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MAY 31, 1951
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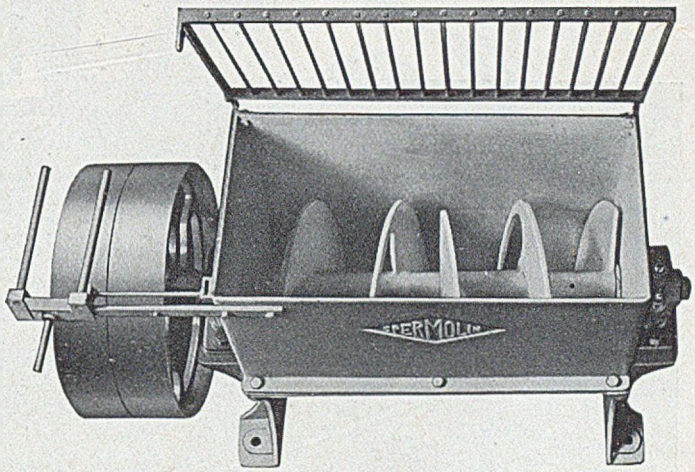
Single Copy, 9d. By Post, 11d. Annual Subscription, Home 40/-, Abroad 45/- (Prepaid)

The SPERMOLIN

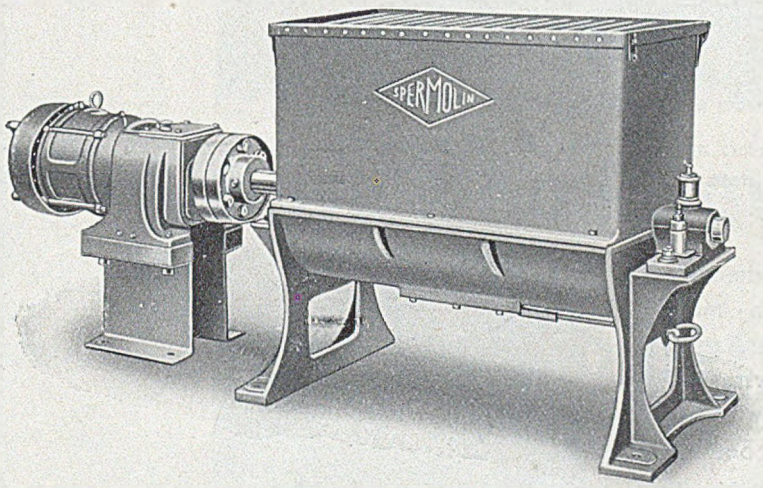
Major

Sand Mixing Machine



BELT DRIVE

Floor space required	4 ft. 6 in. × 2 ft.
Height	3 ft.
Capacity ... 6 bucketfuls (1½ cwts.)	
Time for one batch ... 4 minutes	
Horse power required ... 5 H.P.	
Driving pulley	23½ in. dia. × 4½ in. face
Speed of pulley ...	70 R.P.M.



