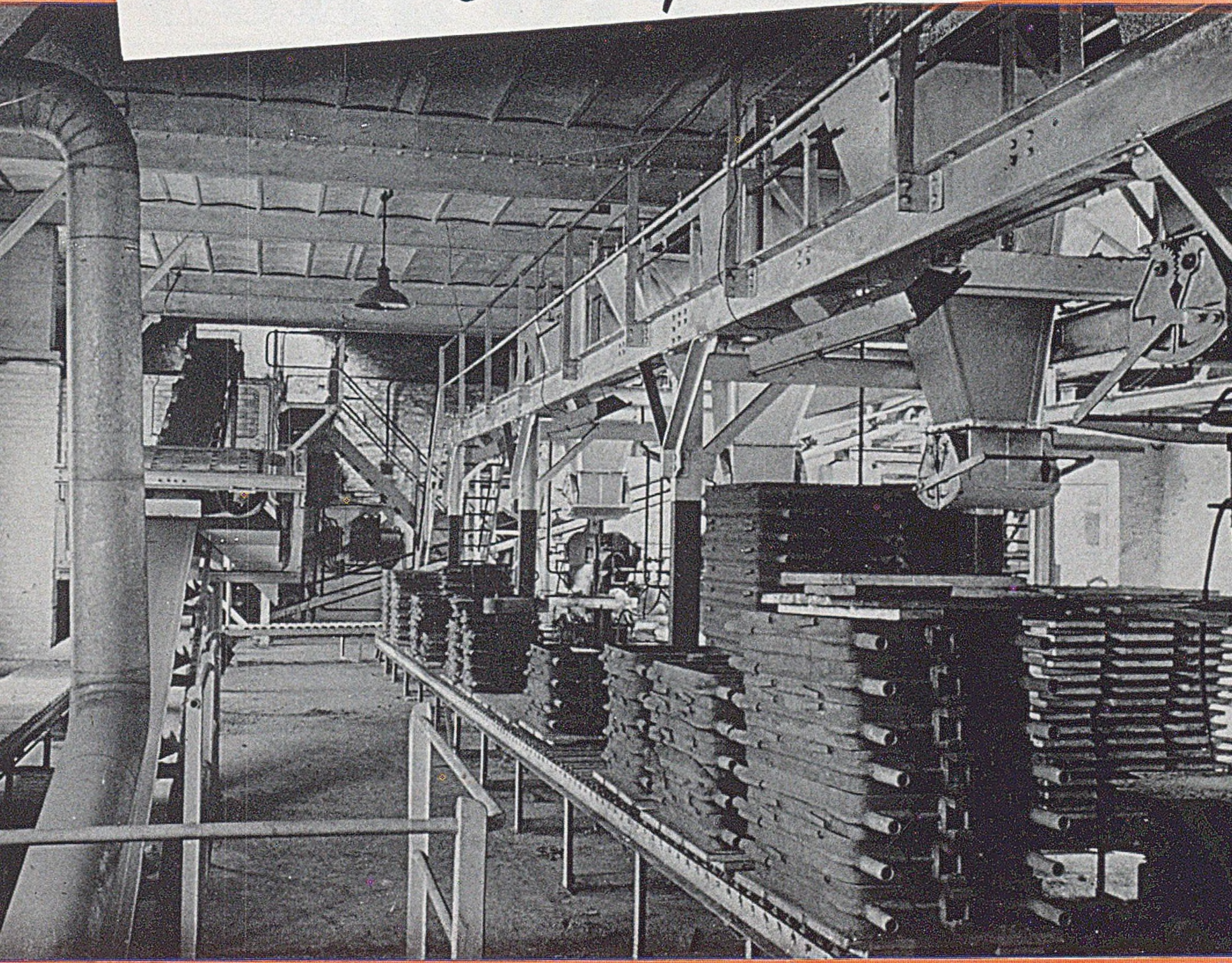

It has been said that the man who never made a mistake never made anything. It is true, experience is the finest tutor. All the more reason then, when considering mechanisation, that experienced foundry engineers should be seconded to assist. The success of Coleman-Wallwork equipment and the high production figures being obtained in the many foundries where it is installed, demonstrates that we have the ability to design and produce foundry plant to meet the needs and problems of this specialised industry, an ability that comes only after many years of experience.

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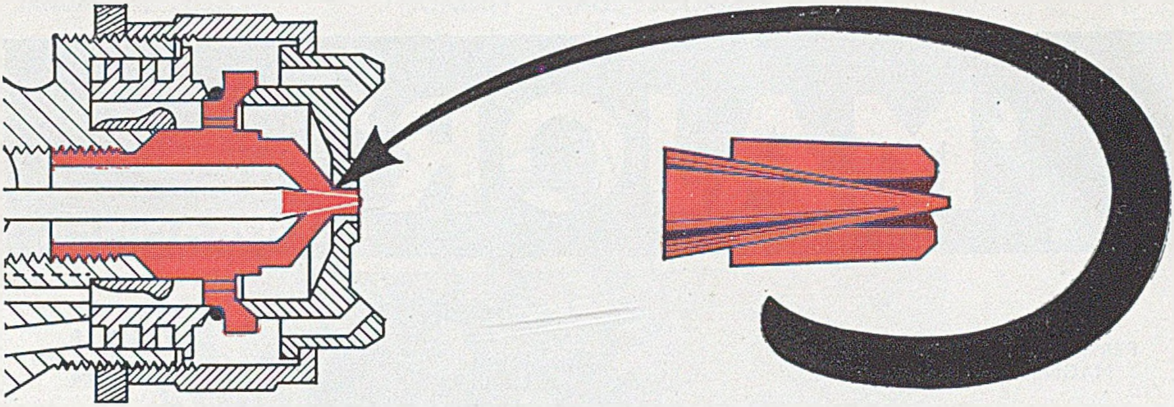

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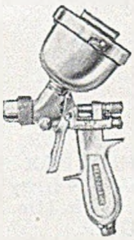

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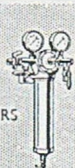

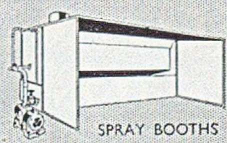

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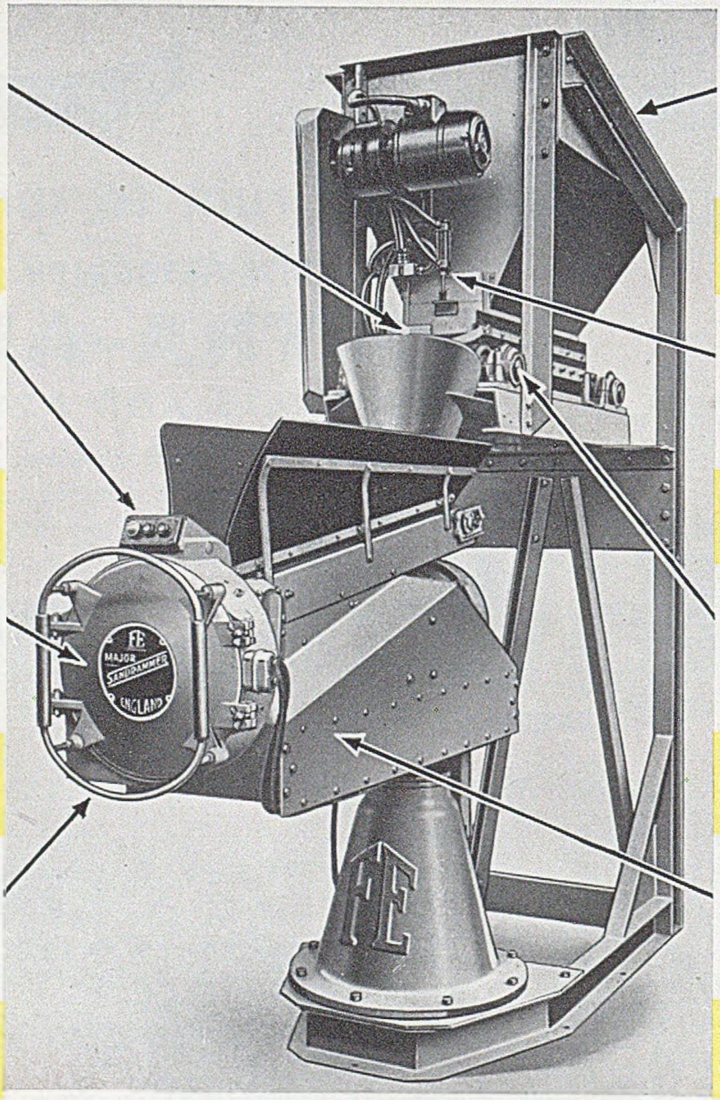

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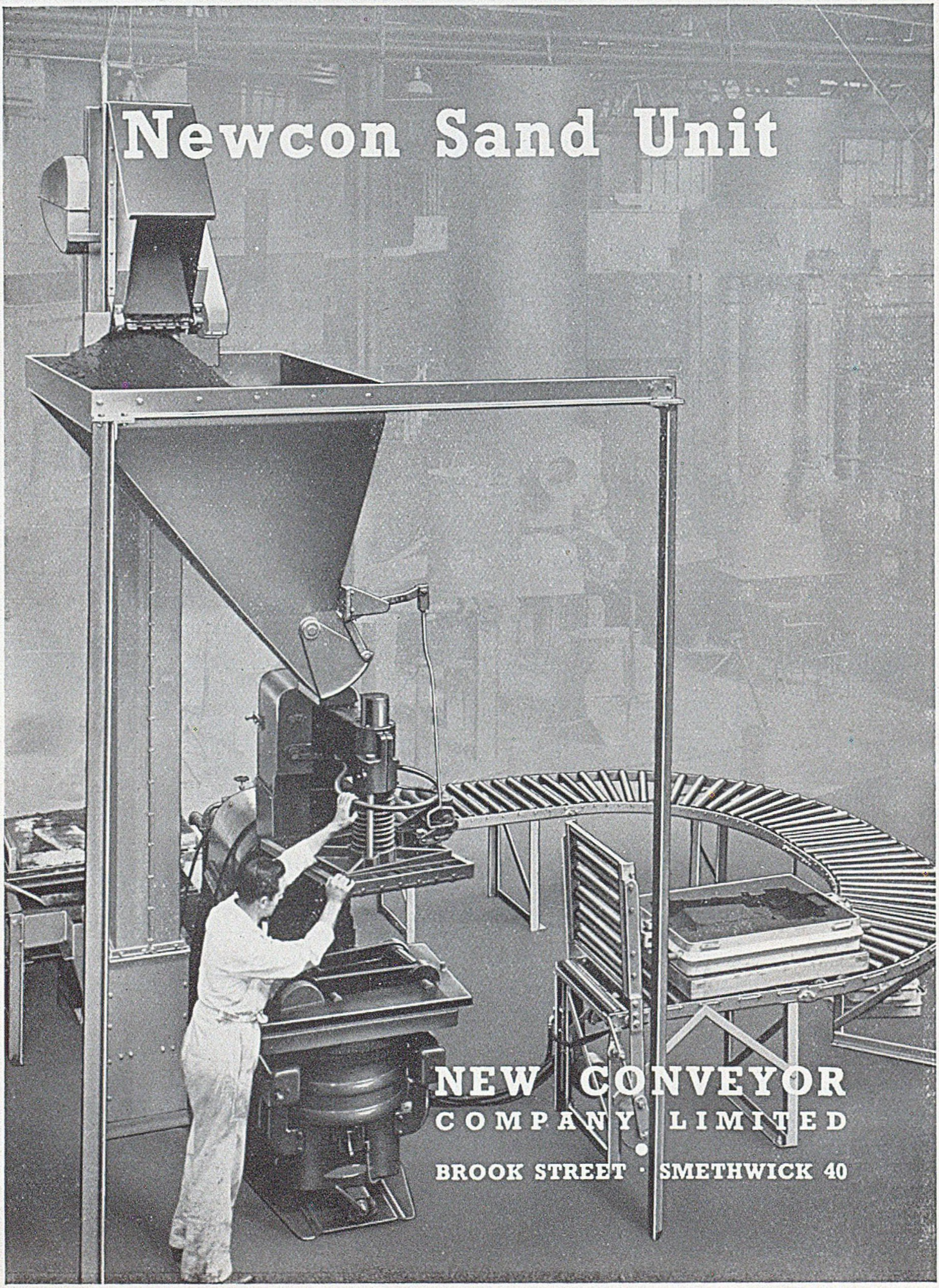
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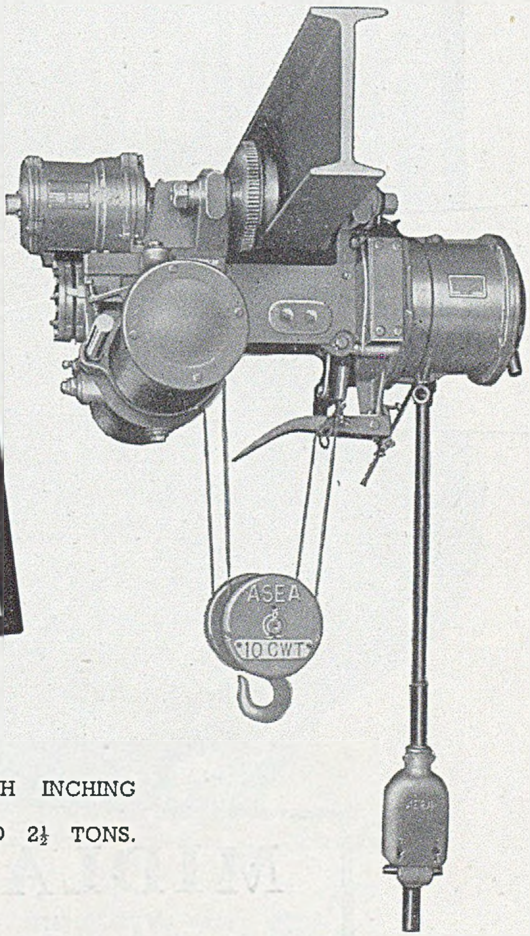

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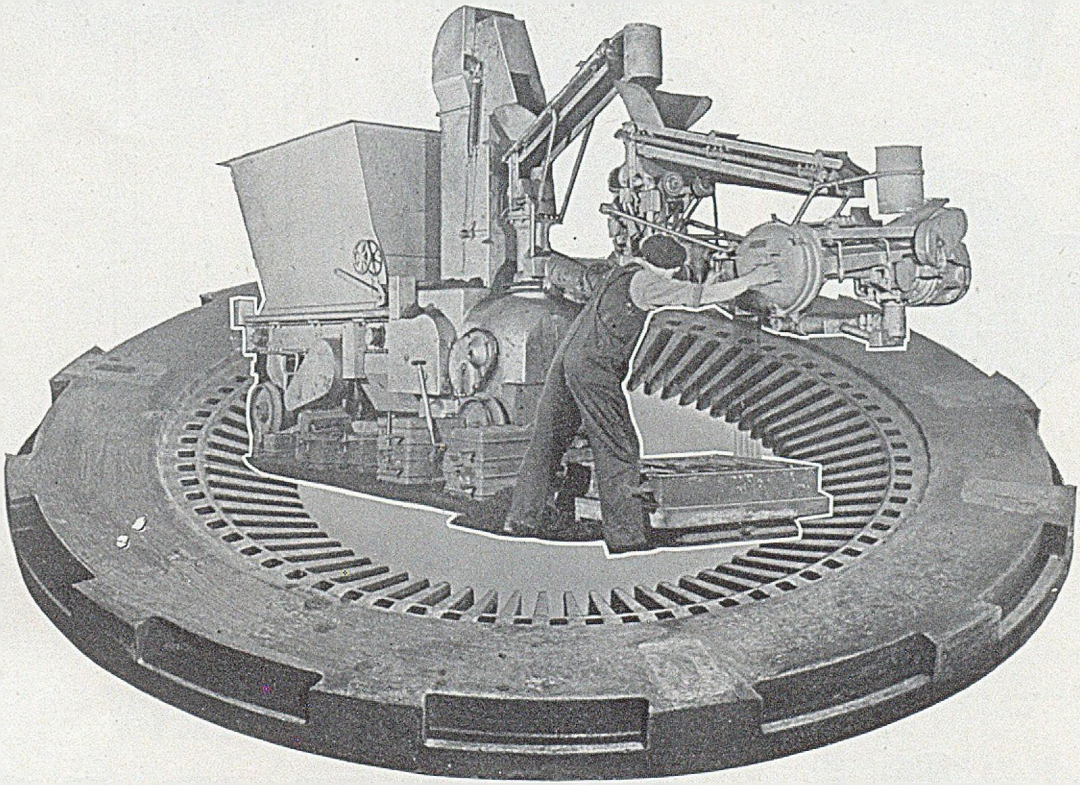

Casting shown is Stator End Clamp in Nomag non-magnetic cast iron. Diameter 7ft. 6in. Weight 3½ Tons. Rammed by Motive Type Sandslinger. Photos by Courtesy of Messrs. Ferranti Ltd.

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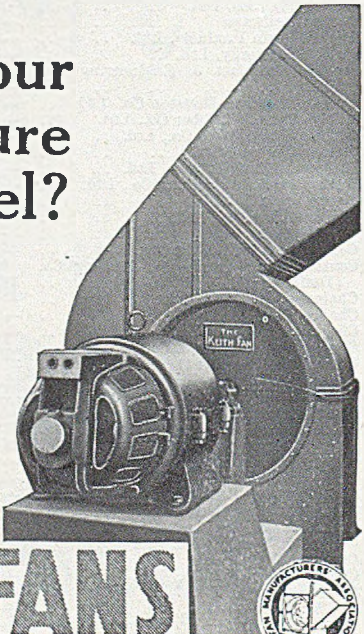

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Established 1902
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PRINCIPAL CONTENTS

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Raw Materials

Coke, pig-iron and scrap of various sorts are the iron and steel founders' main raw materials. The coke supply position has materially improved during recent years, through the construction of new carbonization plant. The relative position of pig-iron and scrap supplies is largely dependent on the amount of scrap going into the blast furnaces. Fundamentally, the raw materials for the blast furnaces are iron ore, coke and fluxes, and not scrap. By and large, throughout Europe, last year there was a decrease in the quantities of scrap entering the blast furnaces. Yet production was maintained and indeed increased. It has satisfied the general needs of the enhanced steel production shown throughout by European producers. Thus, gossip in steel-making circles points to a glut of its products before this year is out, except for alloyed steel, and, associated with this, ample supplies of scrap are forecast. When Mr. Duncan Sandys, the Minister of Supply, visited the Coneygre Foundry, he was told by Mr. J. J. Sheehan, but not in so many words, that it was bad economy to transport iron and steel scrap to South Wales and the North East Coast to be converted into pig-iron and later to be sent back to the Midlands for foundry remelting. By the application of metallurgical control, founders could, using only a limited amount of pig-iron, convert much scrap material into perfectly good metal for making iron castings.

This is perfectly true for foundries possessing good laboratory facilities and a trained metallurgical staff, but many of the smaller concerns must for a long time to come rely on the availability of good brands of pig-iron to enable them to meet their customers' requirements. When they have experimented with steel scrap and ferro-silicon, they have found that to get the silicon content they require by this method is much more expensive than when the silicon exists naturally in the pig-iron. Yet Mr. Sheehan's contention is quite logical and deserves support from those firms capable of imposing meticulous metallurgical control. A neighbouring firm, however, which has established an enviable reputation for quality, never buys any iron scrap. They deem their job to be manufacturers of castings and not metal refiners !

There remains for consideration the non-ferrous metals, and here, with the expansion of world production and the operation of the International Materials Conference, current supplies are adequate to meet present needs, with the exception of nickel and cobalt and to lesser extent copper. The margin between glut and famine is not a wide one and conditions can change—if not overnight, certainly with six months. Buyers can then forget "control" and even become "choosy"—an activity which is the basis of their economic employment, and a major factor in industrial progress.

Efficiency of Coal-burning Space-heaters

The importance to the nation of developing space-heaters which will burn bituminous coal smokelessly, and therefore with greater efficiency than is possible in the conventional open grate, is frequently stressed. The Simon Report, issued in 1946, was based on the assumption that within 20 years there would be a very considerable increase in the production and domestic consumption of solid smokeless fuel. That increase in production has not in fact occurred, and it is now quite certain that a large proportion of the solid fuel used for winter space-heating must continue, for a long time to come, to be raw bituminous coal.

Tests at the Fuel Research Station, Greenwich, which are to be described by Mr. L. L. Fox in a paper to the Institute of Fuel, compare the efficiencies of various types of "improved" appliances with the efficiency of the "ordinary" open fire. The differences between the British and Continental methods of carrying out efficiency tests were examined, and it was shown that the "test bench efficiency" is not the only factor to be taken into account when assessing the ability of space-heating appliances to heat a particular room. The Author suggests a formula for room-heating efficiency which takes the other relevant factors into account, including the rate of flue-gas volume flow.

Mr. Fox's paper, entitled "Efficiency of Domestic Space-heating Appliances Using Solid Fuel," will be read at a meeting to be held at the Institution of Mechanical Engineers, Storey's Gate, London, S.W.1, on January 27.

IRON AND STEEL BILL

In Committee, Mr. Duncan Sandys, the Minister of Supply, has introduced a number of Government revisions in the Iron and Steel Bill which is at present before Parliament. Those principally affecting foundries are:—(1) the exclusion from supervision—by the Board—of research, welfare and joint consultation; (2) exemption of the foundries from the onus of submitting development schemes; (3) limitation of the Board's ability to obtain information; (4) contributions to the cost of the Board are to be levied solely on its "iron and steel" activities. At a meeting with the ironfoundry and engineering organizations held last week, Mr. Sandys said "short of excluding the foundries from the Bill, the Government's revised proposals would remove as far as possible existing anxieties and objections."

British Standards Institution

The British Standards Institution in its monthly information sheet for December, 1952, lists under New Standards Issued: No. 1902:1952 Methods of testing refractory materials (7s. 6d.); and under Revised Standards: 1453:1952 Filler rods for gas welding (3s.). Amendment Slips include: PD 1504, amendment No. 3 to 2 S. 100:1949 inspection and testing procedure for aircraft steels; and PD 1519 amendment No. 2 to S 99: 1949 80 ton, 2½ per cent. nickel/chromium/molybdenum steel (high carbon).

Among Reprints are 220/222:1947 zinc, fine, special and foundry (2s. 6d.); and 1003/4:1942 high-purity zinc and zinc alloys (2s. 6d.).

"Circulated for Comment" includes: CO 7335 Terminology of defects in castings as revealed by radiography; CO 7338 the determination of aluminium (CO 7339 nickel, CO 7340 copper) in permanent magnet alloys; CO 7341 recommended method for the spectrographic analysis of low-alloy steels.

Unsafe Lifting Tackle

Arising out of an accident at the works of H. Widdop and Company, Limited, Diesel-engine builders, of Keighley, on October 29, 1952, when John Ellis was killed and Ernest Arthurs injured, the firm at Keighley Court pleaded "guilty" last week to using lifting tackle—an "S" hook—of inadequate strength; using an "S" hook not marked with the safe working load, and to failing to have the hook examined by a competent person during the previous six months. Miss Kathleen M. Malins Smith, the Keighley factory inspector, stated that sections of a shot-blast cabinet were being transferred to a part of the factory for erection, and it was impossible to get a sling round one of the sections, measuring 19 ft. by 8 ft., as its lower side was resting on the ground. An eye-bolt was therefore screwed on to it and a wrought-iron hook used to lift it by a crane. When lifted, the section was found to be incorrectly balanced, and so the foreman told two men to pull down on the lighter end. While they were doing this, the load crashed. The smaller curve of the "S" hook was found on examination to have fractured almost across, causing it to open out and allow the load to fall. It was said that the foreman did not know the weight of the section, and neither was the safe working load of the hook known. He guessed the weight of the load to be 14 cwt., whereas it was actually 23 cwt., and in consequence the hook was greatly overloaded. On behalf of the firm, it was stated that the lifting of the load had been left in the hands of the person in charge; the eye-bolt was used as an improvization as it was impossible to put a sling round the section. The hook used was not part of the firm's lifting equipment, and was normally kept in a corner of the maintenance room. If it had been part of the regular equipment it would have been examined and properly marked. The firm was fined £35.

International Foundry Congress, 1953

It is understood that *l'Association Technique de Fonderie*, 2, Rue de Bassano, Paris XVI, France, who are organizing the International Foundry Congress which will be held in Paris in September, 1953, would welcome the offer of papers from British authors. The manuscripts of papers offered for presentation at the conference should be sent to the secretary of *l'Association Technique* at the above address, to reach him not later than March 30.

The function will be held from September 21 to 26 inclusive and arrangements are being made for a party from this country to form a delegation. Members of the Institute of British Foundrymen who are desirous of having their names on the list to recieve information from time to time, are requested to communicate with the secretary, who will be glad to forward details as they become available.

Modification of Aluminium/Silicon Alloys*

By R. H. Dyke, B.Sc.

This Paper gives the results of a comparison of the various modification techniques in use for aluminium/silicon alloys. The effectiveness of several rapid tests which could be used by foundrymen to determine whether or not a melt had been successfully modified was also investigated.

Historical

Aluminium/silicon alloys were the first alloys of aluminium to be produced, a published account of their properties appearing in 1874.[1] However, the later development of other aluminium-base alloys having better mechanical properties resulted in the comparative neglect of the aluminium/silicon alloys until about 1923. Early work had shown that the addition of silicon to aluminium gave a progressive increase in tensile strength, accompanied by a reduction in elongation. The maximum tensile strength in a sand-cast alloy was found to occur with a silicon content of 10 to 12 per cent.,[3, 4, 5] the mechanical properties being: Ultimate tensile strength 9 to 10 tons per sq. in., and elongation 2 per cent.

Up to 1923, the cast alloys were characterized by poor machinability and a coarse fracture, attributed to the presence of massive plates of silicon. In 1921, Pacz, in a Patent[6] claimed that the mechanical properties of the aluminium/silicon alloys, principally those containing between 8 and 13 per cent. silicon, could be materially improved by treatment of the molten metal before casting with alkali fluorides, the most effective being sodium fluoride. This process was termed "modification." This Patent was followed by several others covering the modification of these alloys by the use of other agents including alkali metals,[7] alkaline-earth metals,[8] antimony and bismuth,[9] and alkaline oxides.[10] Of these modifying agents, the two most widely used have been sodium metal and the alkali fluorides. Modification, using alkali fluorides, is more popular in Europe, whilst the use of sodium metal, generally contained in a thin aluminium capsule, is preferred in America and Great Britain.

Mechanism

The exact mechanism of modification has been studied by many investigators and several facts regarding the phenomenon have been established. These may be summarized as follow:—

1. In an unmodified alloy containing 12 per cent. or more of silicon, the silicon occurs as a primary phase in the form of coarse needles and plates. In a modified alloy, the silicon occurs as a fine secondary phase of globular types. The transition from unmodified to modified structure is gradual, and one sample may contain both modified and unmodified areas.[5]

2. The process of modification is accompanied by an increase in both tensile strength and elongation.[5] The finer state of distribution of the silicon results in improved machinability.

3. Remelting of a modified alloy, or holding the molten alloy for prolonged periods in the molten state, results in a reversion to the unmodified condition.

4. The silicon content of the eutectic apparently increases from 11.7 per cent. to 14 per cent. during modification; the temperature of the eutectic arrest on cooling is also lowered,[12] the amount of lowering increasing with the cooling rate. Some work has shown a eutectic arrest as low as 564 deg. C.[11, 13]

5. The addition of excessive amounts of sodium to the alloys can produce "over modification." In this condition, the alloy becomes susceptible to gas porosity.[12, 14, 15] It appears that the aluminium/silicon alloys become more susceptible to gas porosity the higher the sodium content, and alloys with a sodium content only sufficient to give modification will absorb hydrogen more rapidly than alloys in the unmodified condition.

Investigation of Modification Techniques

A comparison was made of three techniques commonly used to modify aluminium/silicon alloys containing approximately 12 per cent. silicon using both flux and sodium-metal methods. The modifying agents used were:—(1) A 66 per cent. sodium chloride/34 per cent. sodium fluoride flux; (2) a low-melting-point ternary flux containing 50 per cent. sodium chloride, 35 per cent. sodium fluoride and 15 per cent. potassium chloride; (3) sodium metal. The aluminium/silicon alloy was prepared from commercial aluminium and silicon metals. The compositions of these materials and typical compositions of the final melts are shown in Table I. The requirements of British Standard 2L33 alloy are given as a basis for comparison.

TABLE I.—*Composition of Alloys.*

Sample.	Element (per cent.).					
	Al.	Si.	Fe.	Mn.	Zn.	Others.
Aluminium	99.7	0.1	0.2	—	—	—
Silicon	—	98	1.5	0.4	—	0.1
B.S.S.2L33	Rem.	10 to 13	0.6 max.	0.5 max.	0.1 max.	0.6 max.
AH1 ..	Rem.	12	0.23	—	0.01	0.26
BL3 ..	Rem.	12	0.21	—	—	0.21
SH2 ..	Rem.	12	0.20	—	—	0.25

Charges of 10 lb. each were melted in Salamander crucibles in a coal-gas-fired furnace. After melting, any residual sodium was removed by adding hexachlorethane in successive amounts each of 0.5 per cent. of the charge weight until the

* Paper presented to the American Foundrymen's Society as an Exchange Paper from the Institute of Australian Foundrymen. The author is Scientific Officer, Defence Research Laboratories, Maribyrnong, Australia.

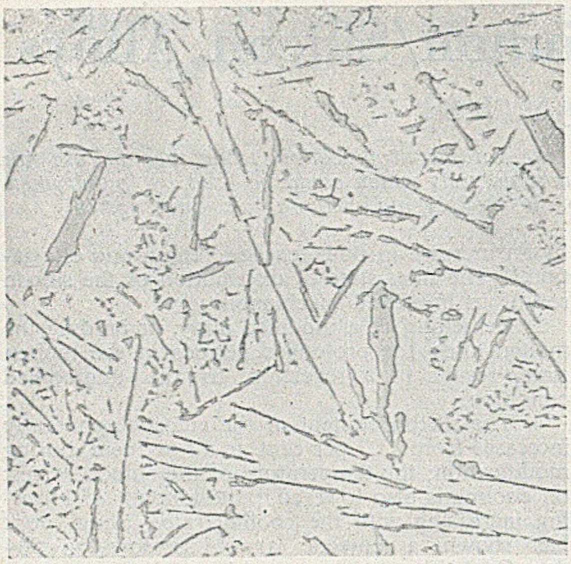

FIG. 1.—*Photomicrograph of Unmodified Aluminium/Silicon Alloy, × 200 mags; Plates and Coarse Needles of Silicon between Dendrites of Al-rich Solid Solution.*

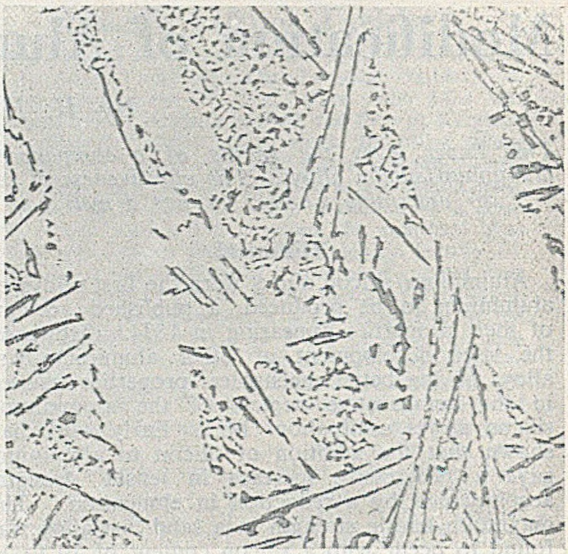

FIG. 2.—*Structure of the Alloy shown in Fig. 1, but cast at Stage 1, 5 min. after the Modification Treatment; Coarse Silicon Needles between Dendrites of Al-rich Solid Solution (× 200 mags.).*

alloy was in the unmodified state. Samples were taken in a small hand-ladle and cast in green-sand moulds into bars approximately ½ in. dia. and 6½ in. long. One sample was taken before the addition of the modifying agent and subsequent samples 5, 10, 15 and 20 min. after the addition. The temperature of the melt was measured by an alundum-covered thermocouple and was held at the two selected modification temperatures, 700 ± 20 deg. C. and 800 ± 20 deg. C. The melts were stirred with a graphite rod before each sample was taken.

The experimental results were expressed in terms of five arbitrary states of modification based on the microstructures of sections taken ½ in. below the top of each bar. The microstructures typical of these states were:—

Stage 1. The unmodified alloy containing plates and coarse needles of silicon randomly distributed in a matrix of aluminium-rich solid solution (Fig. 1).

Stage 2. Coarse needles of silicon between dendrites of aluminium-rich solid solution (Fig. 2).

Stage 3. Coarse, rounded particles of silicon between dendrites of aluminium-rich solid solution (Fig. 3).

Stage 4. A satisfactorily-modified structure with fine particles of eutectic silicon and rounded dendrites of aluminium-rich solid solution (Fig. 4).

Stage 5. An over-modified structure with coarse particles of silicon and bands of aluminium-rich solid solution containing needles of a ternary aluminium/silicon/sodium phase (Fig. 5). A more detailed discussion of these structures is given later in the Paper.

Modification by Sodium Chloride/Fluoride Flux

The original patent application of Pacz[6] covered the use of sodium and potassium fluorides as modifying agents. Fluxes of this type generally consist of mixtures of sodium fluoride and chloride. Typical modification techniques using these fluxes, as given in the literature, are shown in Table II.

TABLE II.—*Binary Flux Literature References.*

Reference.	Composition.		Per cent. of charge.	Temperature, deg. C.	Time of treatment in min.
	NaCl.	NaF.			
Polyak[15] ..	2	1	3	760-800	—
Balkov[16] ..	2	1	1–3	780-800	5–20
Botchvar[17] ..	2	1	—	740-790	—
Duport[18] ..	2	1	1.5	900	5–10
Welter[19] ..	1	2	0.4	700	—
Archer[11] ..	1	2	3	927	—

A study of the above references suggested that the most satisfactory flux would be a 2:1 sodium chloride/sodium fluoride mixture; an amount equal to 3 per cent. of the charge weight being used at 800 deg. C. The references gave no conclusive information on the time of treatment for satisfactory modification. A flux containing 66 per cent. sodium chloride, and 34 per cent. sodium fluoride was used, the amount of flux being 1, 2, 3 and 5 per cent. of the charge weight. The stages of modification of the test-bars, as assessed by metallographic examination, are given in Table III.

Techniques which gave satisfactory modification were checked using fresh 10 lb. melts, and the results confirmed with those in Table III. During the experiments with this flux it was found that at 700 deg. C. the flux did not melt but only formed a granular layer on the metal. At 800 deg. C., however, the flux melted and covered the surface of the melt. German work[21] has shown that modifying fluxes are most efficient when molten; this flux should therefore be used at a temperature approaching 800 deg. C.

TABLE III.—*Binary Flux Modification Results.*

Modification temperature, deg. C.	Amount of flux, per cent.	State of modification after			
		0 min.	5 min.	10 min.	15 min.
700	1	1	1	2	3–4
	2	1	1–2	2–3	2
	3	1	2–3	3–4	4
	5	1	3–4	4	4
800	1	1	3–4	3–4	3
	2	1	3	3–4	4
	3	1	3–4	4	4
	5	1	4	4	4

Modification with Low-melting-point Ternary Flux

Fluxes based on sodium chloride, sodium fluoride and potassium chloride have a lower melting point than the binary sodium chloride/sodium fluoride mixtures and their use permits lower metal temperatures, decreasing gas absorption by the melt and reducing fuel consumption and wear of furnace refractories.

Welter[18] obtained modification using a flux containing 22 per cent. sodium fluoride, 15 per cent. sodium chloride, 44 per cent. potassium fluoride and 19 per cent. potassium chloride, 2 per cent. of the charge-weight being used at 900 deg. C. A report on German work on the development of a ternary modifying flux[21] described a flux containing 12 per cent. sodium fluoride, 46 per cent. potassium chloride and 42 per cent. sodium chloride which was stated to melt at 650 deg. C. and was claimed to be satisfactory for modification at 720 to 760 deg. C. A Belgian Patent covering the use of a flux similar to this was taken out in 1943.[20] The flux addition was 1 to 1.4 per cent. of the charge-weight, the modifying temperature being 650 to 800 deg. C. No definite time of treatment was quoted. Duport and Caminade[19] described the use of this flux; the conditions used being 2 to 4 per cent. of the charge weight, 680 to 820 deg. C. modification temperature and 5 to 10 min. treatment time.

The flux selected for investigation contained 50

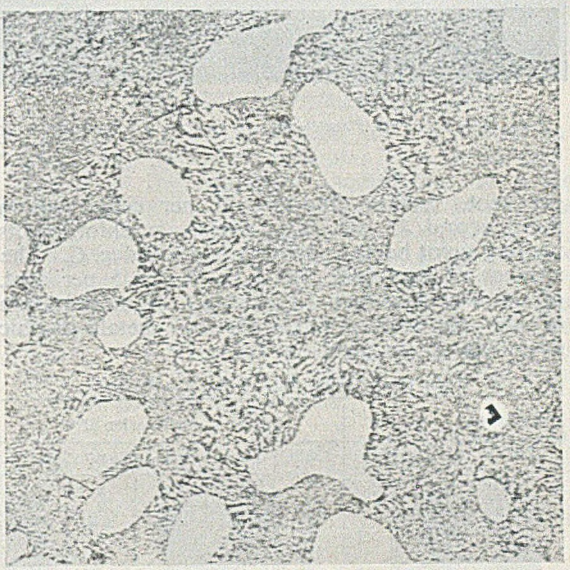

FIG. 4.—*Fully-modified Structure at Stage* 4 *(after* 15 *min.),* × 200 *mags; Fine Particles of Eutectic Silicon in a Matrix of Al-rich Solid Solution.*

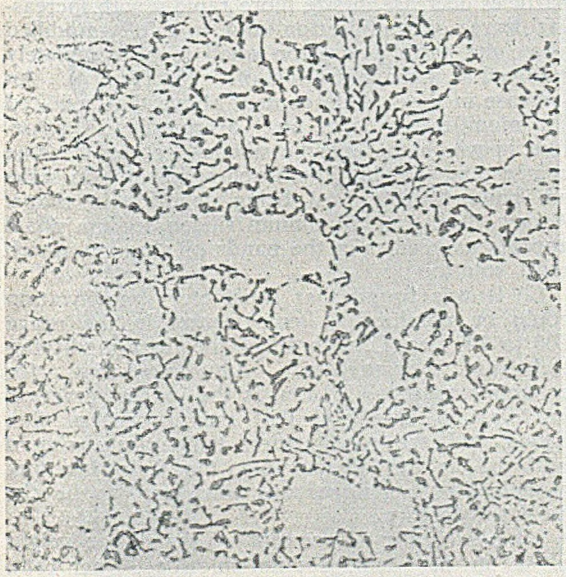

FIG. 3.—*Stage* 3 *Structure,* 10 *min. after Modification* (× 200 *mags); Coarse, Rounded Particles of Silicon between Dendrites of Al-rich Solid Solution.*

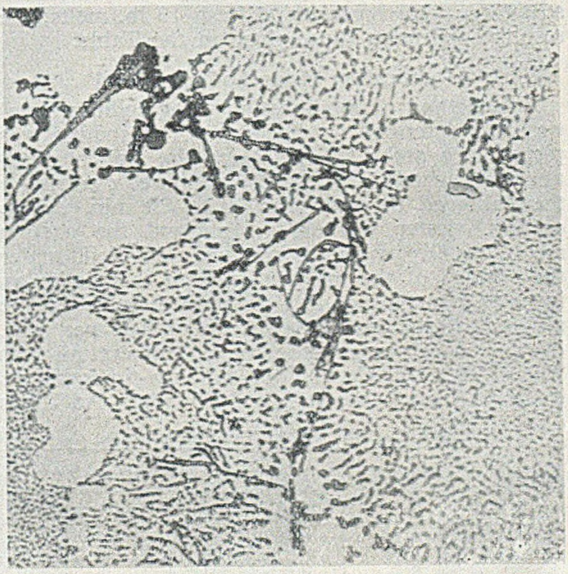

FIG. 5.—*Stage* 5, ×200 *mags; Coarse Particles of Silicon and Bands of Al-rich Solid Solution containing Needles of a Ternary Aluminium/Silicon/Sodium Phase.*

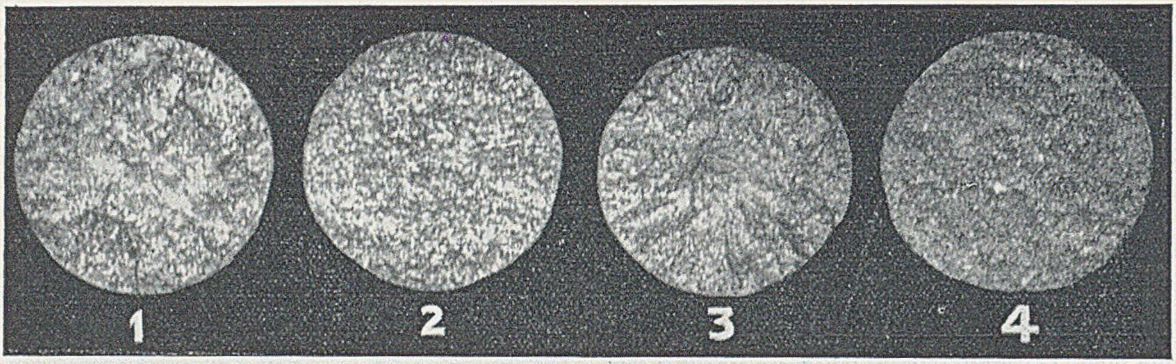

FIG. 6.—*Typical Fractures of Bars corresponding to the Stages of Modification shown in Figs. 1 to 5 (× 2 mags.).*

per cent. sodium chloride, 35 per cent. sodium fluoride and 15 per cent. potassium chloride, its melting point being approximately 650 deg. C. The amount of flux used was 1, 2, 3 and 5 per cent. of the charge-weight. The stages of modification of the test-bars as assessed by metallographic examination are given in Table IV.

TABLE IV.—*Ternary Flux Modification Results.*

Modification temperature, deg. C.	Amount of flux, per cent.	Degree of modification after				
		0 min.	5 min.	10 min.	15 min	20 min.
700	1	1	1	1–2	2	—
	2	1	1	1–2	2	—
	3	1	1	1–2	2–3	—
	5	1	1–2	2	3	4
800	1	1–2	2	2	2	—
	2	1	2	3	3	4
	3	1	2–3	3	4	—
	5	1	3	4	4	—

Techniques which gave satisfactorily-modified structures were repeated on fresh 10 lb. melts; the results confirming those given in the Table.

Modification Using Sodium Metal

The method of modification using sodium metal was first described by Archer.[11] The sodium was placed in a preheated ladle, and the molten metal at approximately 770 deg. C. was poured over it and then allowed to stand for 10 to 20 min. before casting. Later workers[13, 22] plunged the sodium metal, usually wrapped in aluminium foil, under the surface of the melt and held it there with an inverted cup type of plunger until dissolved. The amount of sodium used was about 0.06 per cent. of the charge-weight, the metal temperature was 700 to 750 deg. C., and the holding times before casting varied between 5 and 20 min. Additions

TABLE V.—*Sodium Metal Modification Results.*

Modification temperature, deg. C.	Amount of sodium, per cent.	Degree of modification after				
		0 min.	5 min.	10 min.	15 min.	20 min.
700	0.02	1	1	3–4	2–3	2
	0.05	1	2–3	3	2	1–2
	0.1	1	1	4	5	4
800	0.02	1	1–2	1	1	1
	0.05	1	5	4-5	4	4

of 0.02, 0.05 and 0.1 per cent. of the charge weight of sodium wrapped in thin aluminium foil were made in the present series and the stages of modification of the test-bars, as before assessed, are given in Table V.

The techniques which gave satisfactorily-modified structures were repeated and the results confirmed those of the Table.

Conclusions

(1) Metallographic examinations showed that modification affected the structures in a progressive manner. The first change in the structure of an unmodified alloy is that the random distribution of the silicon particles changes to a dendritic form in which the silicon/aluminium eutectic is present between well-defined dendrites of primary aluminium-rich solid solution (Fig. 2). This change is followed by a second phase in which the silicon particles decrease in size more rapidly with increasing degree of modification until, in a fully-modified alloy, the particles are too small to be completely resolved at a magnification of ×200 (Fig. 4). An increase in the sodium content above that required for modification gives an "overmodified" structure in which the eutectic silicon particles become coarser and the aluminium-rich solid-solution areas are banded, instead of being dendritic in shape. A new, dark grey aluminium/silicon/sodium phase appears as needles in the bands of aluminium-rich solid solution.

(2) It was found that satisfactory modification could be obtained at temperatures in the range 700 to 800 deg. C. with all of the three modifying techniques investigated. Assuming that, for economic reasons, 15 min. is the longest practical modification time and that the amount of flux added and the modification temperature should both be as low as possible, the following flux modification techniques are considered to be the most satisfactory.

(*a*) *Binary flux*—2 per cent. of the charge-weight of a 66 per cent. sodium-chloride/34 per cent. sodium-fluoride mixture allowed to remain on the metal for 15 min. at 800 deg. C.

(*b*) *Ternary flux*—3 per cent. of the charge-weight of flux containing 50 per cent. sodium chloride, 35 per cent. sodium fluoride and 15 per cent. potassium chloride allowed to remain on the metal for 15 min. at 800 deg. C.

(c) *Sodium metal*—0.05 per cent. of the charge-weight of sodium metal plunged beneath the metal surface at 800 deg. C. and the metal allowed to stand for 10 min. before casting.

(3) The experimental work has shown that there is a difference in the progress of the modification between the flux and sodium-metal techniques. With flux techniques, the sodium content of the melt will increase progressively during the progress of modification whereas with the sodium-metal technique the sodium content of the melt will reach a maximum when solution of the sodium metal is complete, and then, because of oxidation and volatilization, decrease during the holding period required for the sodium to diffuse throughout the melt. The sodium content of the melt is therefore always higher with the sodium-metal technique than with the flux technique. As it is well established that the rate of absorption of hydrogen by the melt increases with sodium content,[12, 15] there is consequently more risk of excessive gas-absorption when sodium metal is used than when modifying fluxes are used. Because of this and also because the modification occurs more gradually with fluxes, it is considered that the use of fluxes for modifying would give better results than the use of sodium metal.

(4) Degassing with chlorine-containing agents results in a loss of sodium, it therefore being necessary to degass with these agents before modifying. This will also ensure that the residual sodium content of the melt is low, enabling the foundryman to adopt a definite modification technique without the need to consider the effects of varying residual sodium contents of the melt. If degassing after modification is considered necessary, dry nitrogen should be used.

RAPID TESTS FOR DETERMINATION OF DEGREE OF MODIFICATION

For the control of modification, it would be a great help to the foundryman if a rapid test to determine the degree of modification of a melt were available. To be of practical use, the test should require only equipment normally used in a light-alloy foundry and the correlation between test results and stage of modification should be reliable. For the purpose of this investigation, three tests conforming to the first of these requirements were studied to determine whether or not they gave a satisfactory indication of the degree of modification of the melt.

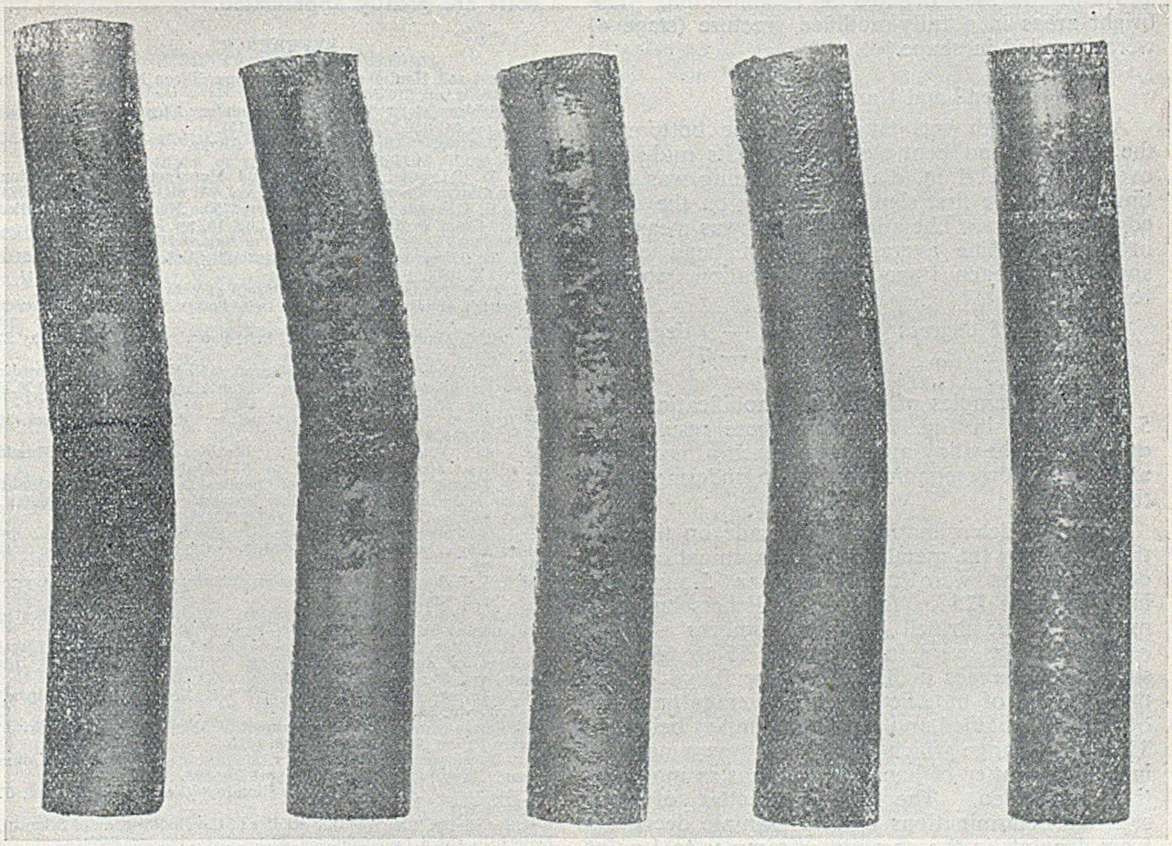

FIG. 7.—*Bend Test Samples representing (left to right) Modification Stages 1 to 5 (approximately half size).*

Modification of Aluminium/Silicon Alloys

Fracture Tests

Fracture specimens were prepared by machining a small groove around each test-bar, approximately 1 in. below the position of the metallographic sample and fracturing the bar. Typical fractures of bars having structures corresponding to the stages of modification described earlier are shown in Fig. 6.