DIRECT DRIVE

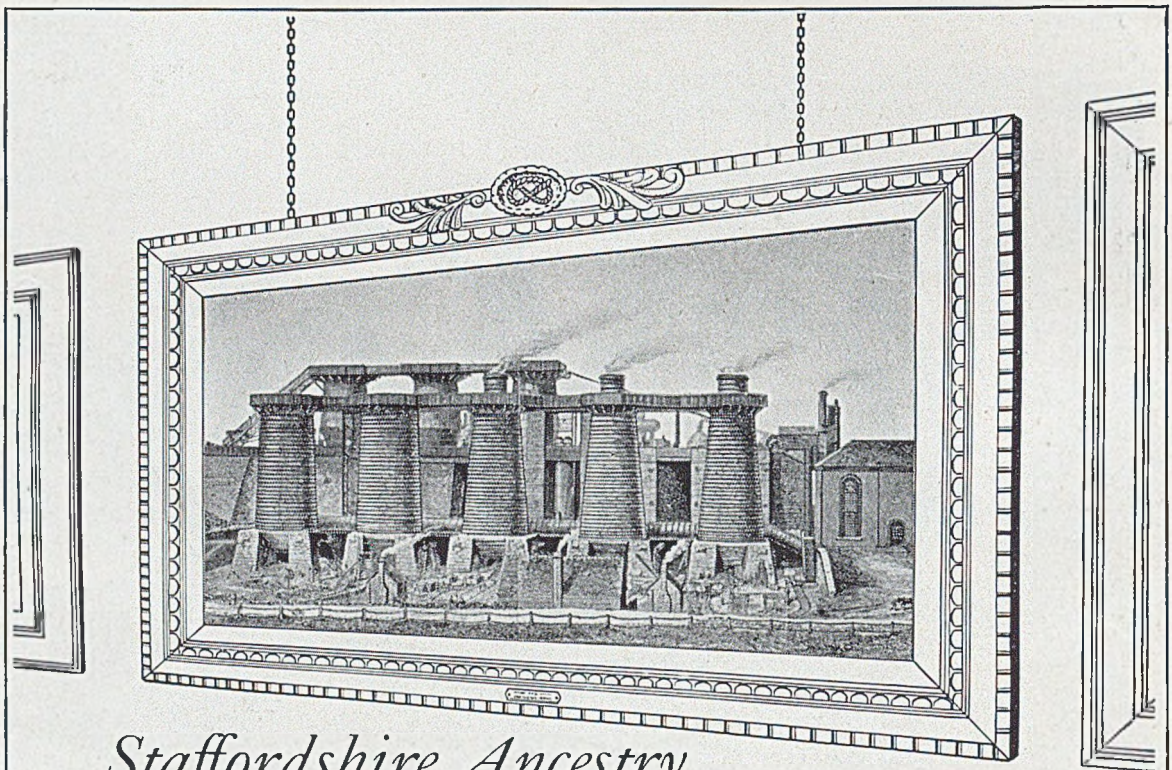
Floor space required ...	7 ft. × 2 ft.
Height	3 ft.
Capacity ...	6 bucketfuls (1½ cwts.)
Time for one batch ... 4 minutes	
Motor ... 5 H.P. geared unit	

Spermolin LTD.

HALIFAX, YORKS

Tel.: 4197
'Grams: Spermolin Halifax

A



Staffordshire Ancestry

Since 1700 almost every major improvement in the technique of iron founding has originated in Staffordshire.

No. 7. THE LILLESHALL COMPANY'S LODGE FURNACES.

When Lord Napier entered the fortress of Magdala during the Abyssinian campaign of 1868, he discovered pig iron made by these works in King Theodore's foundry .... a tribute alike to his enemy's resourcefulness and to the esteem in which the product of this old Shropshire firm was held.

The Iron and Steel trade of the Midlands had its beginnings in Shropshire, and it is to Abraham Darby of Coalbrookdale that the fabulous ironmasters of Staffordshire in the nineteenth century owed their origin and traced their lineage.

For the past 136 years Pig Iron has been manufactured at Bradley & Foster's Darlaston Iron Works.
Today, Bradley & Foster's spectrographic control of raw material and finished product enables them to supply pig iron of consistent uniformity to the most exacting specification.