It was found that a completely-unmodified alloy has a rough fracture, showing bright areas, the latter being due to the large plates and needles of silicon in the alloy. As modification proceeds and the size of the silicon particles decreases, the fracture becomes less rough and the size of the bright areas decreases. When the silicon particles become very small (stage 3), the fracture becomes dendritic in character and, in general, a small area in the centre of the section has an even, greyish appearance characteristic of a fully-modified alloy. With complete modification, the fracture is even and grey in colour with some small bright areas.

In the case of a fine-grained alloy, difficulty was experienced in distinguishing between stages 2 and 4. The most satisfactory distinguishing feature was the presence in the fracture of elongated, bright areas representing the silicon needles in alloys in the second stage of modification. The bright areas in a fully-modified fracture (stage 4) were rounded in shape.

Bend and Hardness Tests

A 5-in. length was taken from the bottom of the test-bars and bent slowly about its mid-point over a mandrel 1 in. dia. The bending was continued until the first sign of cracking on the outer edge of the bar. The angle of bend was measured in degrees. The average angle of bend corresponding to each stage of modification was as follows:—

Stage 1 — 8 degrees	Stage 4 — 9 degrees
„ 2 — 9 „	„ 5 — 7 „
„ 3 —14 „	

Bend-test samples of stages of modification 1 to 5 are shown in Fig. 7. From these results, the ductility of the alloy appears to reach a maximum at a stage corresponding to slight undermodification.

Hardness determinations were made on the sections used for the metallographic examination. The determinations were made using a 5-mm. dia. indicator and 125-kg. load on a Vickers hardness machine. The Brinell hardness numbers of most of the samples were in the range 55 to 65. No significant changes in hardness were found during the progress of modification, the average hardness of both unmodified and modified samples being 57. The only change which was found was a narrowing of the scatter of hardness readings as modification proceeded. The average scatter of four separate determinations on each sample decreased from 4 points in the unmodified samples to 1 point in the modified samples. It was considered that the change of hardness which occurs during modification is too small to say that hardness determinations satisfactorily determine the stage of modification of any particular melt.

Practical Value

(1) The investigation of several rapid tests which could be used by foundrymen to determine the degree of modification of a melt showed that fracture tests of bars of equivalent thickness to the casting being made would give a reliable indication of the stage of modification of the melt. (2) Bend tests are not considered satisfactory for foundry control as the ductility reaches a maximum at a stage of slight undermodification, but they may be of use to supplement the fracture tests. (3) The variation of hardness with the degree of modification is not considered sufficiently large for this method to be used for the following of the progress of modification.

Acknowledgments

The Author wishes to thank the chief superintendent, Defence Research Laboratories, for permission to carry out and publish the results of the above investigation. The comments and encouragements of Mr. I. J. Ferris, head of the section, and the practical assistance of Mr. W. L. Crofts are greatly appreciated.

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Shell-moulding and the Plastics Industry

Full Co-operation being accorded to Founders

When the plastics industry was first established in this country, there was much loose talk concerning its potential competition with castings. In actual fact, however, it has become a highly esteemed customer of the foundries for presses and other equipment, and over the last half-century, in which plastics have been developed into the important materials they are to-day, there has been a growing appreciation of the identity of interests between the two industries. With the introduction of shell-moulding this identity has been further cemented and, because of it, the Editor recently paid a visit to the extensive works of one of the pioneers of plastics in this country, Bakelite Limited, at Tyseley, Birmingham. Here it is possible to witness the production of plastics in many of the forms in which they are to-day most useful to industry—as moulding materials, for example, from which components of all shapes and sizes are easily mass-produced, and as laminated sheet, rod and tube which, if not outstanding for any one property, are nevertheless remarkable for the combination of such qualities as strength, light-weight, electrical and chemical resistance which they offer.

Manufacture and Applications

These materials, like all forms of plastics, are based upon synthetic resins, which must be manufactured under meticulously controlled conditions if a uniform product is to be obtained. The raw materials—phenol (a by-product of coal) cresol, formaldehyde, etc.—are first fed into great, steam-heated stills, and from these, when cooled, an amber-like solid is obtained, which is then ground and carefully blended. As either liquid or powder, the resultant resin is already of great industrial value. It is, for instance, incorporated in most modern paints and varnishes to increase their protective qualities, and, with suitable modifications, is widely used to provide adhesives for the woodworking industry and bonding agents for lamp-capping, grinding wheels and brake linings.

It is in this form, too, that plastics are chiefly of interest to the foundry industry. They have long been used in solution to seal porous castings and this process has made such progress that there are now a number of firms up and down the country which operate plants specially designed for the treatment of defective castings. Much has also been done for the industry in the development of synthetic core-binders, the progress of which has been phenomenal, and now we are on the brink of the infinitely more important developments which the shell-moulding process portends.

From the point of view of plastics manufacturers, it is emphasized that the provision of suitable resins for this process is not in any way different from the production of bonding agents for the variety of purposes already mentioned. Whereas for the foundries, therefore, shell-moulding constitutes a revolution, to the producers of resins it signifies merely a variation of a technique for which they have long acquired the " know-how." The value of synthetic resins in fact lies in the many variations of which they are capable, and it is for this reason that such careful control in their manufacture is necessary. It has also meant that plastics manufacturers are well used to tackling the problems of other industries and, in keeping with their past practice, they are now rapidly familiarizing themselves with foundry requirements. The scientific facilities of Bakelite Limited, indeed, are at first sight bewildering, for they must possess at a minimum a dozen laboratories devoted to either product control, development or pure research. For some time past, too, they have been providing demonstrations of shell moulding to interested foundrymen and it is now their policy to reinforce these services by the erection of a metallurgical workshop staffed by practical foundrymen. The installation of a crucible melting furnace is well under way and foundrymen will soon be able to witness the whole process with, if they wish, moulds made from their own patterns. Already some fifty foundries have sent in patterns of varying complexity and, from these, shells have been made for submission to standard testing.

Clamping of Shells Superseded

One difference between the methods used by Bakelite Limited and those seen elsewhere is that bent nails and similar means of clamping the half-moulds together are discarded by this company. Instead, one half-mould is daubed with a synthetic glue (also made by the firm) whilst on the other half is spread an accelerator. When these are brought together, bonding takes place in a few minutes and a joint is formed which is well suited to resist the strains set up by the liquid metal. This process is the subject of a patent application.

The Editor discussed with the technical staff of this concern the potentialities of shell-moulding and its future requirements. Once the process is established, it is anticipated that there will be a very heavy demand for resins, but it is deemed that the resources of the plastics industry will be quite capable of meeting it. This company alone has three different resins for the process already in quantity production, and it was pleasing to learn that two firms—one the largest supplier of foundry equipment in this country and the other notable for its contribution to tooling-up the plastics industry—are devoting their energies to the creation of special plant for rationalizing the process. Whilst admitting that the plastics manufacturers have here a promising field for expansion, the foundry industry should be grateful to them for their co-operation, for the service given is of the highest order.

Merit Rating for Apprentices

A merit rating scheme for apprentices, a feature of the comprehensive training programme introduced at the beginning of last year at Smith & Wellstood Limited and its subsidiary, Mitchell, Russell & Company, Limited, ironfounders, Bonnybridge, Scotland, is commended in a recent issue of *Target*. Details of the scheme are as follow:—

Bonuses are awarded on quarterly assessment reports by the training supervisor, factory or foundry manager, and the foreman of the boys' shop. Assessments are carried out under five categories:

1. *Workmanship and progress;* care, method, skill, and quality of work; adaptability at learning new jobs; handling and care of tools (maximum points: 35).
2. *Industry and perseverance;* hard work, interest in work; keenness; perseverance in less-interesting jobs (maximum points: 25).
3. *Co-operation and general attitude;* helpfulness to fellow workers, foreman and managers; willingness; friendliness; initiative; attendance at continuation classes, *i.e.* day-release, or evening classes (maximum points: 20).
4. *Conduct and appearance;* behaviour; respect for elders; obedience to safety and work rules; pride in appearance (maximum points: 15).
5. *Timekeeping and attendance* (maximum points: 5).

Bonus is not paid for 50 points or less. For a score of 51 points, the bonus is 9d. per week, rising by 3d. a point to 60 points, and then by 6d. for every point up to 70. Higher bonuses are paid to top-scoring apprentices with 71 to 100 points, *viz.* 71 to 80, 10s.; 81 to 90, 12s. 6d.; 91 to 100, 15s. Besides his own report, each boy is allowed to see the scores of other boys; he thus knows the categories in which he needs to improve. The training scheme, as a whole, is designed to attract a good-calibre apprentice, particularly in moulding and fitting.

Working the Scheme

Details of the scheme were first published in the local press, with an account of prospects for an apprentice after training. The firm's training supervisor, who administers the scheme, met local Youth Employment Officers and headmasters. A boy is first interviewed by the training supervisor; the supervisor talks with the boy's headmaster and the boy is finally seen by the foreman under whose charge he will be. The probationary period of three months begins with a one-week introductory course during which the apprentice is taken round every department in the two works.

Training becomes more specialized at the end of the first week, when the boy is assigned to his own particular department. Here he is engaged on productive work, besides being allowed to attend day-release classes once a week. Foundry apprentices attend the Burnbank Foundry Trade Centre in Falkirk. Apprentices in other trades attend appropriate technical schools. Not until satisfactory reports are received from all quarters at the conclusion of the three-months' trial period is an apprenticeship agreement entered upon. At the conclusion of the full five-year period each boy is presented with an official certificate of apprenticeship.

A statement made on behalf of the Amalgamated Union of Foundry Workers, the United Pattern Makers Association, and the General Ironfounders' Association says: "This scheme has had a very good effect on the apprentices. . . . It has been the means of attracting a good class boy to the industry. . . . We approve of the training scheme, and, so far, have been able to see that it is going well." The National Light Castings Ironfounders' Federation, in a tribute to the scheme, also stresses the values of attracting good-quality apprentices.

Book Reviews

Handbuch der Schmelz-und Legierungspraxis in der Metallgiesserei (Handbook for Melting and Alloying Practice in the Non-ferrous Foundry) by A. Schulenburg. Published by Fachverlag Schiele und Schön, 10 Boppstrasse, Berlin, SW 29, Germany. Price 18 D.M.

The Author points out in the foreword that this book is written for a practical foundryman, but the student will also benefit from reading it. The question is, is there such a thing as a practical foundryman in a modern non-ferrous foundry? In this age of specialization there is a foundry manager, foundry foreman, foundry metallurgist and a works engineer. Each of them requires more specialized knowledge than this book conveys. It contains very little basic knowledge one would expect to find in a handbook, and what there is, is at times somewhat contradictory particularly as far as degasing is concerned. The statements that lead could be alloyed easily with copper and no phosphor content in tin bronzes over 0.5 is of any use, would not be shared by some experts. No serious foundryman will agree with a statement that the metal scrap lying out of doors exposed to the weather would adversely affect the quality of the metal.

Various good practical hints can be found in the book, particularly so far as the treatment of crucibles, use of pyrometers, etc., are concerned. The chapter dealing with the chemical corrosion is somewhat vague and inconclusive. The book is divided into two parts, one dealing with heavy metals, the other describing the melting and alloying of light alloys.

G. S.

Technical Report. New Series. Vol. 1. Published by the British Engine Boiler and Electrical Insurance Company, Limited, 24, Fennel Street, Manchester 4. Price 12s. 6d.

The reviewer well remembers the earlier series of these important reports. In them were detailed many cases of failure in service of iron castings. This present volume is devoid of such cases, yet this does not mean it is devoid of interest for foundrymen. On the contrary, there is the failure of a crane-hook which caused a fatal accident. It was, at the time of the accident, lifting a much heavier load than it was rated to carry. The hook was made from unsuitable material, but if it had only been regularly heat-treated, it would most probably have responded to the conditions imposed. This Report takes up nine pages, is well illustrated, and makes fascinating reading. Another report which interested the reviewer was the failure of a steam-engine crankshaft. There is a report on defective squirrel-case motors, which is the only case reported of the failure of a casting. The rotors of the motors in question are a composite of an aluminium casting and steel inserts. The failure was to the opening up of the mould before the metal had properly set, plus the incorrect assembly of the lamination. It sems a pity that these excellent reports should be anonymous. The book which runs to well over a hundred pages contains sixteen reports and a paper on "Some Sources of Error in Quasi-Static and Impact Notched-bar Testing," by Mr. G. A. Cottell. The only criticism the reviewer would make is that the interest of the book would be enhanced by the captioning of the illustrations.

Davy & United Engineering Company, Limited—Mr. K. C. Gardner and Mr. F. J. Browse have left the board.

Foundry Sand Control*

Special Application to Synthetic Sand Practice

By A. Tipper, M.Sc. (Eng.), F.I.M.

The object of this Paper is to discuss those characteristics of moulding sands which are of particular importance to foundrymen in producing good moulds and good castings, and in doing so the Author reviews the various methods at present used for routine sand control, the investigation of sand properties, and possible causes and cures for certain sand troubles.

Causes of Sand Defects

Sand defects in castings may be (*a*) merely an occasional trouble due to the human element, for example, inadequate venting—causing "blown" castings; (*b*) too-hard ramming, causing "buckles" and "blows"; and (*c*) too-soft ramming, resulting in "swells" and rough surfaces.

Other defects may be due to failure or bad adjustment of the moulding machine, causing:—(*a*) Patchy moisture and under-milling of sand, (*b*) low strength and/or plasticity, and (*c*) uneven ramming or slinging.

Yet a further class of defects may be caused by a malady of the sand in use, causing a fluctuating or persistent occurrence of defects, such as:—(*a*) A sand lacking in plasticity and strength; (*b*) a sand with too high a proportion of fines, giving low permeability; (*c*) a sand with poor refractory characteristics, causing burning-on and bad surface finish; (*d*) a sand which is tough and lacking flowability; and (*e*) a sand with unsuitable grading.

The question is how to prevent or reduce the incidence of sand defects and the first step must be to apply some measure of general sand control. Routine testing will include tests for moisture; green-strength in compression; shatter; mould-hardness and permeability; and the occasional determination of mechanical grading, clay content, coal-dust or pitch content, dry-strength, and deformation and hot strength.

Control Determinations

Dealing now with each property in more detail—*Moisture* is usually determined:—(*a*) By the hand method (which includes a measure of plasticity), *e.g.*, "feel"; (*b*) by the "speedy" moisture tester or Moisture Teller; and (*c*) by the electrical-resistance moisture-meter (which can be used to give a continuous record of sand travelling along a belt, as distinct from individual tests). Great attention must be paid to securing uniform moisture by adequate distribution and tempering of the sand leaving the sand plant, such as by the use of clay slurry (used at Coneygre and Sheepbridge foundries), or clay and coal-dust or pitch and water. It is known that both green-strength and dry-strength properties are materially affected by the moisture content whatever type of clay bond be present and, when dealing with a synthetic sand, the permissible moisture range is appreciably less than with a naturally-bonded sand, and therefore sand control is also more important.

Drying-out of the sand surface is a major cause of sand "washes," inclusions, etc., and the sharper the peak of the moisture/strength curve the greater is this danger. Indications are that the nature of the bonding clay has an influence on the "friability" of an air-dried mould. Methods of overcoming this trouble include the making of various additions, such as:—

(*a*) Water attracting agents such as molasses, wood extract, dextrine or core-gum, glycerine (ethylene glycol), and the use of surface wetting agents, which may be applied as sprays;

(*b*) Additions of fuel-oil, resin and pelleted pitch, which increases the plastic-bond and hot-strength without needing the presence of water, so maintaining the bond strength with a minimum moisture content in the sand; or

(*c*) Fine sand or silica-flour to reduce the pore size and permeability of sand surface, etc.

One factor which has not yet been mentioned in dealing with the question of moisture control is that of sand temperature. This, as is well known, is one of the major "headaches" in operating a mechanized plant, and whilst the addition of water from sprays as soon as possible after the knock-out helps to reduce the sand temperature, some form of air-cooling with consequent loss of moisture is often necessary, and the answer seems to be in having sufficient space and quantity of sand in the system to allow time for this cooling to take place, and to permit the final adjustment of moisture in the cooled sand.

Green-strength.—Whilst the green-compression-strength test measures the ability of rammed sand to withstand a slowly-applied load in compression, it is an arbitrary measurement depending on conditions of preparing the test-piece, and it is known that this does not completely measure the mouldable properties of a foundry sand, which takes into account its plasticity, *i.e.*, the deformation (or the ability to flow without rupture) which the rammed sand will permit. The mouldability or plasticity of sand has been defined as "that property which determines its cohesive power, or its ability to be moulded and retained in a desired shape." This implies the properties of rigidity and plastic flow (without plasticity). Deformation under stress may

* Paper given to the East Midlands branch of the Institute of British Foundrymen.

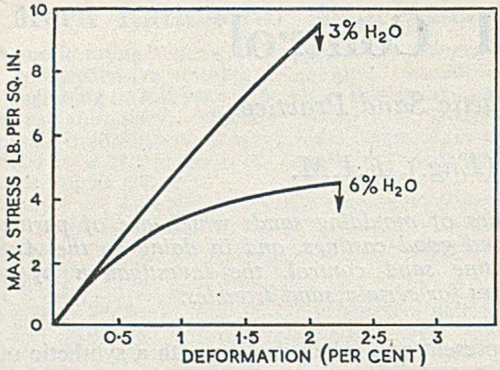

FIG. 1.—*Plastic Behaviour of Sand in Compression for a Sand bonded with 5 per cent. Fulbond 1.B.*

be of three types:—(1) Elastic, as in metals, etc.; (2) viscous, as in fluids; and (3) plastic, as in sand. Several methods have been suggested for measuring these two properties quantitatively, and at present they are being investigated by the Joint Sands Committee and by various individuals to determine suitability for putting forward as standard foundry tests.

The methods include:—

(*a*) Measuring the amount of work required to cause deformation (*e.g.*, the work required to rupture the 2 by 2 in. compression test-piece) which is obtained by calculating the area under the stress deformation curve to the point of rupture. This is now often referred to as the toughness (Figs. 1 and 2).

(*b*) The measurement of deformation—as a criterion of the moulding properties of a sand when considered together with the green-strength.

(*c*) The determination of "bulk density before compression," and from these results to determine the optimum moisture content for maximum plasticity, *i.e.*, the minimum density or packing is shown to correspond to maximum plasticity as assessed by other tests and "feel." This test relates the energy to rupture the bond (*e.g.*, plasticity) to the packing-density for each moisture content chosen.

(*d*) The shatter test is an empirical test to measure the "toughness" of a rammed sand mass. The shatter-tester was devised for the easy control of normal moulding sands, especially for sands used in a mechanized system. The test is practical and can be carried out by anyone unfamiliar with the normal routine tests and can be carried out in the immediate vicinity of the sand mills. A system-sand, once established, can be controlled to the limits required for all normal moulding procedure by the use of this test, but it does not eliminate the usual moisture, green-strength and permeability tests. Its objective is to provide a sand of given "shatter" which will ensure adequate lifting properties and yet have good flowability. The ideal value must be established by trial and error and, for preference, should be kept in the limits of plus or minus 3 to 5 per cent. from the given value. This will ensure that machine moulders are provided with a sand which can be jolted for a given time and yield a series of moulds of the same mould hardness and density. The percentage of a given sample retained on ½ in. mesh represents the shatter index of the sand.

Controlling Factors

All these tests give added information on the moulding properties of a sand—in particular the shatter-test is simple and easy to perform, giving reproducible results and is sensitive to moisture variations. Plasticity and strength are dependent on a number of factors which are fairly well known, and are inter-related with the nature of the sand grains (small grain size and low angularity give high deformation); the bonding material (static and mobile bond), and, of course, with the moisture content. Permeability is largely dependent on the grading of the sand grains (which can be controlled, particularly in a synthetic sand), but also on the degree of ramming (as measured by the bulk-density value). Dr. Davies, in his book on "Foundry Sand Control" has drawn attention to the usefulness of the "bulk-density *v.* moisture" curves for various sand mixtures as indicating the plastic range for a particular type of clay bond and the optimum moisture content for maximum toughness.

In practice, it is necessary to determine by experience on various types of castings the safe range of mould hardness/strength and moisture contents for low bulk-density causes swells and sand "washes" and penetration. Too high a bulk-density may cause buckles, scabs and burnt-on sand. The bulk-density gradient enables conditions in a mould to be investigated.

Bulk Density v. Mould Hardness v. Compression Strength

Whilst the dry-compression, transverse or tensile strength is readily determined, far less is known about the hot-strength of moulding sands and its relation to defective castings. It is known that the dry-strength of any sand depends upon the nature

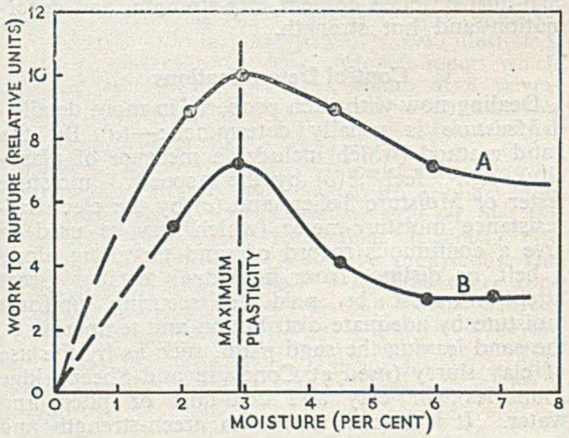

FIG. 2.—*Graph of Work-to-rupture Values against Moisture Content for Moulding Sands of Two Types, A as in Fig. 1 and B bonded with 7.5 per cent. Kloidex.*

of the bonding clay, as well as on the amount of clay and water present. Failures are seldom due to lack of dry-strength alone, although sand " washes " are often attributed to low dry-strength. Friability is probably due to loss of moisture and other factors, which may be correlated with a low-dry-strength clay-bond, plus the important influence of special organic additions, *e.g.*, pitch, coal-dust, etc. The hot strength of moulding sands depends largely on the nature of the mineral constituents of the clay and fines in the sand and can also be influenced by the temperature at which the bonding clays reach their hot-strength peak. This varies for particular clays, *e.g.*, kaolinite clays develop their maximum strength at considerably higher temperatures than the bentonites. Ideally, the hot-strength should be developed as quickly as possible to resist " washing " at the surface of a mould on pouring.

The difference between strength at elevated temperatures and the " retained strength " on cooling down to room temperature is dealt with in Dr. Davies' book. The low retained-strength is said to be due to thermal shock and the cracking of the sand mass. Again, this will depend on both initial moisture content and ramming density.

Choice of Sand

The selection of a sand must depend partly on the availability of supplies of local material, either naturally-bonded or of the silica variety, suitable for the production of synthetic sand. The choice as to whether natural or synthetic sands are to be used can be dealt with by stating that whilst " natural " moulding sands have definite advantages in (*a*) a wider moisture range (giving easier patching and less drying out), and (*b*) generally finer texture, giving more easily a smooth finish to the casting, these advantages are generally outweighed by the several advantages of the synthetic moulding sand, which include:—(*a*) better refractoriness, *e.g.*, less burning-on; (*b*) higher permeability, giving less chance of " blows "; (*c*) easier and closer control of properties, and (*d*) ease of securing any combination of green-strength, dry-strength and good permeability.

Scabbing may be a greater problem with the more-uniformly-grained synthetic sand but can be overcome in a number of ways, for instance, by the addition of various kinds of combustible material, or by blending different types of sands. Synthetic sands on the whole should be more uniform or reliable than " natural " moulding sands, and be particularly suited to the requirements of the highly-mechanized foundry. In considering natural-bonded sands, apart from the factors of availability and price, there are questions of:—(*a*) bond strength; (*b*) refractoriness; (*c*) grading and permeability, and most important (*d*) uniformity of clay-content, grading, etc., to be considered.

Examination of a " raw " natural-bonded sand should distinguish between what has been called the " static " and the " mobile " bond. The mobile bond is that which can be removed from around the sand grains by simple water washing or be transferred from grain to grain. That referred to as static is the fixed coating on the sand grains not readily removed, *e.g.*, limonite, and glauconite, which form a key for the mobile bond. The static bond (present in most Bunter red moulding sands) has a greater effect on strength than a similar amount of mobile bond. The smooth-surface, clean, silica grains used for synthetic sand need to develop this static coating (the process being assisted by coal-tars, etc.) before they will respond fully to clay additions.

Interpretation of Results

(1) General trends can be recognized from graphs of routine sand-control tests and remedial action can be taken. (2) Sporadic outcroppings of particular defects may be localized to a particular section of the foundry; a particular machine; a particular operator, or a particular job. Then with the help of the mould-hardness tester, moisture-meter and perhaps an investigation of the grading or clay content, coal-dust content or permeability at various ramming densities, the various possible causes can be eliminated one by one, till the cause of the trouble is found and cured.

Acknowledgment

In conclusion, the Author expressed his thanks to Dr. Davies and Mr. Parkes for permission to use diagrams and information from their lectures, to Dr. White of Sheffield University, to Mr. Ridsdale for loan of slides, and finally to the directors of the Harborough Construction Company, Limited, for all the facilities placed at his disposal to prepare this Paper.

Claim Against Foundry Fails

Sheriff-sub. Macgregor, Q.C., has issued judgment in an action in Falkirk Sheriff Court at the instance of Douglas M. Gillan, iron moulder, against his employers, Mitchell, Russell & Company, Limited, Chattan Foundry, Bonnybridge. The man sued for £1,500 damages in respect of an accident which occurred in the moulding shop on December 20, 1950, when he fell while carrying a ladle of molten metal and sustained burns to his left foot and ankle. Gillan averred that, as he was walking towards the row of boxes which he was about to cast, he tripped over a ridge of hard sand four to six in. high, which formed an obstruction on the passage-way on which he had to walk. He held that the accident was due to defenders' breach of Section 25 (1) of the Factories Act, 1937, which provides that all floors, passageways and gangways shall be of sound construction and properly maintained, and of Section 26 (1) of the Act which provides that there shall, so far as practicable, be provided and maintained safe means of access to every place at which any person has at any time to work. The firm denied the pursuer's allegations and said the passageway was of sound construction, properly maintained and a safe means of access to the working place. After proof, the Sheriff-sub. has granted decree of absolvitor in favour of defenders and found the pursuer liable for expenses. He found that the passageway was constructed and maintained in accordance with the standard required by the Act and that it was safe for men having to pass along it while engaged in their duties.

Italian Metallurgical Industries

Survey by our Rome Correspondent

Non-ferrous

The production of raw aluminium in Italy, amounting to 37,800 *tonnes** in the first nine months of 1951, shows an increase to 39,500 *tonnes* in the corresponding period of 1952 and should have exceeded during the year the forecast figure of 50,000 *tonnes*. There has been a considerable increase in the manufacture of intermediary products of pure aluminium and its alloys, from 27,500 in the first nine months of 1951 to 33,900 *tonnes* in the corresponding period of 1952 and the total production last year will be of the order of 45,000 *tonnes* as against 42,000 in 1951. The import of raw aluminium and intermediary products shows an increase from 3,000 *tonnes* in the first nine months of 1951 to 3,500 in the corresponding period of 1952, while exports diminished from 9,500 to 8,000 *tonnes*.

Imports of copper showed a decrease from 53,900 *tonnes* in the first nine months of 1951 to 39,100 in the corresponding period of 1952. The manufacture of intermediary products of pure copper shows also a decrease from 40,000 to 37,700 *tonnes*. Reduced activity has been also noted in industries concerned with intermediary products of brass and copper (from 37,000 in the first nine months of 1951 to 36,000 *tonnes* in the corresponding period of 1952).

As to the other metals, the production of lead has kept at about the same level while a considerable increment has been shown for zinc. In the secondary metals industry, there was a lowered production of aluminium and its alloys (from 16,000 in the first nine months of 1951 to 13,000 *tonnes* in the corresponding period of 1952) and in secondary copper from 7,500 in the first nine months of 1951 to 4,000 *tonnes* in the corresponding period of 1952.

On the question of prices and supply of the non-ferrous metals, if aluminium be excluded (the price of this being established by the Government), a considerable reduction has been seen for all the other metals during the first five months of 1952; and the levels have been successively stabilized at the price reached by the end of May. With the one exception of nickel, which is still in very short supply, the condition of the supply market for these metals is about normal.

Iron and Steel

The Italian iron and steel industry has shown in 1952 a satisfying increase in productivity in comparison with the preceding years and the levels attained before the second world war have been exceeded in all sections, due to the improved supply of raw materials and the rearrangement of industrial plant, the reconstruction of which has been almost completed. An impetus will be given by the exploitation of the new plant situated in Cornigliano, to be inaugurated in 1953. The *per capita* consumption of steel in Italy has increased from 167 lb. in 1951 to 191 lb. in 1952.

The consumption of raw materials by the Italian iron and steel industry has shown a considerable increase in the past year. Usage of iron ore and agglomerated products, that amounted to 1,692,000 *tonnes* in 1951, will have increased, according to the general forecasts to about two millions in 1952.

A change in the structure of the Italian iron and steel production has permitted a larger utilization of ores which are more readily available than of scrap iron. At the new levels of production, Italy now holds the sixth place, as producer of iron and steel among the countries of Western Europe.

The production of iron castings, continuously rising since the end of the second world war, amounted to 844,000 *tonnes* in the first nine months of 1952 and should have exceeded an output of one million *tonnes* for the year. The cast iron/raw steel ratio increased from 21 per cent. in 1950 to 31 per cent. in 1951 and 32 per cent. in 1952. It is interesting to note the high value attained by the production of electrically melted cast iron.

The production of ferro-alloys has also shown a good increase in the year, surpassing 88,000 *tonnes* in the January to September period. The increase has been noteworthy in cases of ferro-manganese and ferro-silicon. Steel production amounted to 2,626,500 *tonnes* in the first nine months and should have attained during 1952, according to the general forecasts, a figure of about 3,500,000 *tonnes* of which 43 per cent. was made by the electric-furnace process. Alloy steels constitute 9 per cent. of the total production.

Owing to the increased national production and the higher prices of the foreign products, a considerable reduction in imports of pig-iron and steel has taken place. Exports on the other hand have shown a slight improvement, particularly in the case of ferro-alloys and seamless tubes. The course followed in 1952 by prices on the iron and steel side has been normal.

* Metric tons of 2,200 lb. are retained throughout this article, as conversion to tons of 2,240 lb. would only be confusing when only figures in round numbers are being quoted.

French Coal and Steel Plans

The main lines of the second French development plan have now been made clear. The aim is to continue and extend the first plan, to raise the general level of industrial equipment and methods in order to remove anomalies such as that in Lorraine, where blast furnaces erected before 1914 still work near newly constructed modern units, and, thirdly, to prepare the French economy for the competitive conditions that will be encountered in the common European economy which is gradually being created, for example, on the common market of the European Coal and Steel community.

It is hoped to increase industrial production between 1953 and 1956-57 by 30 per cent. over the level reached in 1952. Coal output is to be expanded to 60,000,000 metric tons by 1956-7 (compared with an estimated output of some 55,000,000 tons in 1952), and to 65,000,000 tons in 1960. Crude steel production is to be increased to between 15,000,000 and 16,000,000 metric tons by 1956, compared with the present capacity of approximately 12,500,000 tons.

The August-Thyssen-Hütte in Western Germany has recently blown in a fourth blast furnace, increasing the pig-iron making capacity of the works to approximately 800,000 metric tons annually. Pig-iron production in December, 1952, totalled 55,000 metric tons, while steel production is at present running at a monthly rate of 13,000 to 14,000 tons. The steelmaking capacity of the plant is expected to increase sharply when further furnaces are brought in early this year.

Non-ferrous Foundry Transferred

Developments at George Kent, Limited

About six months ago, it was recorded that the foundry of George Kent, Limited, had been transferred from the Biscot Road Factory to new premises known as the Lea Works on the other side of Luton town. This foundry is now in full production and it is possible to outline the layout and methods adopted for a variety of non-ferrous work.

Last year, George Kent, Limited transferred to their newly-acquired Lea Works in Luton, their non-ferrous foundry and the illustration at the foot of this page shows a model which was prepared to help in determining the layout of the new premises. The old foundry went on working until July 18, when the works holiday began; and the first casting from the new foundry was produced at 8 a.m. on August 5. The firm's output consists of high-quality castings used in water-, oil-, steam-, air-, gas- and petrol-meters. The manufacture of these meters, and other industrial instruments, embraces many "purpose-made" devices designed for a few specialized applications only in a limited field and for which the chances of repeat orders are small. Many of the castings have to be pressure-tight, and the compromise between high standards of finish, freedom from gas-holes, and thin-walls for optimum weight saving, is difficult of attainment. To complicate matters further, the plant is situated in an area where labour is scarce, especially for relatively uncongenial work. It has been found necessary, therefore, to exploit to the full recent developments in foundry technique, such as arranging a large proportion of the work on pattern-plates for machine moulding, introducing roller-conveyor tracks for reducing handling, and producing air-blown resin-bonded cores, by semi-skilled labour on machines. On the other hand, such jobs as large "venturi" throat castings weighing up to 3,000 lb. are moulded by strickle board and loam cores are employed. Fig. 2 shows a general view of the new foundry taken from above the furnaces. The foundry occupies 20,000 of the total 63,000 sq. ft. of the new factory and thus forms a major portion of the new flow-production scheme.

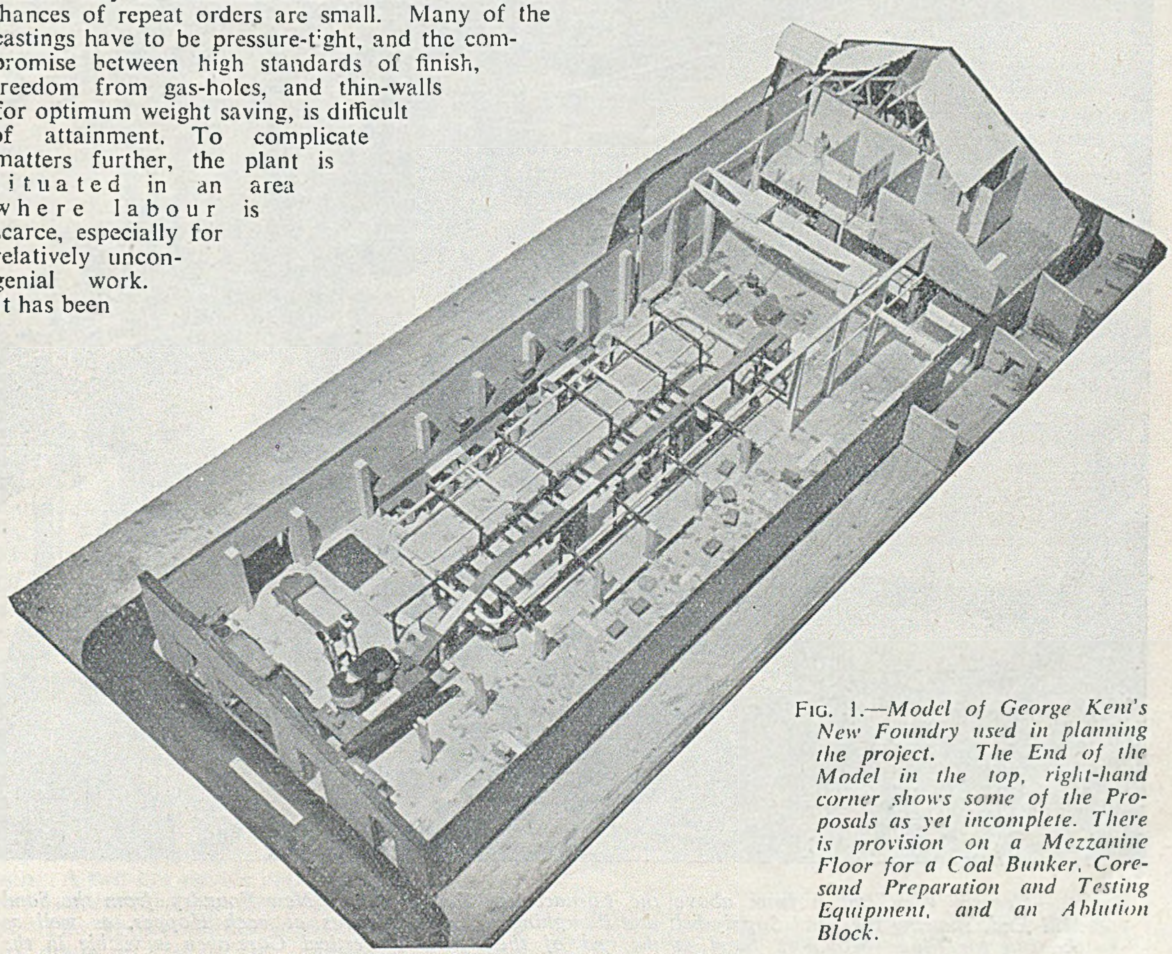

Fig. 1.—*Model of George Kent's New Foundry used in planning the project. The End of the Model in the top, right-hand corner shows some of the Proposals as yet incomplete. There is provision on a Mezzanine Floor for a Coal Bunker, Core-sand Preparation and Testing Equipment, and an Ablution Block.*

Non-ferrous Foundry Transferred

Equipment

Ingot metal is received and stored on steel pallets in a compound outside the foundry wall. The furnaces are fed by means of a Ransome 1-ton fork truck, which loads the pallets through hatches in the wall on to a platform served by roller track, running the whole length of the row of furnaces, the height of this platform being such that ingots can conveniently be fed into the tops of the furnaces as required. The melting installation consists of four 450-lb. Morgan units (coke-fired) and two 600-lb. Polford units (oil-fired), all of the tilting type. The ancillary equipment, fans, etc., are housed under the roller platform and separated from the furnaces by a brick wall, which layout makes for reasonable running conditions and easy maintenance. Metal is taken to the moulds in 150-lb. plumbago crucibles, carried by Roper hoists on a King Supertrack monorail, with a convenient arrangement of loops and track switches.

Sand and Moulding Plant

New Bromsgrove red sand is delivered by road transport and unloaded through a hatch in the wall into a bin adjacent to the returned-sand bin. Then in suitable proportions of new and old, sand is conveyed by skip-hoist to a breeches hopper and discharged into one of two Pneulec 6-cwt. batch-type mills and water is added in measured quantity (determined by a Kent water-meter). A system of electric indicators and mechanical interlocks of the firm's own manufacture is operated by signal-type levers and is designed to eliminate double loading and other

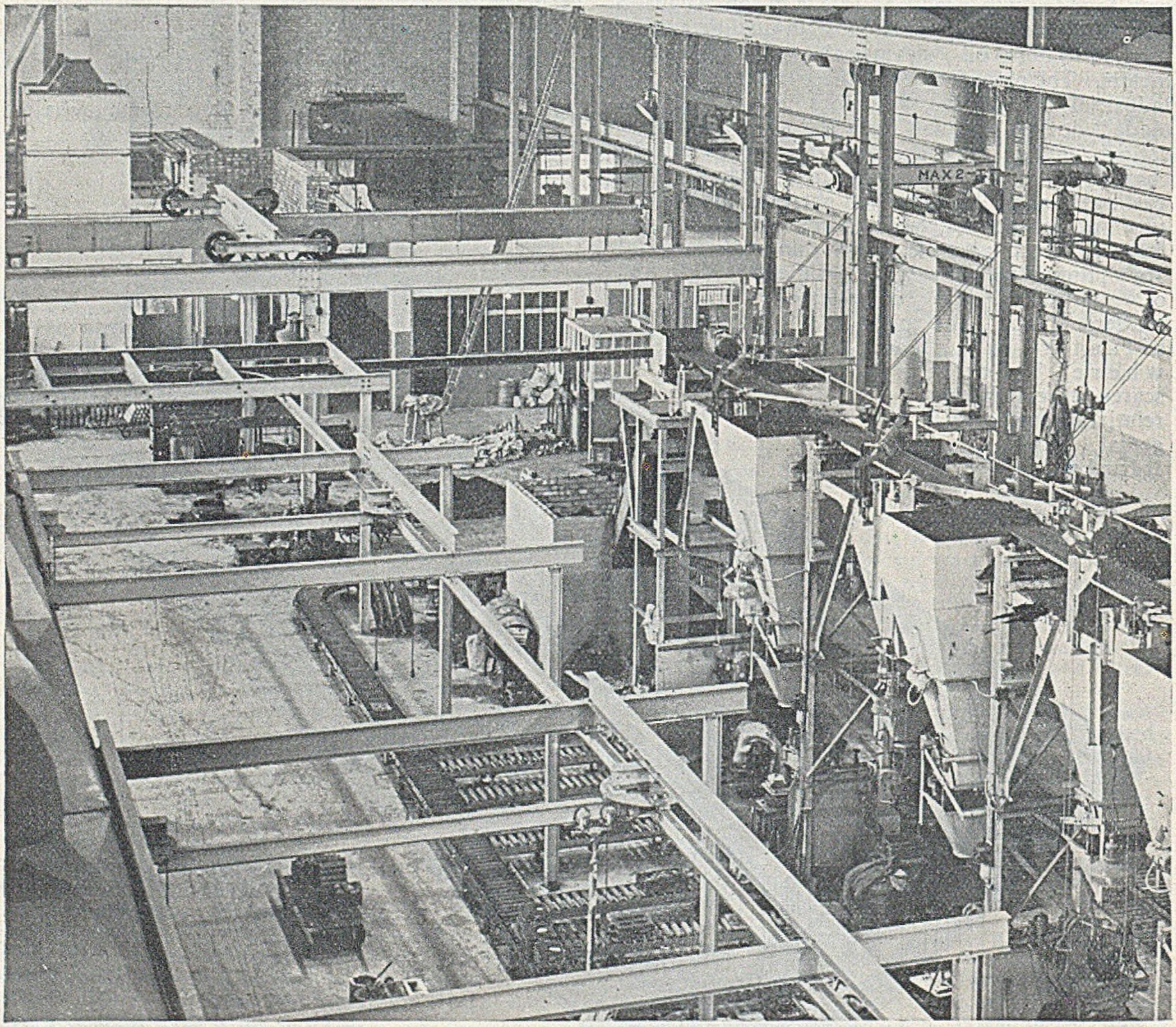

FIG. 2.—*General View, taken from above the Furnaces, of George Kent's New Foundry, from the Sand Mill End, showing the Sand Supply-belt and Ploughing-off Arrangements at each Hopper, as well as the Bin for Floor Moulders' Sand at the end of the Belt. A Vertical Core-oven is visible in the top Left-hand Corner and a Pallet of Metal Ingots is shown in the Left Foreground.*

mistakes on the part of the operator which might damage the plant.

Mixed sand discharged from the mills is received by a Paterson Hughes conveyor belt and delivered into overhead hoppers situated at each of the six moulding machines and also into a bin at floor level, for the use of floor moulders. A gangway beside the belt facilitates maintenance and gives access to the ploughs controlling the supply to each hopper. The belt has a delivery capacity of 15 tons per hour. The moulding machines comprise two models by Stone-Wallwork and four by Eastern & Johnson (Zimmerman type) and are situated inside a continuous loop of Rownson heavy-duty roller track. Moulds are laid down, cored and closed on short lengths of track at right angles to the main loop.

Pouring, Sand Return and Fettling

Pouring is carried out immediately in front of the line of furnaces and, after a cooling period, the moulds are then pushed round to a Sherwen magnetic shake-out supplied by Fraser & Chalmers. Used sand passes through a floor grid, on to an inclined conveyor belt, and after passing a magnetic separator and negotiating a right-angle turn, reaches and discharges through a rotary sieve at high level.

The fettling section is installed immediately adjacent to the shake-out and is equipped with abrasive cutting-off machines and a bandsaw. Two Duplex stand grinders are employed for rough fettling, and shot-blasting is done in a tumbling-type machine made by St. Georges Engineers, Limited, and a cabinet shot-blast plant furnished by Tilghman's Patent Shot-blast Company, Limited. Bench fettling is assisted by pneumatic shipping hammers of various sizes. Finished work and runners are taken away by Ransome fork truck or Collis jack-lift truck and steel pallets.

Other Services

Modern methods are used for coremaking. Resin-bonded cores are blown by two 75-lb. Titan core-blowers and also by cartridge-type blowers (by British Ronceray). "Green" cores are stoved in a vertical continuous conveyor oven made by the Foundry and Engineering Company, Limited. Other cores are hand made in the wooden coreboxes by girl labour. Raw sand for coremaking comes from Maidstone. Eventually, it is intended that all sand-preparation, drying, etc., shall be done on a mezzanine floor over the coreshop, so that supplies can be fed down hoppers to the benches.

Large loam cores are used in some of the larger jobs. These are dried in a large brick-built core oven, heated by a unit supplied by Foundry Refractories, Limited, and temperature control in this oven is by Kent instruments. A rolling-axle bogie runs into the oven, giving very easy handling of the quite heavy weights. This oven is situated outside the main wall and at the end of the floor-moulding section. A two-ton electric and a hand gantry crane serve this area, for assistance with both moulds and cores. The whole foundry is spanned by a 15-ton gantry crane of 57-ft. span. The core shop also caters for some special castings made by core-assembly methods—oil-meter castings, for example.

The quite large output also of aluminium castings are mainly floor moulded. Both bale-out and tilting furnaces are employed for melting this metal; they are oil-fired and of 200-lb. capacity. The oil supply for the furnaces, generally, is contained in two 1,000-gallon underground tanks. It is pumped to two 100-gallon head tanks mounted on the outside wall and thence is gravity fed to the burners. The fire hazard is covered by valves, held open by air pressure. When the foundry shuts off its compressed air, the valves automatically cut off the oil. In an emergency, the whole oil supply is cut off by the operation of one air valve. The general ventilation of the foundry is capable of exhausting 150,000 cub. ft. per min. The output of the foundry is 15 tons per week, in castings weighing from a few ounces to 3,000 lb. Fifteen alloys are used regularly.

Record Production of European Steel

Increased by 9 per cent. in 1952

Crude steel production in Europe (not counting the Soviet Union) established a new record in 1952, exceeding by about 9 per cent. the output of 1951, the previous best year, according to estimates of the Secretariat of the United Nations Economic Commission for Europe (E.C.E.) in Geneva. Total production is put at 73,870,000 metric tons. There were also notable increases in the production of iron ore, pig-iron. and metallurgical coke. The accompanying table gives the E.C.E. estimates of steel production in the chief producing countries, together with the figures for 1951.

Europe's Crude Steel Production (in metric tons)

	1951.	1952.*	1952 as a per cent. of 1951.
	Thous. metric tons.	Thous. metric tons.	Per cent.
Reporting Countries :			
United Kingdom ..	15,889	16,400	103
Western Germany ..	13,506	15,800	117
France	9,835	10,900	111
Belgium	5,091	5,100	100
Italy	3,007	3,500	116
Luxembourg	3,077	3,000	97
Saar	2,603	2,800	108
Sweden	1,525	1,650	108
Austria	1,028	1,060	103
Spain	812	890	110
Netherlands	553	630	114
Others†	1,177	1,240	105
Total	58,103	62,970	108
Other Countries :			
Czechoslovakia	3,312*	3,500	106
Poland	2,792	3,250	116
Eastern Germany ..	1,552	2,000	129
Hungary	1,234*	1,425	115
Rumania	646	725	112
Total	9,536*	10,900	114
TOTAL EUROPE ..	67,639*	73,870	109
U.S.A.	95,437	84,750	89
U.S.S.R.	31,300	35,000	112

* Estimated.