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Bradley & Foster LIMITED

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DARLASTON · STAFFORDSHIRE

L.G.B

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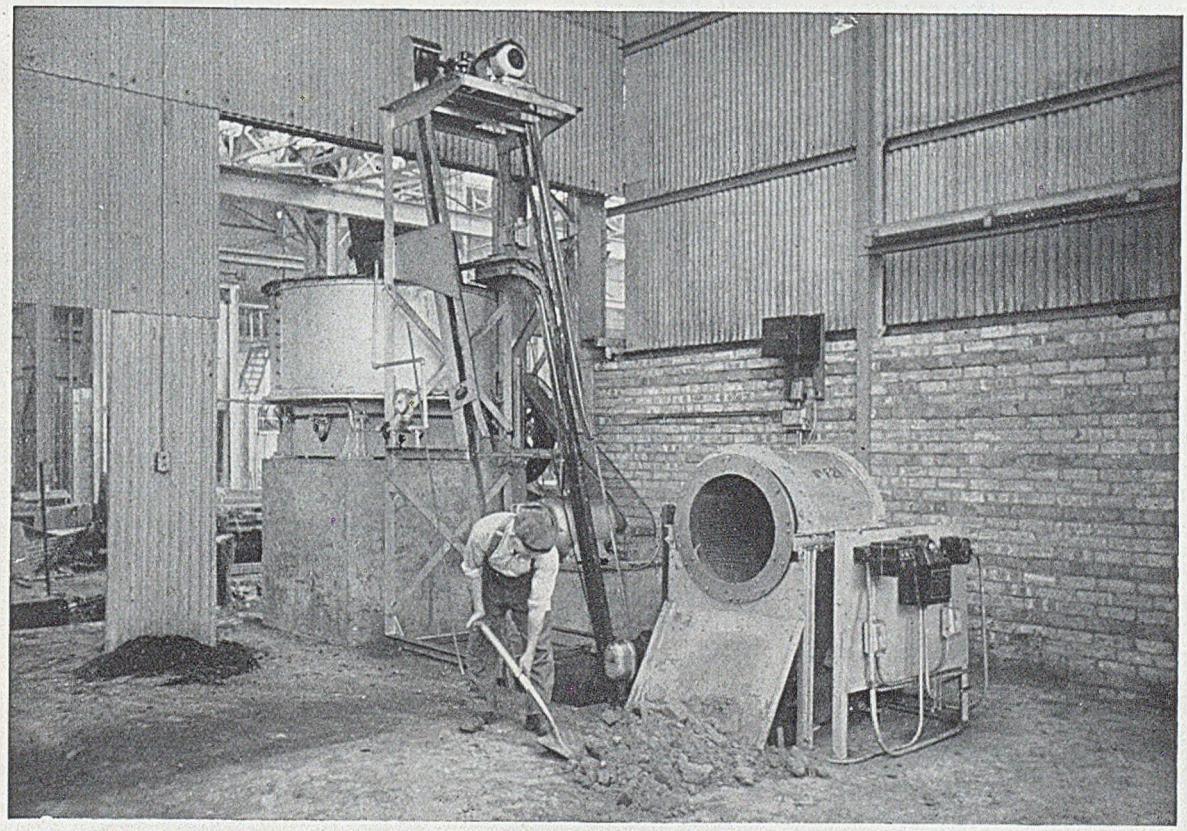

Built in England by

PNEULEC LIMITED, SMETHWICK, Nr. BIRMINGHAM

Pouring refrigerator castings; note the absence of fumes when W20 is used. Photograph by courtesy of Coneygre Foundry Ltd.

"Scrap lowest for 2½ years" is Coneygre's experience

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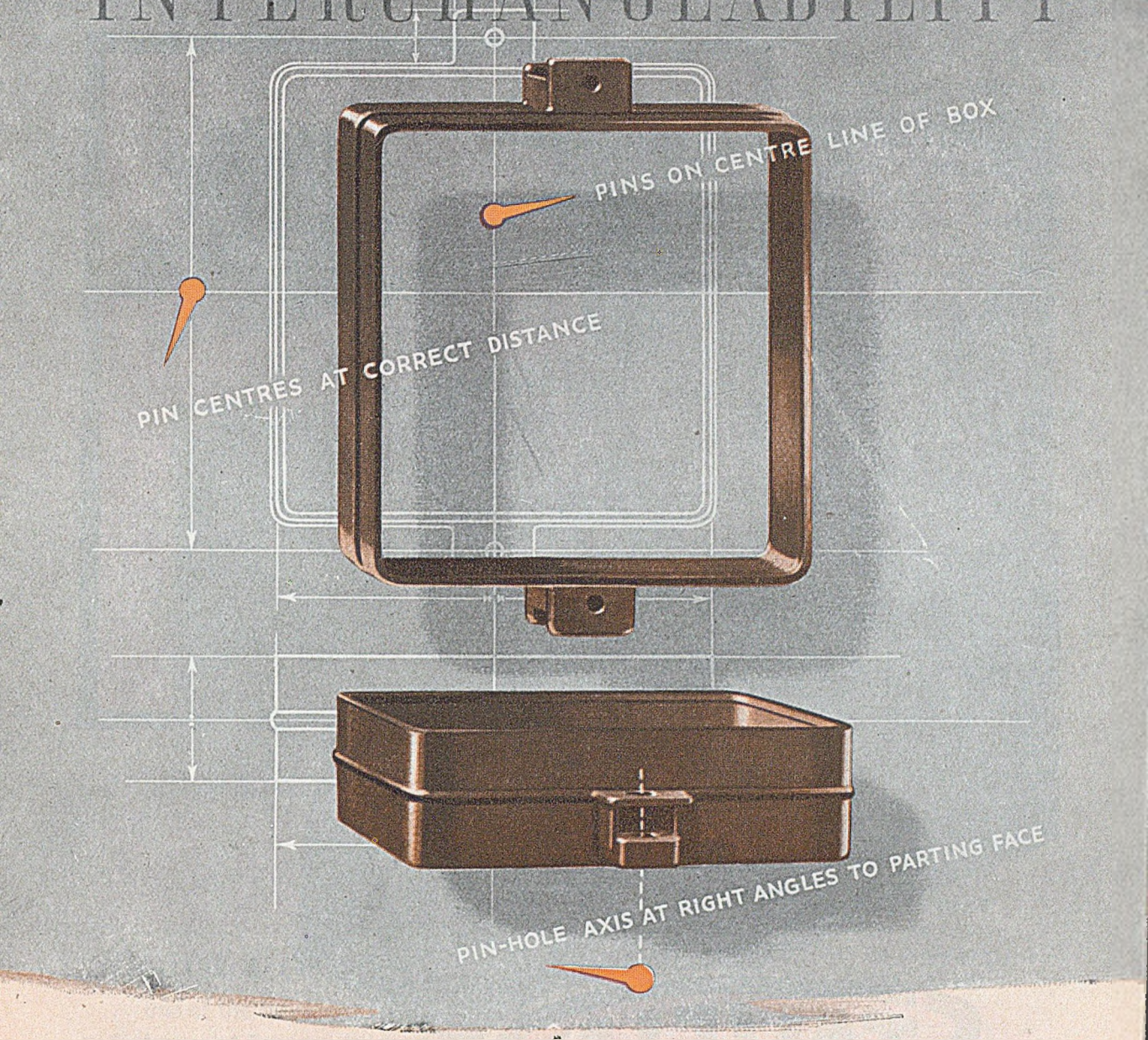