† Countries producing less than 500,000 tons individually *i.e.*, Denmark, Finland, Greece, Trieste, Norway, Switzerland, Turkey, and Yugoslavia.

Fettling-shop Reorganization*

Time-study requested

In 1949, a small group of workers in the foundry dressing-shop of John Harper & Company, Limited, ironfounders and engineers, of Willenhall, Staffordshire, asked to have their jobs time-studied, with a view to being put on an individual incentive payment basis. The men were being paid a collective bonus which, they considered, did not give sufficient personal incentive. The firm agreed. Time-studies were made and the new system of payment introduced. The system was applied gradually, eight men being involved as a first step. The immediate result was an increase in output from these eight men, and the system was extended to the other men in the shop.

Productivity was doubled within two years, and thirty men in the dressing shop were released for other work. The installation of two extra grinding booths and chipping benches brought a further substantial increase in output. To keep pace with the increased productivity of the dressing shop, other operations, chiefly shot-blasting and inspection, had to be speeded up. Time-studies were made in these two sections and individual incentives introduced. The layout was modified to facilitate service to the operatives and two new Wheelabrators were installed in the shot-blasting section. Output per man/hour rose substantially, and a further two men were released for other work. Tables I and II show the considerable increase in productivity which followed the application of time-study, the better utilization of machinery, which was a direct result of the study, and modification of layout.

TABLE I.—*Dressing-shop Modification.*

—	Tons per week.	Men.	Total hours per week.	Cwts. per man/hour.
Mid 1949	150	78	3,232	0.87
,, 1950	155	50	2,200	1.41
,, 1951	157	47	2,068	1.52 }†
1st qtr., 1952 ..	170	48	2,112	1.61
2nd qtr., 1952 ..	210	54	2,376	1.77†

TABLE II.—*Shot-blasting Section Reorganization.*

—	Tons per week.	Men.	Total hours per week.	Cwts. per man/hour.
Mid 1949	150	8	424	7.08
,, 1950	155	7	308	10.06†
,, 1951	157	6	240	13.08†
1st qtr., 1952 ..	170	6	216	15.74
2nd qtr., 1952 ..	210	6	264	15.91

† New incentive introduced.
‡ New equipment introduced.

New Layout

When the reorganization of the dressing-shop, the inspection and shot-blasting sections was complete, the existing method of trucking castings out of the foundry proved to be inadequate to cope with the higher output. Work pans were distributed at night, enabling the night turn to place the previous day's work in them. Trucks arriving in the morning were not kept waiting for complete loads as previously.

The time-study engineers next investigated the moulding sections. Moulders were performing jobs, such as knocking-out moulds and rough chipping—jobs wasteful of their skill. This waste will be entirely eliminated when a new layout, with a rough-dressing section is completed, but as a temporary solution better servicing by night-shift workers has been introduced.

Nineteen men were employed in the grey-iron foundry on the night turn getting up moulds and servicing 17 pneumatic-machine sides, 10 hydraulic-machine sides, and servicing the floor moulders. After time-study, 21 men on the night turn got up the moulds and serviced the moulding sides of 17 pneumatic machines, 95 hydraulic machines, 12 bench moulders and part of the floor section. This extra service to moulders increased production by about 7 per cent.

The Meehanite foundry dressing-shop will cease operating as a separate unit at the firm in about nine months' time. Castings from both the grey-iron and the Meehanite foundries will be processed in the grey-iron dressing-shop. This will free 1,700 sq. yds. of floor space. All this has been made possible because of the greater capacity resulting from the new methods and the individual incentive bonus scheme.

Because of reduction in material handling, there will be a substantial saving in manpower. A fully-mechanized and centralized rubbish-disposal section will also save labour employed on cleaning. There will be a saving in the shot-blasting and dressing sections of about 360 man/hours a week and in labourers' time of about 440 man/hours a week. Many workers displaced from the dressing-shop are being found alternative employment in other foundry sections.

* Abstracted from *Target*.

Use of Indigenous Materials Advocated

When Mr. Duncan Sandys visited the works of Coneygre Foundry, Limited, Mr. John J. Sheehan, the managing director, said in his address of welcome: "Here, in the industrial midlands, we can operate solely or mainly on engineers' by-products—that is, the borings and turnings and also all worn and obsolete machinery—and we would respectfully point out to you, and to your Ministry, that by paying the controlled price of this scrap material we are paying a price which includes transport to places and industries distant from their point of origin. We feel, too, that industry generally, and the country's economy, is best served by using these scrap materials where they arise. You will see in the foundries you visit a variety of products made by a variety of methods using a variety of raw materials—pig-irons of high-, low- and medium-phosphorus—made specially for the iron-foundry industry; we would use less if foundry pig-iron were made more readily available. We use scrap arising from the districts about us:—Scrap steel, scrap iron (general and selected), iron borings, and steel turnings. We are beholden to no particular source for our raw material. There is, however, an overall uniform activity that will impress you. Our furnaces do not just melt, they must be considered now as, essentially, refineries. We refine all this miscellaneous material into a metallurgically and chemically controlled product (cast iron) specified to the rigid physical and chemical requirements of our varied customers. Here in our own foundry—in this one building—through the skill of our workers, metallurgists and technicians, we collect and obtain scrap material to the value of about £6 per ton and convert it into material of value to industry of at least £60 per ton."

THE REV. MAURICE BARNETT, of Eastbrook Hall, Bradford, has been asked by the employees of Jowett Cars, Limited, Idle, Bradford, to take up the position of industrial chaplain.

"Virtue from Necessity"

Mr. D. Graham Bisset's Presidential Address

At the meeting inaugurating the present session of the London branch of the Institute of British Foundrymen, Mr. D. G. Bisset delivered his presidential address in the course of which he said:—

Mr. Beresford and gentlemen,

In my view it is essential to speak, if possible, on a theme of general interest which concerns, or at least should colour our approach to the work of the season now starting.

Such a theme could well be the so-called trade recession which some profess to see coming or are actually experiencing at this moment and we might profitably occupy our thoughts for a little time to-night in considering what our reactions to such an event might be as far as our work is concerned. It might thus be possible to create a virtue out of necessity.

A trade recession does not necessarily mean that there is no work to be had and that there is nothing we can do about it. It may more probably be not so much a recession as a change-over from one condition of economic affairs to another which I believe is what is happening now. Such a change surely means a change in outlook of the foundryman. Habits of mind, methods of production, cupola practice, etc., that have served well in the past can no longer be allowed to continue as a matter of custom. All those concerned in these processes must waken up to the possibility that perhaps their methods may not be as up-to-date or as efficient as they may think and that, in consequence, they may begin to lose work to more progressive and actively minded foundrymen who are continually striving to improve by all methods open to them.

Many if not most of the very large firms make it their business to take fullest advantage of all modern trends of thought and have the financial resources to put them into practice. But, after all, such foundries by no means comprise even the bulk of the industry and they are nearly always ready to pass on to the smaller foundries who comprise by far the greater number of foundries in the country, the lessons they have learned from their own trials and errors.

Using Information Available

This information is passed on at meetings such as we, in this and all the other Institute branches, hold during each season. That is precisely the "*raison d'être*" of our existence.

Such information being freely offered in lectures and as freely in print, it behoves all of us to take full advantage of it and to apply it in our own shops as far as we can apply it. I am convinced that every foundry in the branch can improve its technique somewhere and thereby improve its efficiency thus justifying its right to exist. I say therefore that our meetings should be the forum where members should be forever seeking knowledge from those who have it to give and who are able and willing to give it. It is a short-sighted policy not to come to a meeting because you think it can hold no interest for you. Something may be said, something may crop up that bears directly on a problem of your own. All you need therefore is the frankness to recognize that you may be on the wrong track in your methods and that the other fellow is on the right one. What is necessary then is the determination to put into effect the lesson you have learned to see for yourself how it goes.

I can hear some of the moulder members saying "that's all very well, but if I were to go to my Governor and tell him our methods might be improved, I know what he would say." If the "Governor" has a modicum of commonsense he will be highly gratified that one of his men is obviously taking a keen interest in his job. He will discuss your suggestion with you. If it is a good suggestion something will happen and progress will be made. If he doesn't do any of these things then there is little hope for him. No intelligent and progressive man will stay with him, and it would not be difficult to say where his business will finish up. Such employers however must be in a very small minority.

Value of Change

This matter of "change of approach" or "change of action" is always an extremely difficult thing to do when it means putting in that little bit extra which we have got out of the way of doing. For the past decade we have, so to speak, been on the crest of the wave. We have all had plenty of work and our concern was not how to get more but how to stop it from coming in cluttering up our order books and our pattern stores. The inevitable result has been a tendency to take things for granted; to lose, to some extent, the urge to go out and keep in close touch with customers. Now that necessity is returning and the "change of action" is going to be very difficult to make, especially as those who must make it are all ten years older than they were.

Men on the shop floor are no less affected by any such change. Jobs are no longer lined up waiting to be made and the change, it seems to me, must be towards giving greater thought and intelligent work to make our ultimate products cheaper and quicker with no loss of quality, to enable us to hold our own against foreign competition. The Institute exists to propagate scientific and technical foundry knowledge as it affects everyday foundry practice amongst its members.

One of the changes necessary is that the practical foundryman, *i.e.* the man who has served his time at the trade and has worked for years as a journey-

Virtue from Necessity

man or a foreman must realize that he is not the only pebble on the beach. The days when we mixed metal by fracture only and prepared moulding sand by "feel" are no longer good enough. We now have metallurgists, chemists and foundry engineers and practical foundrymen must co-operate closely and intelligently with these specialists.

Because a man has not served his time and worked as a journeyman moulder in a foundry, he should not be deemed unfit to advise on any aspects of everyday foundry problems.

On the other hand, the specialists, if they are ever tempted to think of the moulder as being something beneath their notice and in consequence treat the man as if he knew little or nothing about his business, then they are even more guilty of an injustice, as they have every reason to know better. The attitude of mind of "I know better than you" must be changed to "where can we go together." Branch meetings are the very places where the fallacy of such an attitude of mind is exposed and its work is invaluable even if it does nothing else than to make abundantly clear to everyone that the foundry industry is one of great complexity where the different branches have great need of each other and where the utmost co-ordination of effort and honest co-operation is a pre-requisite to the successful running of an industry.

Research on every aspect of our industry is going ahead, not only in our country, but in every engineering country in the world to-day. As an exporting country our need to apply the results of research is probably more urgent than in any other country, and one of the most potent means of passing knowledge to the general rank and file, so to speak, of our industry is through the Institute.

Attendance at Meetings

I sometimes wonder whether we, in the London branch, get the maximum benefit from our meetings. I am told we have approximately 779 members. We are even bigger than the biggest Chapter in the American Foundrymen's Society. However, does mere size mean anything worth while? To judge by the average attendance only a minority of our 779 attend meetings. It cannot be that the fare provided is not good fare. Great care is taken to see that it is the best we can get. May it be that mere size might be a disadvantage? To attend these meetings, members must travel very long distances and, what is worse, must go back again late in the evening which can be extremely inconvenient and fatiguing and not conducive to a prompt start the next morning. I wonder if a degree of de-centralization might be a good thing. It might be the means of getting more intimate discussion on any chosen subject with the men in the pattern shops and the foundries with more positive results more quickly. Probably this idea has been considered before and turned-down, but anything which will enable more members to attend meetings and to take an active part in them must be for the good of the industry and the Institute.

Publications Received

Class Rates Section of Standard Charges (6 to 750 miles). Published by The Railway and Shipping Publishing Company, Limited, 12, Cherry Street, Birmingham 2. Price 10s.

This 30-page pamphlet is a ready-reckoner for assessing the cost of goods entering either 1 to 21 or in other cases 11 to 20. Its usefulness to concerns dispatching goods by rail is obvious.

The Iron and Steel Trades in 1952. Issued by William Jacks & Company, Limited, Winchester House, Old Broad Street, London, E.C.2.

This review, as would be expected, is mainly concerned with the bill to denationalize the iron and steel industries, and somewhat surprisingly omits to mention ironfounding. Although it relates only to the first three quarters of the year, the review makes interesting reading for foundry owners, as the main items of the bill are properly stressed.

The Engineering Properties and Applications of Spheroidal-graphite Cast Iron, by A. B. Everest, Ph.D. Issued by the Mond Nickel Company, Limited, Sunderland House, Curzon Street, London, W.1.

This is a reprint of a Paper which Dr. Everest gave to the 4th International Mechanical Engineering Congress at Stockholm. Dr. Everest has as usual written a very interesting Paper, and has drawn on the whole of Europe for his matter. The lines are rather lengthy which makes reading just a little difficult. The properties of the alloy are well authenticated by illustrations, graphs and tables even down to the Steinmetz factor.

Silicosis Risks in Steel Foundries, by J. L. Garthwaite, F.C.I.I. A reprint from the Journal of the Chartered Insurance Institute, The Hall, 20, Aldermanbury, London, E.C.2, price 2s. net.

The pamphlet opens with a layman's description of steelfoundry practice. It is not too bad. There is a basic and fundamental mistake in telling readers that steelfounders use sand as an abrasive. Another refers to sand-blasting instead of shot-blasting throughout the pamphlet. Yet this does not detract the message of the booklet, which is a study of Franklin *v.* Gramophone Company, Limited, and is of great import to all steelfounders. It would appear that the findings in this case will have profound repercussion in future litigation on pneumoconiosis claims, and the reviewer recommends that all steelfounders should read this 52-page pamphlet.

The Nationalized Industries. A survey and recommendations by S. J. L. Hardie, D.S.O., LL.D.

This important document could have been improved by passing through the hands of a competent journalist, for at the moment the too-frequent use of the first person pronoun makes tiresome reading. The basis of the author's arguments seem to be reliance on experts for deciding whether or not an industry should or should not be nationalized and when they have been taken over these same experts should be responsible for their conduct. Evidently the author has profound regard for expert people, but not being fallible—as was so in the case of ground nuts and shell eggs—it is the man in the street and not the investor who foots the bill. Still it is quite interesting to have the views of one so experienced in administration and finance as the author.

Ferrous Metals and World Markets

Review of Last Year's Trends

Although it may be premature to suggest that a world slump is approaching, it is generally agreed that an era of keener competition is at hand. Since the end of the war we have been living under conditions of full employment, and until recently a seller's market. Conditions are now changing. Import restrictions imposed by foreign and Commonwealth countries have placed limitations upon the volume of British exports during the past year. These, of course, may be withdrawn as quickly as they were imposed.

What the world needs is a vigorous assault on trade barriers, a campaign for the liberation of commerce from restriction. This, it is hoped, will be the principal outcome of the Commonwealth conference, whose deliberations have recently ended.

What Britain needs is a renewal of confidence; a modification of a system of taxation which stifles enterprise and discourages initiative.

Development

In that belief, the British ferrous metals industry has nailed its colours to the mast. Before the first post-war development plan has been completed, a second five-year plan is in process of preparation, with the object of raising the steel output to 20,000,000 tons per annum. The cost of the scheme is estimated to be in the region of £60,000,000 per annum, of which sum it is thought that about 50 per cent. could be provided out of the resources of the industry. Its achievement will necessitate the expansion of pig-iron production to an annual rate of 15,000,000 tons and calls for the construction of 15 new blast furnaces each with an annual capacity of 250,000-300,000 tons. The scheme also calls for a considerable long-term policy in the development of ore supplies and ore transport. New orefields are being developed; others are in process of exploration, and a fleet of special ore carriers is being built in which the steel companies will have a financial interest of 49 per cent.

Further expansion of pig-iron production will also depend upon the availability of sufficient coking coal and coking plant. Many new batteries of coke ovens are being built and one of the most important conditions of the whole plan is that the National Coal Board will be able to provide an extra 7,000,000 tons of coking coal for the steel industry. Unfortunately, the reserves of coking coal in this country are diminishing very rapidly and the possibilities of producing a satisfactory coke for blast-furnace use from a blend of other grades of coal are now being examined.

The provision of transport facilities is also under review. The steel industry is by far the biggest user of rail transport and the provision of an extra 4,000,000 tons of steel per annum will involve the movement of approximately 24,000,000 tons of additional raw materials. Obviously the development of rail transport, and particularly the provision of extra mineral wagons, will have to keep pace with industrial requirements.

Production

Recognizing the improbability of expanding the imports of foreign scrap to any appreciable extent, and also the high cost thereof, steelmakers have been concentrating upon the production of more pig-iron. During the year, six new blast furnaces of high capacity were brought into production and two more are almost ready for operation. More pig-iron and less scrap is being used in the steel furnaces and this trend will continue as the reconstruction plans are advanced towards completion. Aggregate output of pig-iron for the past year will probably exceed that of 1951 by about 900,000 tons and the ultimate targets fixed for the industry are 15,000,000 tons of pig-iron and 20,000,000 tons of steel. Obviously the attainment of these targets will not be speedily accomplished. Moreover, the cost of the new plant will be colossal.

Rationed Steel

Inherent in any attempt to forecast the extent of the demand for iron and steel—or for that matter of any other manufactured commodity—is the possibility of a wide margin of error. Moreover, the whole trend of recent legislation and taxation has been to discourage risk and encourage the quest for financial and social security. To contemplate the fabulous capital expenditures required calls for courage and confidence in the capacity of British industry to cope successfully with intense world competition. That courage and confidence is not lacking. Faith in the vast programme of expansion is fortified by the clear evidence of the crippling effects upon British industry which have been imposed by the shortage of iron and steel.

Motor manufacturers, founders, shipbuilders, and engineers have figured conspicuously in the list of users much affected by the national shortage of steel products. Production has been slowed down, and in some instances workers have been laid idle through lack of steel. There is a substantial weight of evidence to support the contention that deliveries were unduly restricted. The fact is incontrovertible that in recent months, when many users were starving for steel, stocks at the producing plants have been steadily mounting.

Easier conditions are now seen to be developing. Many industries which encountered acute difficulties in obtaining steel earlier in the year are now obtaining more adequate supplies. Allocations for the first quarter of 1953 have been increased, and in view of the changed circumstances, and the comparative inflexibility of an allocation scheme which is based on past performance rather than on present needs, many sections of the industry now

Ferrous Metals and World Markets

feel that there is good reason for ending or substantially modifying the whole system.

Perhaps the balance between supply and demand is still too precarious to justify immediate and drastic action, but the time is obviously approaching when the scheme should be reconsidered with the assurance that every expansion of production brings nearer the day of complete liberation.

Raw Materials

Of the various contributory factors in this brightening outlook undoubtedly the most decisive is the steady improvement in the flow of the essential raw materials for iron and steel production. This winter, for the first time for several years, industry has been spared the crippling effects of a fuel crisis. The severe weather in November led to encroachments upon winter coal stocks somewhat earlier than usual, but, unless the weather is quite exceptional, it is believed that fuel reserves are adequate to sustain full-scale production until the spring. There remain, however, long-term problems which have yet to be solved.

Britain's reserves of high-grade coking coal are rapidly diminishing. On the other hand, it has been estimated that an extra 7,000,000 tons of coke per annum will be required to ensure fulfilment of programmes to raise the outputs of pig-iron and steel to 15,000,000 tons and 20,000,000 tons respectively, as is proposed in the second five-year development plan. To expand the production of coking coal to this extent is probably beyond the capacity of the National Coal Board, and even if this could be accomplished it must inevitably bring nearer the exhaustion of available supplies.

There are possibilities that some of the need may be met by blended coal, and various expedients of this description are under close examination. It has also been suggested that other coke consumers might cover their requirements by the substitution of other forms of hard fuel, in order that blast-furnacemen's needs can be satisfied. But, in either event, more large-scale coke-oven installations have become a necessity and erection of these ancillaries will have to keep pace with the construction of new blast-furnaces.

Iron Ore

An industry which in the past year has consumed a weekly average of 500,000 tons of iron ore, and estimates that this figure will be substantially increased in the year ahead, can never be wholly complacent about the mobilization of these large tonnages.

A year ago the withdrawal of ore carriers to bring in foreign coal was a profoundly disturbing factor. Not only were ore freight rates raised to fantastic heights, but there was an actual shortage of transport, which had serious repercussions in the iron trade. In the earlier post-war period freights were nearly 600 per cent. over the pre-war figure, and special financial arrangements were introduced to relieve the excessive burden upon the blast-furnacemen. Since 1950, however, assistance on imported ore costs has been largely withdrawn and the full cost of foreign ore borne by the users in this country.

The total ore consumption in the British blast furnaces during the past 12 months has amounted to about 25,500,000 tons. Of this aggregate tonnage about 16,000,000 tons were home produced and 9,500,000 tons imported. In terms of iron content this means that our total ore requirements have been satisfied in approximately equal proportions from home and oversea sources. But it is obvious that very much bigger tonnages will be required in the near future. To provide for the new blast furnaces recently brought into operation or approaching completion, the industry is buying extra tonnages of foreign ore for consumption in 1953, and has prepared plans for an additional 1,250,000 tons in home ore usage.

Nor is this the end. With the continued expansion of blast-furnace capacity, which is an essential feature of the next five-year plan, iron-ore requirements will rise still further in the next quinquennium.

There are ample reserves of home ores—chiefly in the Midlands—and it is believed to be possible to expand home ore supplies to a limit of about 20,000,000 tons a year, at which rate of output the life of the main British orefields is estimated at not less than 100 to 200 years.

New Sources of Supply

So far as foreign ore supplies are concerned, it may be noted that large extensions of production are being planned in the principal orefields and, in addition, new sources of supply are being developed. Perhaps the most spectacular are the American enterprises in Labrador and Quebec. Increased supplies are also expected from Venezuela and Liberia, while the British-French enterprise in Conakry has been brought to the stage of actual production, and further developments are planned in Mauretania.

It would appear that, for the immediate future, the supply of adequate tonnages of iron ore is reasonably secure, though there is still much work to be done in the improvement of the facilities for the preparation of ores for blast-furnace use by crushing, screening, and sintering.

Dearth of Scrap

Of all the difficulties and embarrassments encountered by British steelmakers during the past two years the most intractable has been the dearth of scrap. In the last two years of the half century ferrous scrap imports were running at the rate of 2,000,000 tons per annum; in 1951 the imported tonnage fell short of 600,000 tons and was only about 100,000 tons better in the past 12 months. Moreover, even this reduced intake was only sustained by the payment of prices nearly four times the maximum figure paid for home scrap.

Although a severe shrinkage was foreseen to be the inevitable consequence of the consumption of war scrap which had previously been obtainable in abundance, the consequences were calamitous. The lack of scrap has been the principal cause of the failure of the steelmakers to match their output to the rising industrial demand. For a time they managed to rub along by raiding their own stocks, but this was a process which could not be continued indefinitely, and in the spring of the year these stocks had fallen to the equivalent of little more than a week's normal consumption. Eventually the steelmakers had to curtail their operations. Many steel furnaces were laid idle; at others the working week was curtailed.

Consequences still more dire were only averted by the vigorous scrap drives instituted by the British Iron and Steel Federation and the National Federation of Iron, Steel and Metal Merchants, and actively supported by the Ministry of Supply. Partly as a result of these drives and partly because of an improvement in foreign supplies coupled with an increased burden of ore in the furnaces, the outlook for scrap supplies in 1953 shows a distinct improvement.

Imports and Exports

Upon the volume of the import and export trade in iron and steel the most decisive influence has been exercised by the prevailing shortage of home supplies and, to a lesser extent, by the growing tendency of foreign countries and Commonwealth States alike to protect their external credits by means of import restrictions. Normally, Great Britain has a substantial disposable surplus. In 1950, for example, the volume of our iron and steel exports was more than four times that of our imports, and in the following year the respective tonnages were:—Exports, 2,683,000 tons; imports, 885,100 tons. Such, however, have been the distortions of trade during the past year that, for the first time since 1931—apart from the war years—arrivals of foreign iron and steel in British ports in 1952 have slightly exceeded the total volume of exports.

The effect upon our own external balance has been disastrous. At a time when plans for economic recovery were primarily based upon a vigorous drive for the expansion of oversea trade, we have had to cut steel exports and resort to the purchase of almost unprecedented tonnages of foreign material at famine prices, which have played havoc with our slender dollar reserves and external balances. Resort to the expedient of buying a million tons of steel from the U.S.A. and still bigger tonnages elsewhere represented the lesser of two evils. Only by these overseas purchases was it possible to avert a serious blow to many vital branches of British industry. We have paid a heavy penalty for being caught short, and we must continue to pay until the economic balance of the steel industry recovers its equilibrium.

Price Movements

Since 1950, when a subsidiary of the British Iron and Steel Corporation was entrusted with the responsibility of the bulk purchase and transportation of foreign ores, it had been the practice to supply blast-furnacemen with this material at prices far below the actual cost, and to recover the consequent deficiency by means of a voluntary levy upon all the steel companies irrespective of whether they used home or imported ores. This is one of the complexities which has now been ironed out. On October 13 pig-iron prices were advanced 10s. to 50s. 6d. per ton, according to quality, and from the same date the corporation was authorized to charge for imported ore on a basis "more nearly approaching the true cost of purchase and transportation," the levy on steel being at the same time correspondingly reduced.

Under the new arrangement, which was really a simplification of the former system, a definite exception was made in favour of foundry iron produced from home ores. For this grade the fixed price remained unchanged and it has since been stated that, in consequence, 60 per cent. of the pig-iron used in the foundries escapes any extra impost. These, with a few trifling exceptions, are the only changes which have been made during the past year. Figures published by the British Iron and Steel Federation, reveal that for nearly every classification of steel products British prices remain substantially below world levels.

Fight for Markets

It may reasonably be assumed that, as home production expands, the volume of imports will be gradually reduced. Recovery of the export trade may be the more difficult task. But the outlook, if uncertain, is not wholly discouraging. Competition is certainly becoming keener. The principal producing countries all have in hand extensive programmes for the expansion of production. The United States, whose output of ingots is already running at the rate of over 100,000,000 tons per annum, projects a capital investment programme to increase capacity by 20 per cent. Western German steel production has already almost overtaken that of the U.K. and has a target figure of 20,000,000 tons per annum, and all the member States of the European coal-steel pool have also big expansionist schemes in hand. Perhaps redundancy is no more than a distant shadow. No doubt the Korean war, and the various national schemes of rearmament, have swollen the immediate demand for steel. Whether the world demand for steel will be sustained if these artificial stimuli have been withdrawn is a matter for conjecture.

Civilization is at the cross-roads. The choice is between peaceful co-operation or conflict. If the right choice be made few will doubt the speedy resurgence of the forces of economic recovery. There are limitless tasks for humanity in the development of the resources of the nations already industrialized and still more in the vaster undeveloped spaces, where social unrest and rebellion are the first symptoms of a universal aspiration for a more satisfying standard of life.

If it be permitted to mature, the world demand for ferrous products promises still more rapid expansion in the future than in the past, and the re-equipment of the British steel industry at fabulous cost may be converted from a bold adventure to an abundantly vindicated enterprise.

Notes from the Branches

Scottish—Falkirk Section

The Falkirk section of the Scottish branch of the Institute of British Foundrymen at their November meeting heard an interesting paper, illustrated throughout with slides, and read by Mr. H. P. Hughes, technical representative of the British Electro Metallurgical Company, Limited, Sheffield.

The title of his Paper was "Controlling the Structure and Composition of Cast Iron by the use of Ferro-alloys." Mr. Hughes dealt with the common alloying elements, silicon, manganese, and chromium, and illustrated how the judicious use of these elements could improve the microstructure and physical properties of cast iron. He also pointed out the advantages to be gained from running one quality of iron and innoculating that iron at the cupola spout, by means of alloy additions, for particular jobs which might have to be made to certain specifications. This method would also eliminate the possibility of certain jobs not being ready to cast when the metal was available, thus necessitating a close-down of the cupola until the job was prepared.

Mr. Hughes concluded by describing a few alloy cast irons of the abrasion and heat-resisting types, and indicated the methods employed in their manufacture.

Taper-flask Standards Proposed for Sweden

Following upon the issue of the British Standard Specification for a range of moulding boxes comes the news that the box standardization committee of the Foundry Division of the Swedish Federation of Mechanical Engineering Industries has now presented a proposal for the standardization of taper-flasks. Only one type of flask is to be standardized, *viz*. light-metal taper-flasks with the sides inclined 40 deg. The length and width of the standardized taper flasks are in complete agreement with the Swedish standard for ordinary moulding boxes, with the exception that the taper-flask range has been extended down to smaller sizes. The proposed pins are of approximately the same design as in the existing standard for fixed boxes. When drawing and closing is done by hand, open guides are used, otherwise the usual round and elongated bushings are inserted. A proposal for the standardization of jackets and weights will soon be published. A quite lengthy account of the new recommendations is printed and illustrated in a recent issue of *Gjuteriet*, the journal of the Swedish foundry industry.

Nickel Price Increase.—The Mond Nickel Company, Limited, announces that, following the announcement in Canada by The International Nickel Company of Canada Limited, of an increase in the price of nickel, effective from January 14, it is from the same date raising the price for refined nickel in the United Kingdom to £483 per ton delivered, with appropriate increases for other countries.

Joint investigations have been started by the British Thomson-Houston Company, Limited, and the Anglo-Saxon Petroleum Company into the production of a projected gas-turbine-driven tanker. The vessel will be fitted with two gas-turbine engines, each capable of developing 4,150 h.p., and driving a single propeller shaft.

National Insurance for Students and Unpaid Apprentices

Students and unpaid apprentices who have had less than 26 weeks of paid employment, exclusive of National Service, before they start their course will find it easier to qualify for unemployment and sickness benefits after the end of their course. Under new regulations* made by the Minister of National Insurance, Mr. Osbert Peake, which came into force January 19, 1953, contributions will be credited to them for this purpose for periods of full-time education and full-time unpaid apprenticeship.

This means that if benefit is claimed after the end of the course and the first contribution condition for sickness and unemployment benefits is satisfied (*i.e.*, 26 employed persons contributions have been paid), the special credits awarded during their course will help them to satisfy the second contribution condition for these benefits. The second contribution condition is that for the full rate benefit to be paid, at least 50 contributions have been paid or credited in the previous contribution year: where fewer than 50, but at least 26, contributions have been paid or credited, benefit can be paid at a reduced rate. The regulations also apply, but for sickness benefit only, to students and unpaid apprentices who complete the payment of 26 self-employed contributions after starting their course.

* National Insurance (Contributions) Amendment (No. 2) Regulations, 1952. S.I. 1952, No. 2135, price 2d.

Foundry of Antiquarian Interest

The Old Swan Foundry in the village of Langley, near Stratford-on-Avon, has recently been visited by the curator of the Reading University, Museum of English Rural Life, who is interested in obtaining some of the ancient cogs, wheels and ploughshares. This old iron-foundry, which has been in the hands of the same family for over 200 years, is still making ploughs and agricultural implements of a pattern made 150 years ago. Warwickshire County Council has acquired from it some specimens of such implements and intends to acquire more.

The Old Swan Foundry originated from the industry of charcoal burners and smelters and was transferred to its present site in the 1790s to be nearer to the charcoal of Bearley Woods. Its success followed rapidly on the invention of the Troth plough which has an iron ploughshare, with wood for the body of the plough. The present owner is Mr. W. J. Hillson, a direct descendant of the Troth family. His great-grandfather, who died in 1851 at the age of 95, made the first barley piler in the world. It is recorded that he bought his pig-iron from Swedish traders at the country fairs.

Conferences on Continuous Casting and Deep Drawing. The Department of Industrial Metallurgy, University of Birmingham, is arranging its annual two-day conference this year on Monday and Tuesday, March 16 and 17. The subjects will be "The Deep Drawing of Metals" and "Continuous Casting of Ingots." Full details of the programme may be obtained from the secretary of the Department, the University, Edgbaston, Birmingham, 15. No fees are chargeable for the attendance but registration is required.

Personal

Mr. C. H. de Nordwall, M.I.E.E., has been appointed manager for South America of Metropolitan-Vickers Electrical Export Company, Limited, from January 1.

Mr. C. H. Kain, F.I.M., of Lake & Elliot, Limited, Braintree, left this country last Monday for a business trip covering the Carribean area. He will be absent about six weeks.

J. D. F. Yuille has resigned the honorary secretaryship of the West Wales section of the Institute of British Foundrymen, as he is taking an appointment as foundry manager with a firm in Ontario, Canada.

Dr. Thomas E. Allibone, F.R.S., has been appointed to the Board of the Edison Swan Electric Company, Limited, in the capacity of director of research. Dr. Allibone will, of course, retain his position as director of the A.E.I. research laboratory at Aldermaston.

Mr. D. K. Coutts has joined the staff of the Mond Nickel Company, Limited, research and development department, and will operate from their Bombay office. He was previously chief metallurgist at the Kulti (Bengal) works of the Indian Iron & Steel Company.

Dr. R. Baulk, who was recently seconded to the Department of Fuel Technology at Sheffield University under Professor R. J. Sarjant, has been appointed Fuel Research Officer for Samuel Fox and Company, Limited, Stocksbridge, a branch of United Steel Companies, Limited.

Mr. George Wallwork has resigned from the board of directors of Henry Wallwork & Company, Limited, Redbank, Manchester, 4, after nearly 50 years' association with the company. Mr. Michael Wallwork has been appointed managing director, and Mr. Basil Wallwork has been elected to the board as sales director.

Mr. Hugh Fulton, managing director of Albion Motors, Limited, has left Glasgow by air for South Africa on a four-week visit "to get orders." The company are at present laying out extensions to their plant to cope with big Ministry of Supply contracts. This new section, due to be in production this Spring, will give work to some 600 men.

Mr. Guy Chantrey, chairman of the Birmingham and West Midlands branch of the Institute of Directors, leaves London on January 26 for Karachi, on a visit that will embrace eight countries, including America. Mr. Chantrey is anxious to see for himself how far Japanese competition is affecting the sale of products in which he is interested.

Mr. W. W. Foster, general works manager of Fort Dunlop, is to retire at the end of January owing to ill health, it was announced on January 15. He will remain available for consultation. He is succeeded as works manager by Mr. E. E. Quinton, who was works director for the Dunlop organization in South Africa before going to Speke, Liverpool, as general works manager in 1949.

The retirement took place last Saturday of Mr. J. R. Court and Mr. Aaron Hall, of Prince-Smith and Stells, Limited, textile-machinery manufacturers, Keighley, who have both given long service to the firm. In the presence of all the directors, a pleasant ceremony took place in the works offices, when the chairman of directors, Mr. D. Waterhouse, presented a fireside chair to Mr. Court and a watch and chain to Mr. Hall.

Mr. Matthew Kernahan, who retired from the service of Shanks & Company, Limited, Barrhead, after 56 years with the company, was honoured in Glasgow by directors, branch managers and senior staff, presided over by Mr. W. G. Scott, secretary of the firm. Mr. Kernahan was chief of the "home" department and representative of the company in Edinburgh. Mr. R. F. Campbell, export manager, presented him with a television set.

At the annual meeting of the Derby district Association of the Engineering and Allies Employers' National Federation, held last week, Mr. H. R. Newman, general manager of the Butterley Company, Limited, was appointed president. Mr. R. H. Buckland, director and works manager of Ley's Malleable Castings Company, Limited, Derby, had formerly held the office for two years. Mr. H. Clarke, works manager of Qualcast, Limited, Derby, was appointed senior-vice-president, and Mr. R. H. Weston, works manager, Aiton and Company, Limited, Stores Road, Derby, was appointed junior vice-president.

Metropolitan - Vickers Electrical Company, Limited, announces that Professor Willis Jackson, D.Sc., D.Phil., M.I.E.E., has accepted the full-time appointment with them of director of research and education of that company as from July 1 next. The appointment carries with it a seat on the Board of the company. Professor Jackson is Professor of Electrical Engineering at The Imperial College of Science & Technology of the University of London. The present director of research and education is Dr. C. Dannatt. Professor Jackson's appointment will release Dr. Dannatt for an extension of his present duties as assistant managing director.

Obituary

Mr. Walter Thomas Wales, managing director of Aldam & Company, Limited, iron and brass founders, Misterton, Yorks, has died suddenly at his home in Misterton, at the age of 55.

Mr. Alexander Anderson, of Falkirk, who has died at the age of 87, was for 28 years blast-furnace manager with the Carron Company. He was formerly employed at Dalmellington Iron Works.

Sir James Weir French, who died on January 14 at his home in Glasgow, at the age of 76, was a well-known personality in the industrial and cultural life of the West of Scotland for more than 25 years. He was educated at Glasgow University and the Royal Technical College, Glasgow, and pursued his post-graduate studies on the Continent. His promotion in the Glasgow firm of Barr & Stroud, Limited, was rapid and he did much to extend its ramifications. He held many patents in the field of range and height finders, submarine periscopes, gunnery, fire control, both surface and anti-submarine, aeroplane, and other devices. He succeeded Dr. Barr as vice-chairman of the firm and some years later became chairman in succession to the late Dr. Stroud. He was the author of several technical books and, in his younger days, a frequent contributor to the technical Press.

Correction. In the issue of the Journal of January 15, 1953, reference was made in the "News in Brief" column to presentation of gold watches to old employees of Glanmôr Foundry Company, Limited, in which reference was made to Lt.-Col. H. C. R. Thomas as being one of the ten recipients. This should read Lt.-Col. H. C. R. Thompson, and he should not have been included among the recipients of long-service gold watches. He was separately honoured with a special presentation in recognition of his services to the Company as Chairman over many years.

News in Brief

THE AMERICAN FOUNDRYMEN'S SOCIETY convention this year is to be held in Chicago from May 4 to 8. There will be no exhibition.

C. MACKECHNIE JARVIS & PARTNERS, consulting engineers, have removed from 26, Victoria Street, to 53, Victoria Street, Westminster, S.W.1

MR. DUNCAN SANDYS, the Minister of Supply, was present at the annual presentation of prizes to apprentices, at the Royal Ordnance Factory, Radway Green.

THE BRITISH STANDARDS INSTITUTION announces that it will move at the end of next summer into a single, self-contained office block at 2, Park Street, Mayfair.

TOWN PLANNING APPROVAL has been given by Coatbridge Town Council for extensions to Whifflet Foundry, which, it is stated, will give employment to a further 500 men.

MEMBERS ELIGIBLE for the students' grant of the Institute of British Foundrymen are reminded that applications should be in the hands of the secretary not later than March 31.

THE AMERICAN OUTPUT of ferrous castings last year was of the order of 16,500,000 short tons as against 19,000,000 tons in 1951. The potential demand in 1975 will be of about 29 million tons according to a Government forecast.

THE OIL TANKER British Fusilier (4,101 tons) has arrived in the Gareloch from Falmouth to be broken up at Faslane by Metal Industries, Limited. The vessel was built at Newcastle in 1923 for the British Tanker Company, Limited.

THE COUNCIL of the Institution of Mechanical Engineers has awarded the James Watt International Medal for 1953 to SIR HARRY RICARDO, F.R.S., for his contribution to the knowledge of the fundamental principles of internal combustion engines.

SIX HUNDRED WORKERS in two Falkirk foundries have gone on a four-day week because of "a general recession in trade." An official of the Amalgamated Union of Foundry Workers said in Falkirk that the position locally was "very grim indeed."

THE NEW WELFARE CLUB of International Combustion Limited, at "Park Hill," Browning Street, Derby, was opened on January 10 by Mrs. F. G. Penny, wife of the managing director. The new club includes concert room, billiards room, lounge, and bar.

ABOUT 360 MEMBERS and guests attended the dinner and dance of the Midland branch of the Institute of Metal Finishing at the Grand Hotel, Birmingham, on January 15. Mr. W. F. B. Baker, chairman, presided and Mr. H. Silman, national president, was present.

THE ANNUAL STATEMENT issued by Dorman, Long & Company, Limited, to its staff for 1952, describes the progress made with the Lackenby project, which includes a steel works capable of producing 500,000 tons of ingots a year. It will be some time yet before the works are in operation.

MARGATE COUNCIL have agreed to pay £500 or 25 per cent. of the cost, whichever was the less, towards the cost of laying a six-inch gas main to the Westwood Industrial site for the Emco Brass Manufacturing Company, Limited, who are shortly to build a factory and foundry on the site.

IT WAS ANNOUNCED at the ninth annual luncheon of the British Industrial Measuring and Control Apparatus Manufacturers' Association held at Brown's Hotel, London, on January 13, that they are organizing an exhibition to be held at Olympia (The Second British Instrument Industries Exhibition) from June 30 to July 11 next.

BEAMS FALLING from the roof damaged machinery during a fire on January 13 in a Glasgow foundry at Townmill Road. Part of the roof was burned out and one of the foundry shops extensively damaged. An official said that the break in production would only be of a very temporary nature. The foundry is operated by J. R. McKellar, Limited.

JOSEPH LUCAS INDUSTRIES LIMITED, Birmingham, has announced that, after consultation with trade unions, it has been agreed that the works shall transfer the usual two-day break at Whitsuntide to the Coronation holiday. Four thousand employees at the Bilston factories of John Thompson, Limited, will work through Whitsuntide, and have a holiday from May 29 to June 4.

LISTENERS to the B.B.C. "Home Service" programme to-night at 9.15 p.m. will hear, in the feature "Taking Stock," a discussion on "price rings" and their effect on industry and labour, introduced by William Pickles. It is understood that Mr. W. T. Wren, director of Allied Ironfounders, Limited, will participate, and that the Purchasing Officers' Association has taken a prominent part in organizing the broadcast.

A FOUNDRY LABOURER had his right leg amputated on January 15 after an accident in the foundry yard of Miller & Company, Limited, engineers, etc., London Road, Edinburgh. The man, Thomas Linn, was arranging scrap metal so that it could be smashed by a crane-operated steel ball, weighing a ton and a half, when the ball, which was about 4 ft. above the ground, fell and pinned him by the leg.

THIS YEAR marks the 21st anniversary of the formation of Foundry Services Limited, of Birmingham. The company was formed in 1932 with a staff of five and has now grown until to-day there are five associated companies' representatives or agents in most countries throughout the world and a staff of nearly 500. As part of the jubilee celebrations a dance was held in the West End Ballroom, Birmingham, on Tuesday of last week.

AT A PARTY for employees of Qualcast, Limited, Victory Road, Derby, which was held at the King's Hall, Derby, on January 16, Mr. Vincent Jobson, chairman and managing director, presented clocks to long-service employees. The recipients included Mr. J. Dallison, foreman foundry department, Mr. J. E. Riley, fettling and inspection department, and Mr. C. E. Wheatley, foundry department. About 1,100 people attended the party.

AT A COST OF a million and a quarter pounds, Ilford, Limited have built a plant for the coating of photographic films of the X-ray type and, in collaboration with BX Plastics, Limited, a factory for the manufacture of film base. These projects should reduce the value of imports of American materials annually by two million dollars and remove the chronic shortage in supplies of films to hospitals. The production of industrial films, too, will be augmented.

THE DROP IN NON-FERROUS METAL PRICES since October should help to bring back into production items normally made from these metals but which, since prices have been so high, have been manufactured from other materials, is the opinion of Mr. Horace Hipkiss. This was despite "disturbing" rises in transport costs and wages, he said. Mr. Hipkiss is chairman of the Midland Bright Drawn Steel and Engineering Company, Limited, and the opinion was expressed at the firm's annual meeting in Birmingham on January 13.

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Raw Material Markets

Iron and Steel

The further expansion of British steel production is dependent upon the provision of increased tonnages of pig-iron and scrap. For this reason the lighting up of the new blast furnaces at Shotton will not, it is hoped, be much longer delayed. More basic iron is still our urgent necessity. On the other hand, the supply of foundry iron is now ample for current needs. The call for light castings is not nearly as brisk as it was a few months ago and the general experience is that prompt deliveries of No. 3 iron are obtainable without much difficulty. Most of the engineering foundries have still a good amount of work in hand and the whole of the make of hematite and low- and medium-phosphorus iron is promptly absorbed.

Some of the re-rollers continue to experience difficulty in obtaining adequate supplies of steel semis. Conditions appear to be variable. The flow of billets, etc., from home sources has certainly increased, but these have to be supplemented with liberal supplies of foreign material to maintain continuity of operations. Re-rollers have substantial orders in hand for light sections and bars for the home market, but in oversea markets British prices are no longer competitive and, in consequence, foreign trade is quiet. On the other hand, the sheet trade is still on the crest of the wave. Makers are overwhelmed with orders and inquiries both from home and foreign sources and the bulk of the output of the sheet mills for the first half of the year is already bespoken.

There are indications of a revival of the steel export trade. Last year imports and exports were evenly balanced, but the industry is now in a more favourable position to cater for oversea requirements, and although import restrictions are still severe, there is an incipient movement for the liberalization of world trade, which, if it develops, will give a big impetus to the steel industry. Meanwhile, home requirements are heavy. Shipbuilders' demands impose a heavy strain upon plate-mill capacity and large tonnages of plates and sheets are also required for structural work and for oil-tank contracts. Locomotive and wagon builders have never before had such crowded order-books and their activities are reflected in their specifications to the steelworks, while, among the lighter branches of the steel trade, the wire mills are conspicuous for the volume of orders in hand.

Non-ferrous Metals

The Ministry of Materials has announced that, as from January 17, all sales of zinc made through the Government broker at the Metal Exchange for delivery outside London would carry a premium. Up to that date delivery at Liverpool was free and it is thought that a fair amount of zinc had been taken up there from stocks held by the Ministry. This is now changed, and metal taken up in future will carry £1 premium. Demand for zinc is not particularly good and consumption is probably running at around the level seen in the concluding months of last year.

Lead has been a fairly active market, but the demand in this country is not very brisk and there is a feeling that this is due to the price of the metal being too high. Manufacturers feel it is overpriced and look for a drop before many weeks have gone by.

Spot tin was particularly strong last week. The situation in Bolivia continues to be disturbed, but there is some prospect of Bolivian concentrates being shipped to this country. Output by the U.S. tin smelter at Texas City during 1952 was about 25 per cent. lower than in 1951, but it is expected that the present year will see an improvement.

Statistics released by the Copper Institute in New York show that during December U.S. production of crude copper amounted to 85,837 short tons, more than 5,000 tons up on November. Output of refined copper was 113,965 tons, compared with 100,075 tons in November. Domestic deliveries reached the remarkable total of 143,088 short tons, against 125,338 tons in November. Stocks of refined copper at December 31 were 58,858 short tons, compared with 69,237 a month earlier.

Official prices of refined pig-lead were:—

January—January 15, £97 to £98; January 16, £98 to £98 10s.; January 19, £97 15s. to £98; January 20, £98 15s. to £99; January 21, £99 15s. to £100.

April—January 15, £94 5s. to £94 10s.; January 16, £95 to £95 10s.; January 19, £95 to £95 5s.; January 20, £96 to £96 10s.; January 21, £96 15s. to £97.

Zinc official prices:—

January—January 15, £88 to £88 10s.; January 16, £90 10s. to £91; January 19, £87 10s. to £88; January 20, £86 15s. to £87; January 21, £88 to £88 10s.

April—January 15, £88 to £88 10s.; January 16, £90 5s. to £90 15s.; January 19, £87 15s. to £88; January 20, £86 15s. to £87; January 21, £88 5s. to £88 10s.

The following official tin prices were recorded:—

Cash—January 15, £956 to £957; January 16, £960 to £961; January 19, £967 to £968; January 20, £967 to £969; January 21, £962 to £964.

Three Months—January 15, £942 to £943; January 16, £943 to £944; January 19, £945 to £947; January 20, £943 to £945; January 21, £940 to £942.

Latest Foundry Statistics

According to December issue of the Bulletin of the British Iron & Steel Federation the average weekly production of steel for the making of steel castings during November was 2,920 tons, 120 tons more than October and 440 tons higher than in November, 1951. Employment in the steel foundries during November registered a gain of 212 over the previous month. Compared with a year ago, the gain has been well over 1,000. Ironfounding, on the other hand showed again a distinct decline, losing 612 operatives. However, at 152,131 it is still higher than in November, 1951, when the total employment was 151,956.

JAMES MILLER & PARTNERS, LIMITED, Edinburgh, are to lay four miles of 26 in. concrete-lined cast-iron water main and construct a bridge to carry it over the main railway line at Scotstounhill, Glasgow, for Glasgow Corporation Water Department, at a cost of £107,402. The principal contracts, valued at £131,500, for supplying the pipes have been placed with the Staveley Iron & Chemical Company, Limited, and short lengths of steel pipe to be used for special works will be supplied by Stewarts and Lloyds, Limited, at a cost of £2,600. Valves, costing £5,150, were ordered two years ago from Glenfield & Kennedy, Limited, Kilmarnock, and these should be ready when required. Construction of this part of the department's West mains works will complete the pipelaying of ten miles of mains except for the river crossing. It is expected that work on the department's Clyde tunnel will begin shortly.

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

(Delivered, unless otherwise stated)

January 21, 1953

PIG-IRON

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

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

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

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

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

Cold Blast.—South Staffs, £18 2s.

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

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

FERRO-ALLOYS

(Per ton unless otherwise stated, delivered.)

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

Ferro-vanadium.—50/60 per cent., 22s. to 28s. per lb. of V.

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

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

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

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

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

Cobalt.—98/99 per cent., 20s. per lb.

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

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

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

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

SEMI-FINISHED STEEL

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

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

Sheet and Tinplate Bars.—£25 3s. 6d.

FINISHED STEEL

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

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

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

Tinplates.—57s. 1½d. per basis box.

NON-FERROUS METALS

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

Tin.—Cash, £962 to £964; three months, £940 to £942; settlement, £963.

Zinc.—January, £88 to £88 10s.; April, £88 5s. to £88 10s.

Lead.—Refined pig-lead: January, £99 15s. to £100; April, £96 15s. to £97.

Zinc Sheets, etc.—Sheets, 15g. and thicker, all English destinations, £115 5s.; rolled zinc (boiler plates), all English destinations, £113 5s.; zinc oxide (Red Seal), d/d buyers' premises, £120 15s.

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

Brass.—Solid-drawn tubes, 26¼d. per lb.; rods, drawn, 34⅜d.; sheets to 10 w.g., 284s. 9d. per cwt.; wire, 32½d.; rolled metal 271s. 6d. per cwt.

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

Gunmetal.—Ingots to BS. 1400—LG2—1 (85/5/5/5), £195 to £218; BS. 1400—LG3—1 (86/7/5/2), £210 to £238; BS. 1400—G1—1 (88/10/2), £320 to £375; Admiralty GM (88/10/2), virgin quality, £325 to £380 per ton, delivered.

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

Phosphor Bronze.—Strip, 413s. 3d. per cwt.; sheets to 10 w.g. 435s. per cwt.; wire, 49⅝d. per lb.; rods, 44½d.; tubes, 42¾d.; chill cast bars: solids 3s. 10d. cored 3s. 11d. C. Clifford & Son, Limited.)

Nickel Silver, etc.—Ingots for raising, 2s. 9d. per lb. (7%) to 3s. 11d. (30%); rolled metal, 3 in. to 9 in. wide × .056, 3s. 3d. (7%) to 4s. 5d. (30%); to 12 in. wide × .056, 3s. 3½d. to 4s. 5½d.; to 25 in. wide × .056, 3s. 5½d. to 4s. 7½d. Spoon and fork metal, unsheared, 3s. to 4s. 2d. Wire, 10g., in coils, 3s. 9½d. (10%) to 4s. 11d. (30%). Special quality turning rod, 10%, 3s. 8½d.; 15%, 4s. 2d.; 18%, 4s. 6¾d. All prices are net.

Forthcoming Events

JANUARY 26

North-east Metallurgical Society

Discussion on "The Training of a Metallurgist," opening speaker Dr. A. D. Merriman, 7.15 p.m., at the Cleveland Scientific and Technical Institution, Middlesbrough.

Institution of Works Managers

Glasgow branch:—"Factory Insurance," by Charles Kelly, 7.15 p.m., at the Institution of Engineers and Shipbuilders in Scotland, 39, Elmbank Crescent, C.2.

Institution of Production Engineers

Shrewsbury sub-section:—"Management and Production," by H. Bainbridge, 7.30 p.m., at the Shrewsbury Technical College.

JANUARY 27

Lincoln section:—"Fundamentals of Production Management," by Dr. M. Seaman, 7.30 p.m., at the Staff Canteen, Ruston & Hornsby, Limited, Boultham Works.

Luton section:—"Problems of Machine Maintenance," by R. M. Buckle, 7.15 p.m., at the Small Assembly Room, Town Hall.

Sheffield Metallurgical Association

"Hydrogen in Steel—A General Survey," by K. C. Barraclough, 7 p.m., in the Grand Hotel.

Institution of Works Managers

Wolverhampton branch:—"Material Handling," 7 p.m., at the Star and Garter Royal Hotel.

Purchasing Officers' Association

Wolverhampton branch:—Films by "Aims of Industry," 7.15 p.m., at the Victoria Hotel.

Institute of Industrial Supervisors

Rotherham section:—"Iron and Steel Productivity Team Report—some points of interest for Supervision," by J. Wadsworth, 7.30 p.m., in the Lecture Hall, Steel Peech & Tozer.

JANUARY 28

Institute of British Foundrymen

London branch:—"Runners and Risers," short papers by E. D. Daybell, P. A. Russell, and R. W. Ruddle, 7.30 p.m., at the Waldorf Hotel, Aldwych, W.C.2.

Institution of Works Managers

Tees-side branch:—"Machines and Men," by Professor Burstall 7.30 p.m., at Cleveland Institute, Middlesbrough.

Institution of Production Engineers

Coventry graduate section:—"Batch Production," by F. H. Harris, 7.30 p.m., at the Geisha Café, Hertford Street.

JANUARY 29

Institute of Metals

Birmingham section:—"Modern Technique in Spectrographic Analysis," discussion, 6.30 p.m., at the James Watt Memorial Institute, Great Charles Street.

Purchasing Officers' Association

West of England branch:—"Sound Steel" (film), 7.15 for 7.45 p.m., at Carwardines, Limited, Baldwin Street, Bristol.

Incorporated Plant Engineers

South Yorkshire branch:—"Oxygen in Industry" (film and demonstration), discussion led by H. Townend, 7.30 p.m., at the Grand Hotel, Sheffield.

JANUARY 30

Institute of British Foundrymen

Falkirk section:—"Synthetic Resins," by R. Carswell, 7.30 p.m., at Temperance Café, Lint Riggs.

West Wales section:—"Strength, Structure and Composition of Unalloyed Grey Iron," by H. T. Angus, 7 p.m., at the Canteen of Richard Thomas & Baldwins, Limited, Landore.

Institute of Vitreous Enamellers

Midland section:—"Men only" Dinner, at the Imperial Hotel, Birmingham.

JANUARY 31

Institute of British Foundrymen

Wales and Monmouth branch:—"Strength, Structure and Composition of Unalloyed Grey Irons," by H. T. Angus, 6 p.m., at the Engineers' Institute, Cardiff.

Cancellation of Meeting. Members of the Association of Bronze and Brass Founders in the Yorkshire area are informed that January 23 has proved to be inconvenient to all but a very few and therefore arrangements for the meeting have been cancelled.

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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.

SITUATIONS WANTED

INDIAN, B.Sc., 25, 5 years' (3 years apprentice) in Foundries, Patternmaking, Laboratories, wishes working with some Steel Foundry and Laboratory.—Box 3212, FOUNDRY TRADE JOURNAL.

FOUNDRY ENGINEER, twenty seven years' experience in Canada, U.S.A. and England. Possess drive and initiative to organise and control the maintenance and developments of building plant layout. Knowledge of mechanisation, continuous pouring up to one hundred tons per day.—Box 3176, FOUNDRY TRADE JOURNAL.

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SITUATIONS VACANT

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

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

CORE SHOP SUPERINTENDENT required for large mechanised Iron and Steel Foundry in Yorkshire. Applicants must have previous experience of the mass production of cores by vertical and horizontal core blowers, roll-over core machines, and be familiar with the most up-to-date core making techniques, rate fixing etc. As housing accommodation is not available, this post is more suitable to applicants who are not married.—Apply in the strictest confidence, giving full details of previous experience and salary required to Box 3206, FOUNDRY TRADE JOURNAL.

REPETITION MALLEABLE FOUNDRY in Dudley and Brierley Hill district, requires Pattern Shop Foreman. Used to match plate pattern production. Wood and Metal. Good salary for first-class man.—Apply Box 3207, FOUNDRY TRADE JOURNAL.

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FOREMAN required by North-East Coast Iron Foundry. Experience in the manufacture of Cast Iron Pipe Specials in loam, greensand and drysand is required.—Apply, giving full details of previous experience and salary required, to COCHRANES (MIDDLESBRO') FOUNDRY, LTD., Ormesby Iron Works, Middlesbrough. (This vacancy does not come under the control of the Notification of Vacancies Order, 1952.)

SENIOR ANALYST, age 25/30; A.R.I.C. or equivalent standard; metallurgical analytical experience; to supervise analytical section of laboratory; knowledge of light alloys and/or foundry procedure an advantage. Salary £500 per year, or according to qualifications and experience. —Applications, marked "Confidential," to MANAGING DIRECTOR, Wm. Mills, Ltd., Friar Park Road, Wednesbury, Staffs.

THE DAVID BROWN FOUNDRIES COMPANY, Penistone, Nr. Sheffield, require a Metallurgical Assistant for the Foundry Technical Control Section. Applicants should be of graduate standard, with experience of research on Steel and Bronze Castings, and knowledge of Foundry practice preferably. Age 25/35 years. Reply stating age, education and experience to PERSONNEL OFFICER.

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

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SITUATIONS VACANT—*Contd*

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SENIOR ACCOUNTANT required by large Foundry in Wolverhampton area. Man with Foundry Accountancy preferred, but not absolutely essential.—Reply to Box 3195, FOUNDRY TRADE JOURNAL.

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A REPRESENTATIVE required, preferably with good connections with users of Grey Iron Castings, for an old-established Vitreous Enamelling Company in the Midlands.—Please reply, giving fullest particulars in confidence, to Box 3199, FOUNDRY TRADE JOURNAL.

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SITUATIONS VACANT—*Contd*

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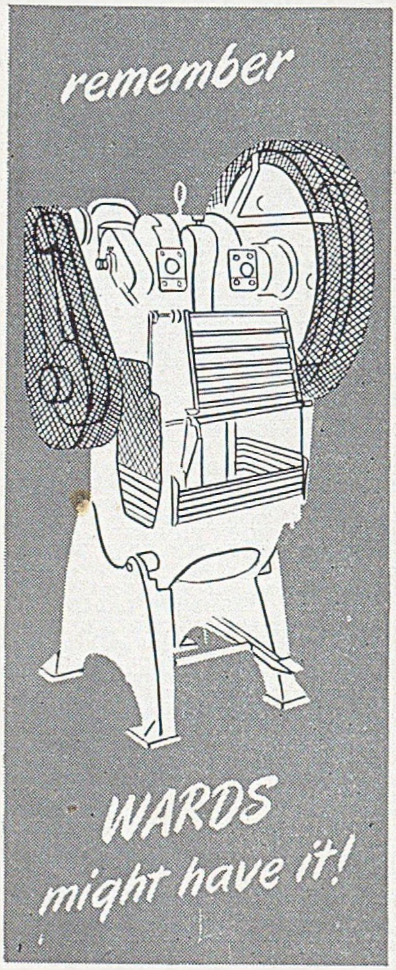

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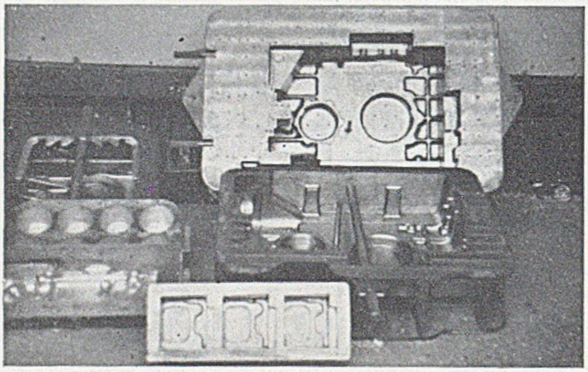

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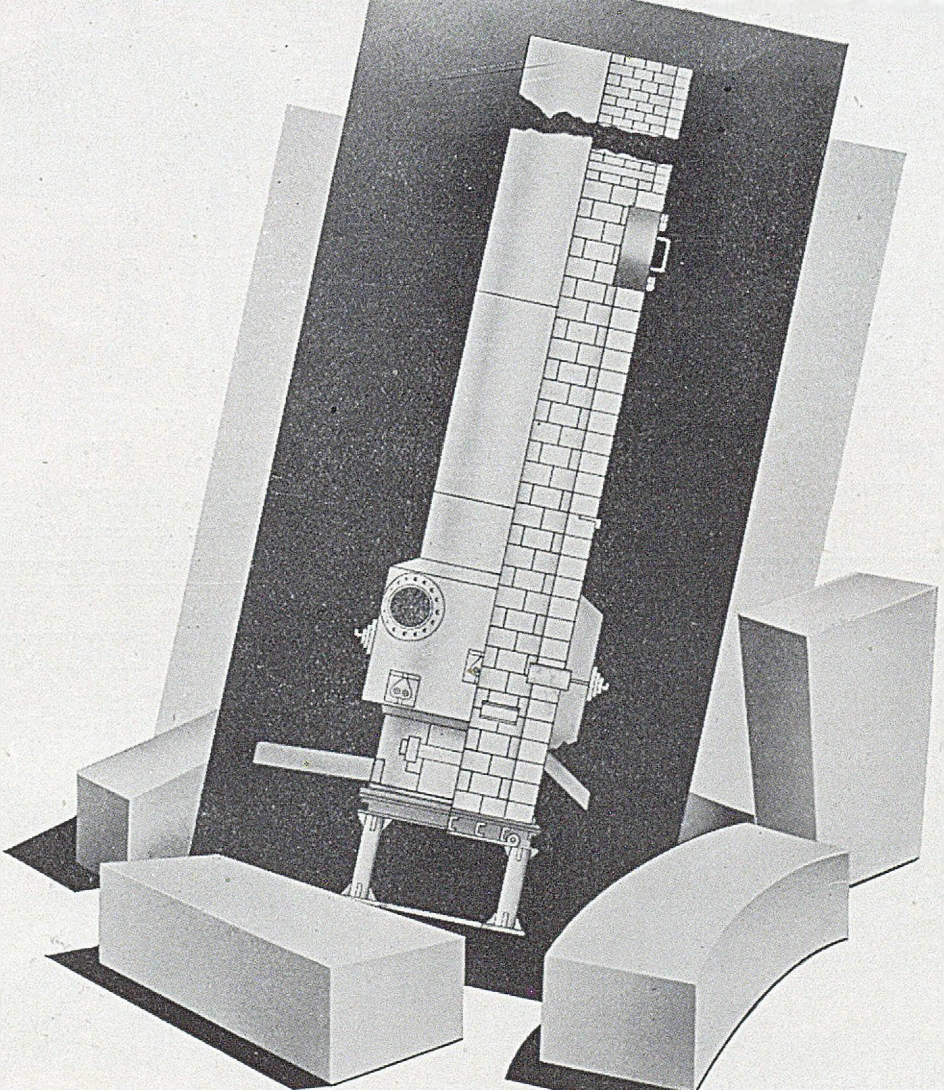

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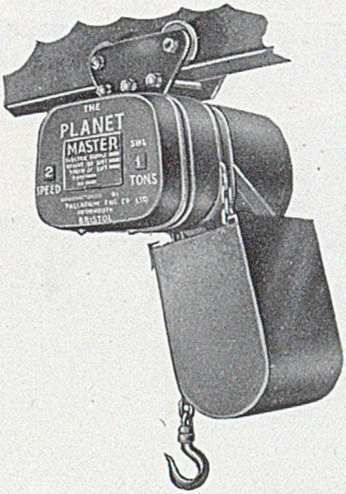

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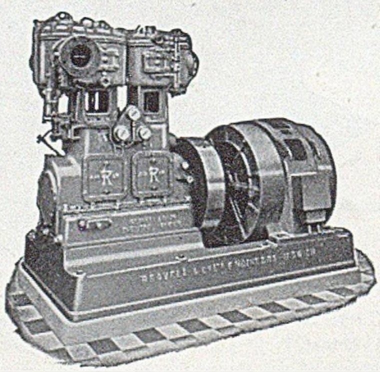

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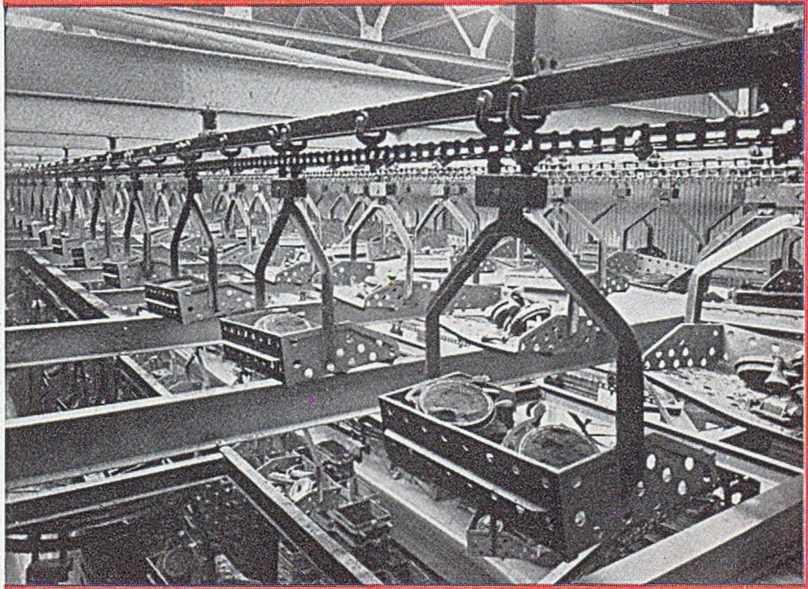

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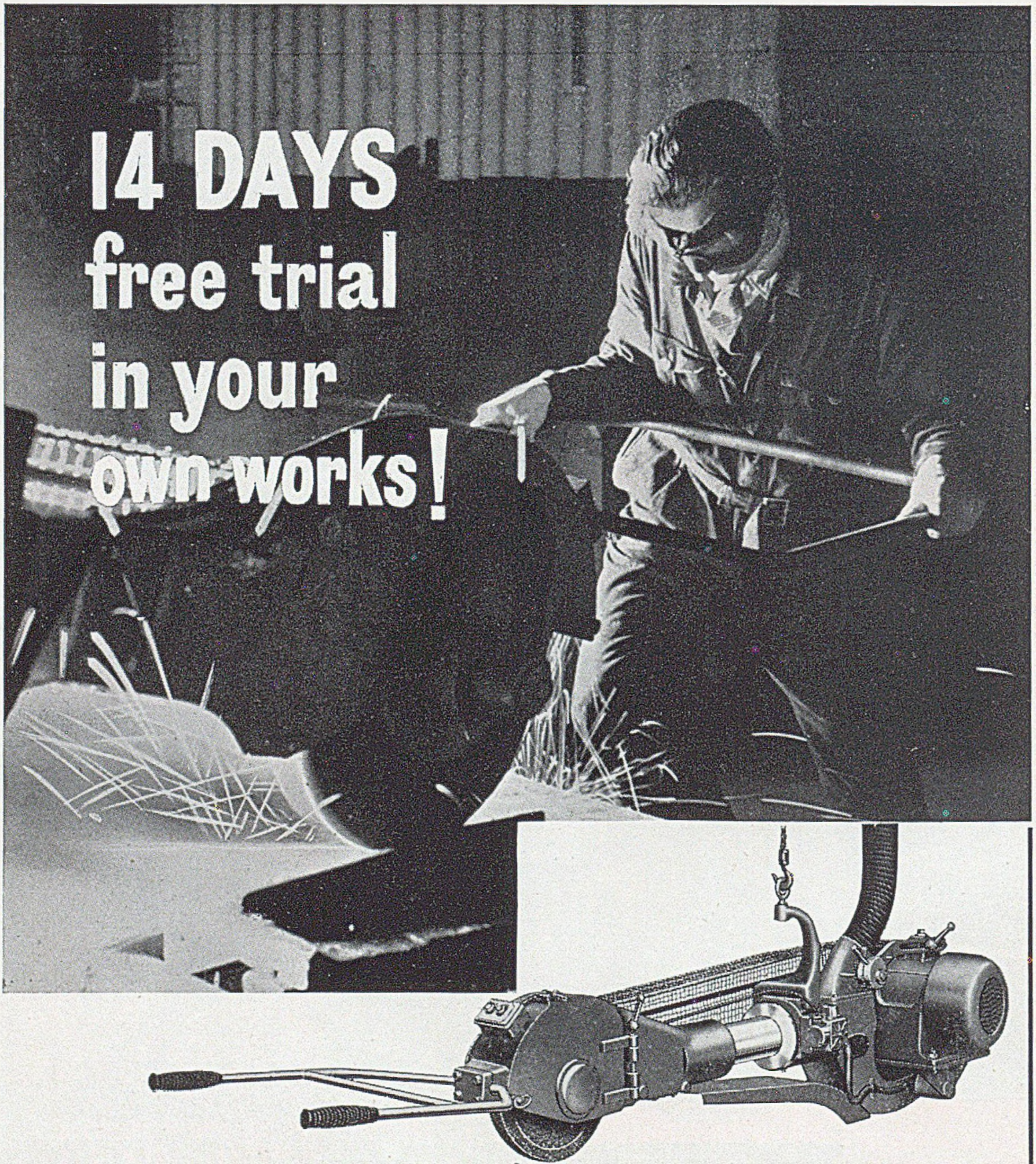

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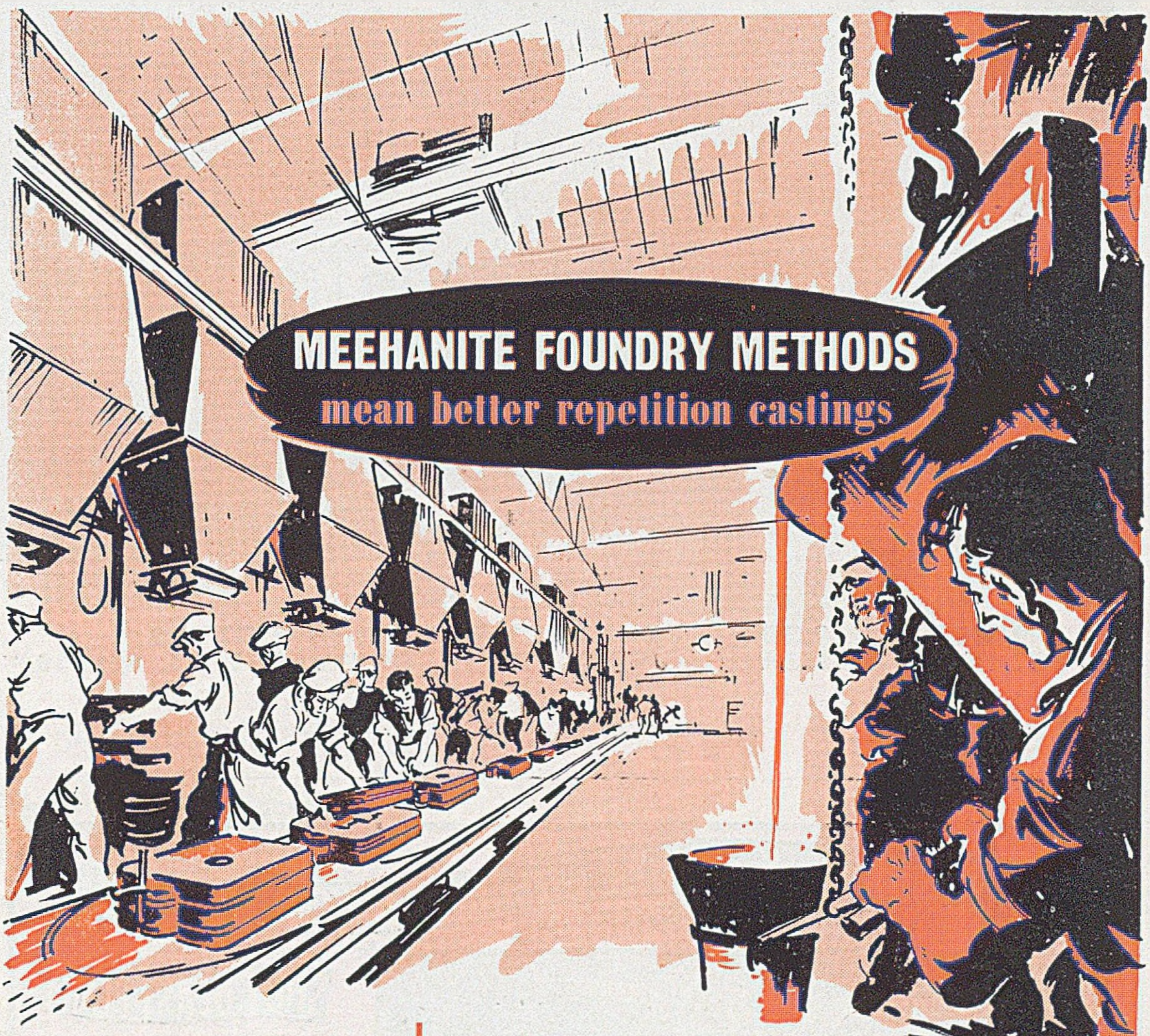

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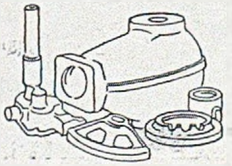

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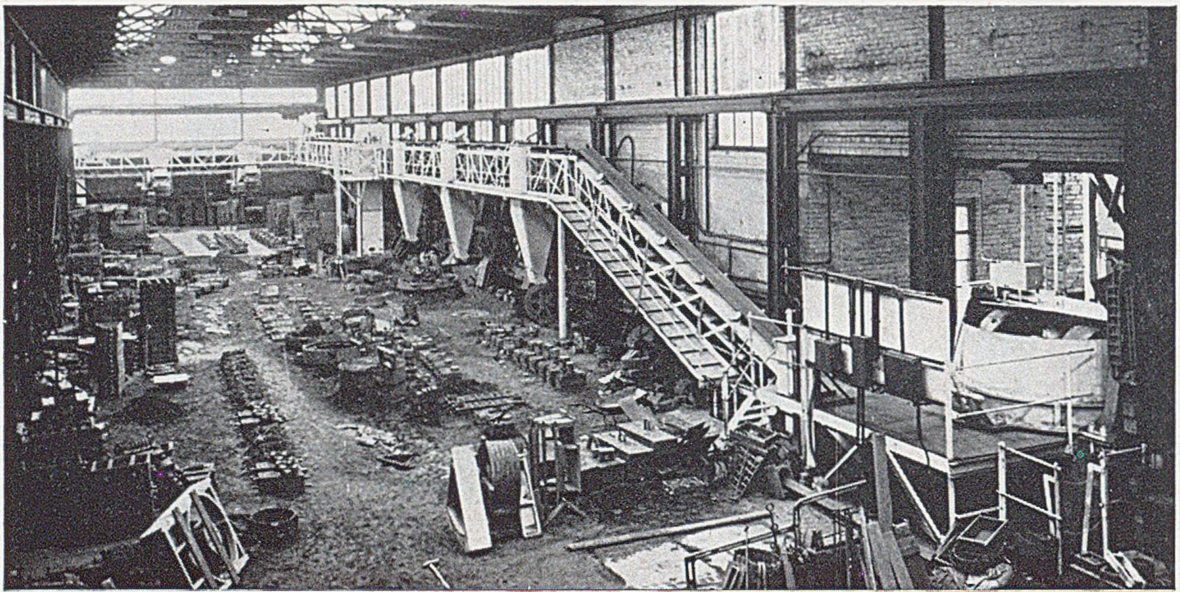

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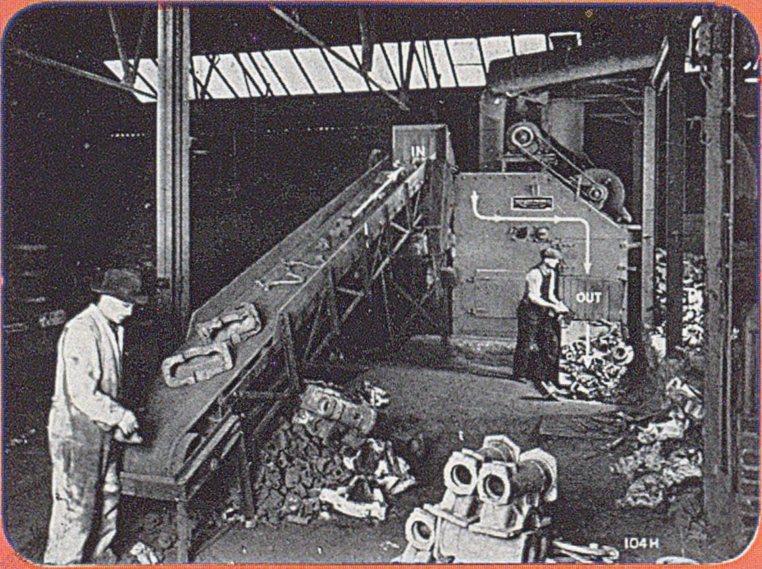

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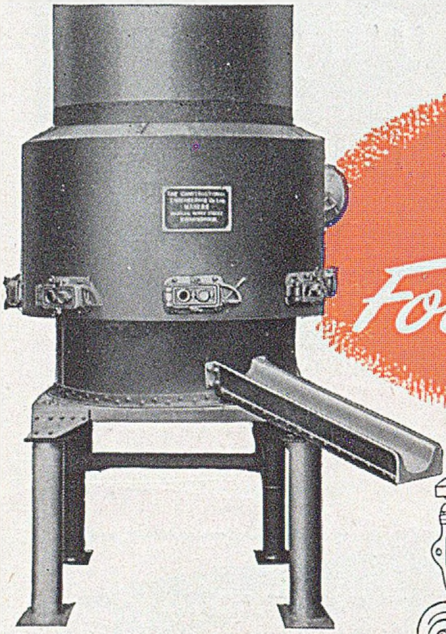

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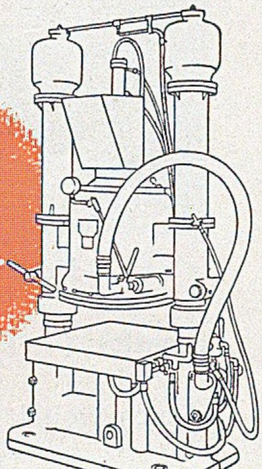

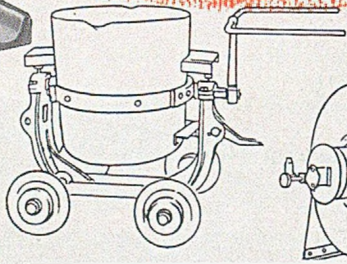

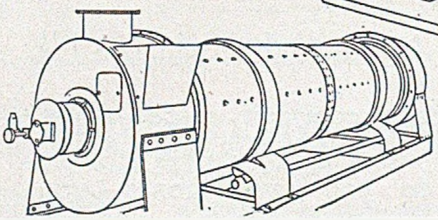

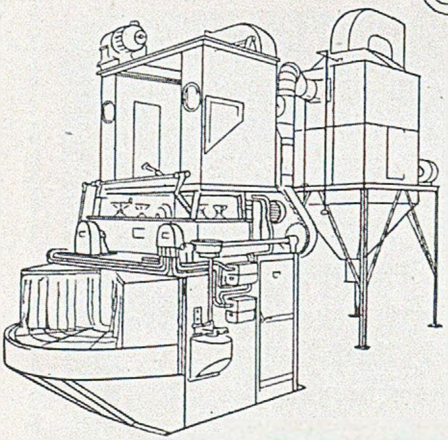

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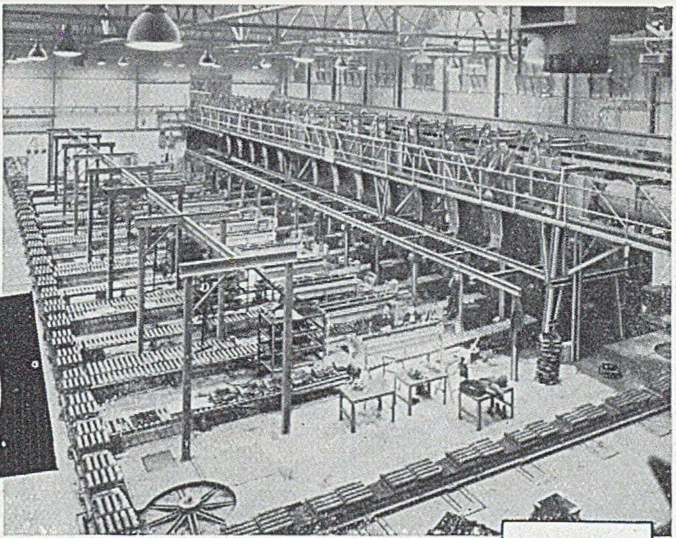

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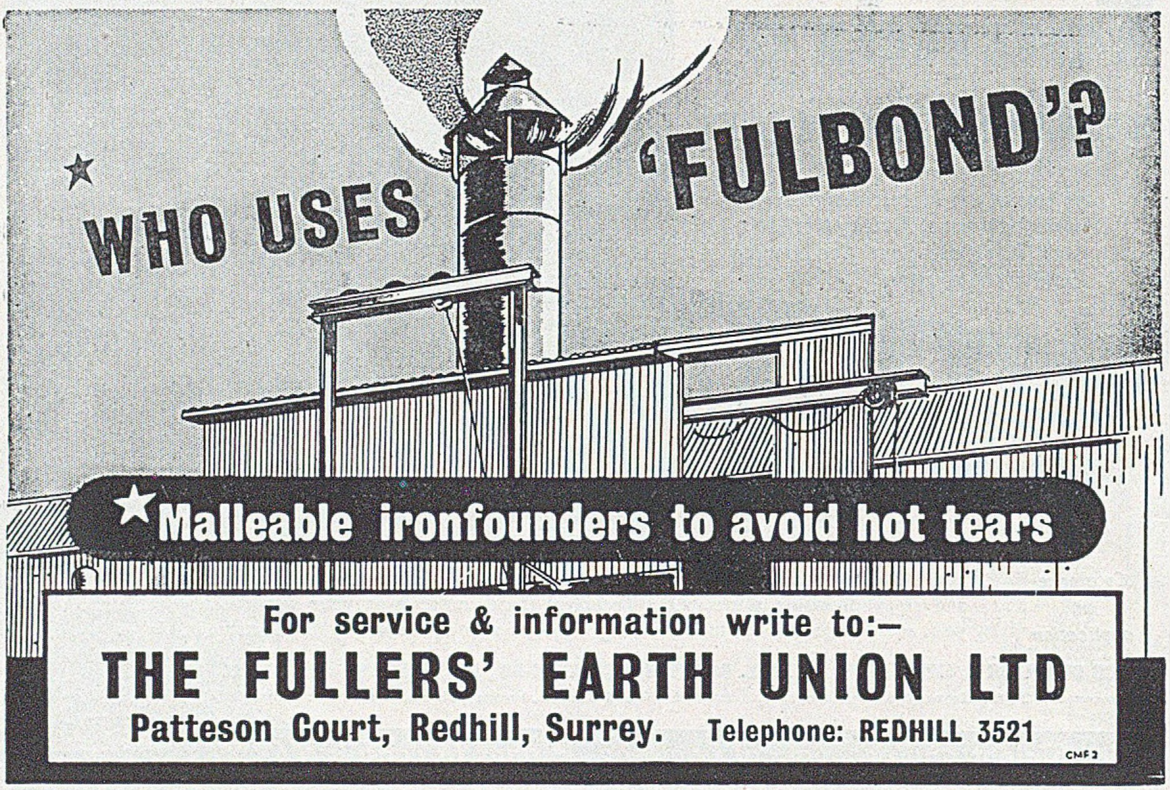
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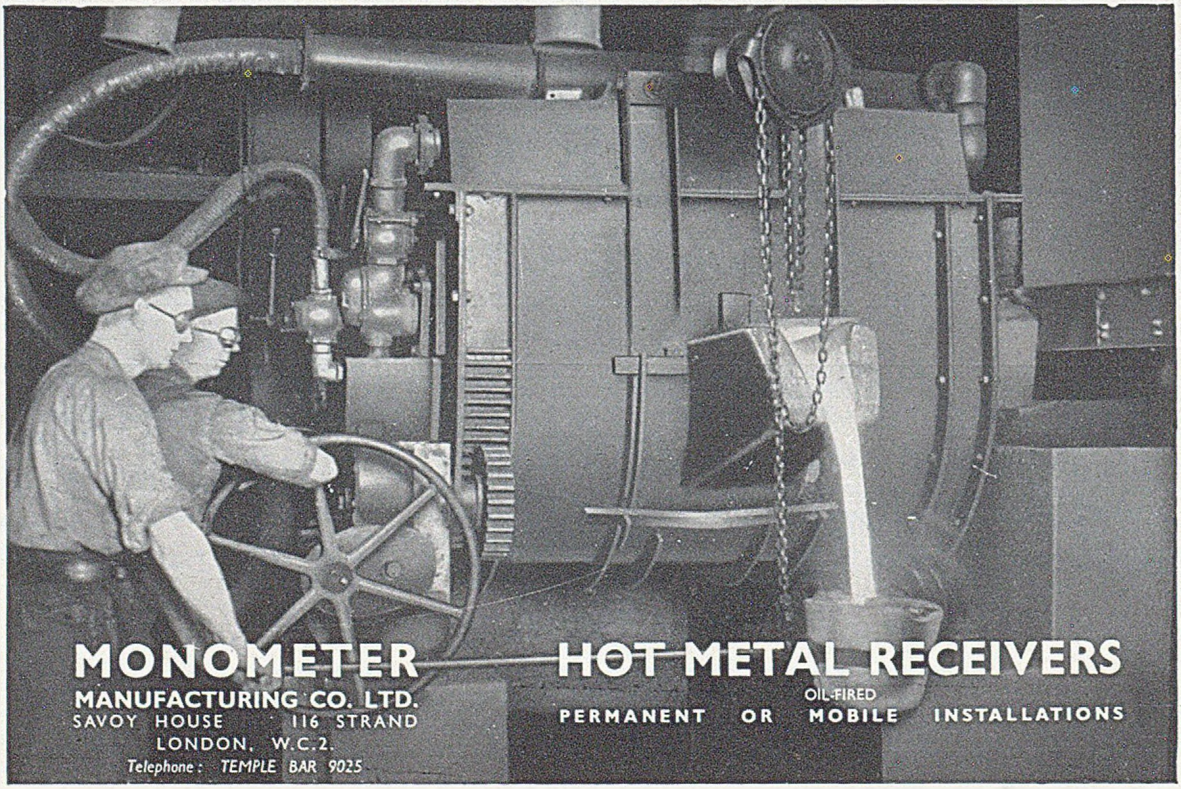
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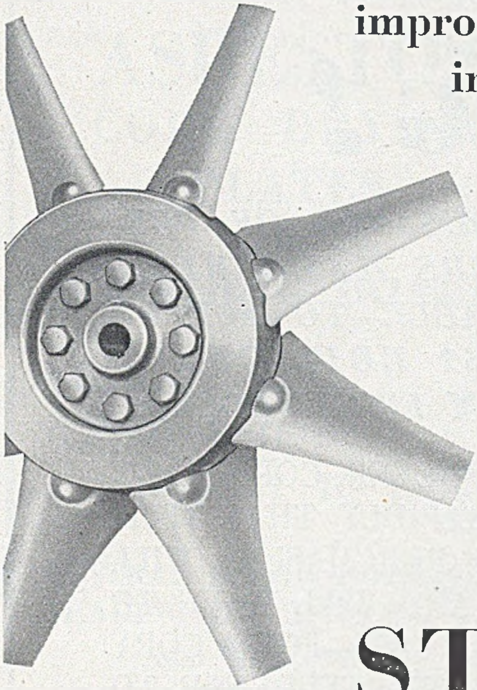

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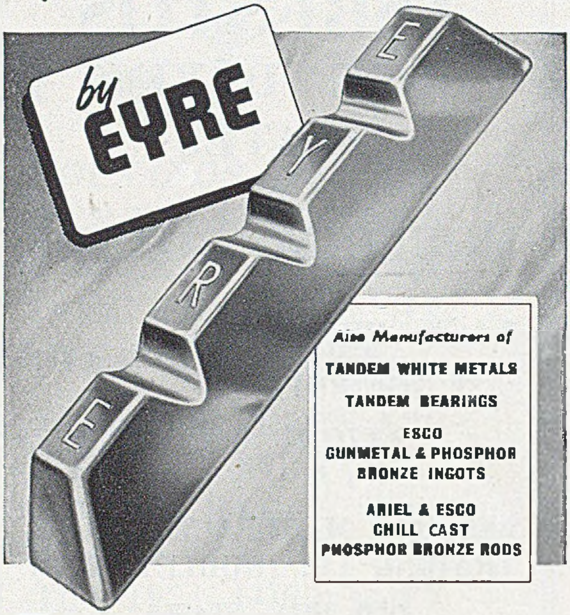

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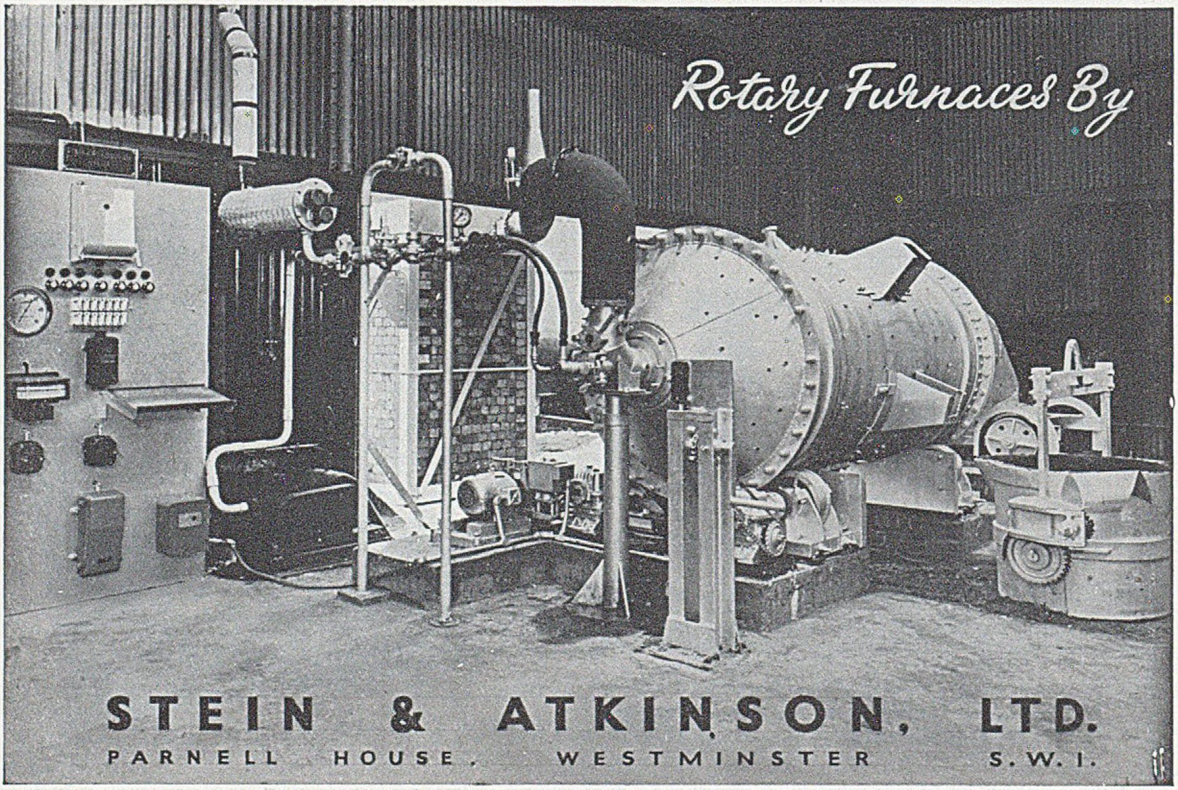

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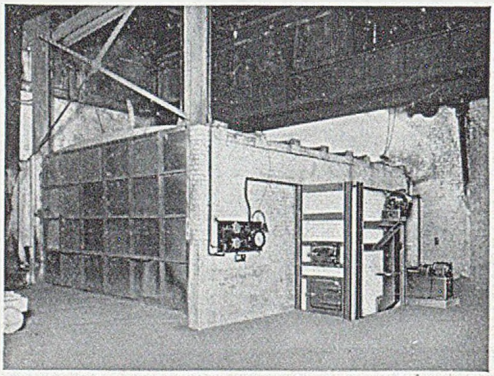

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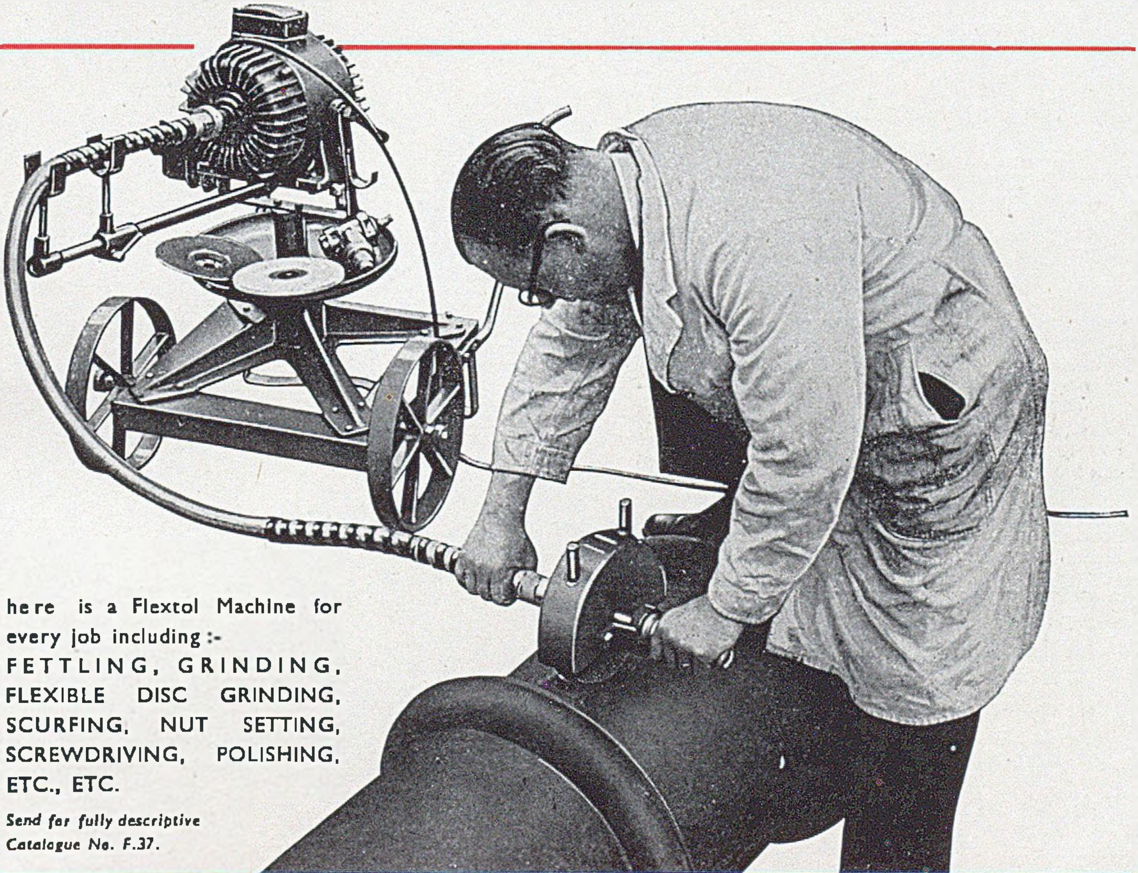

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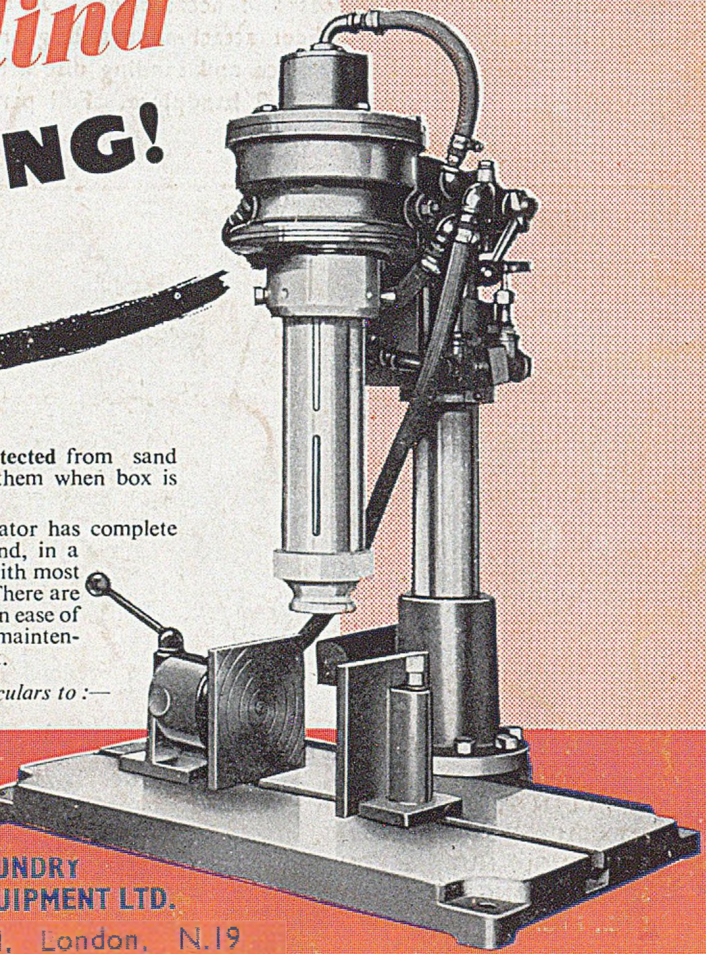

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