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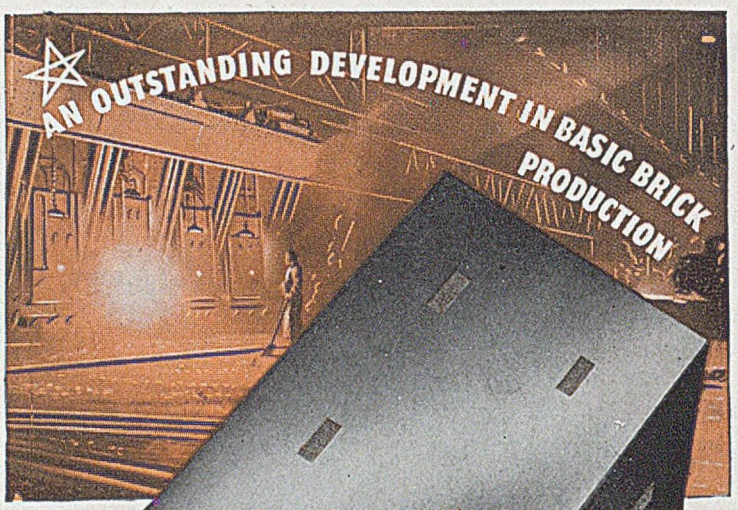

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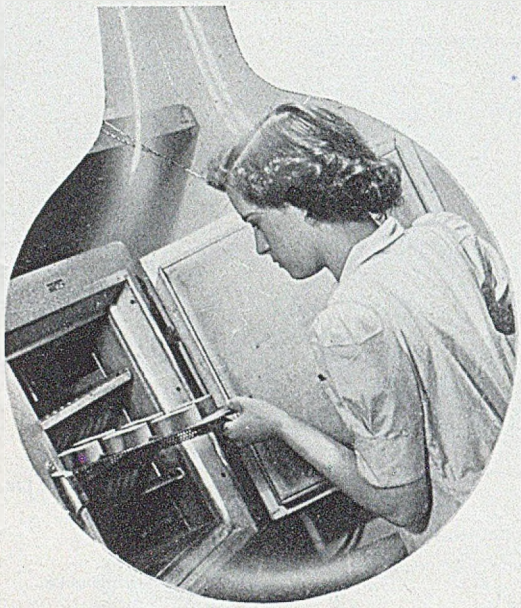

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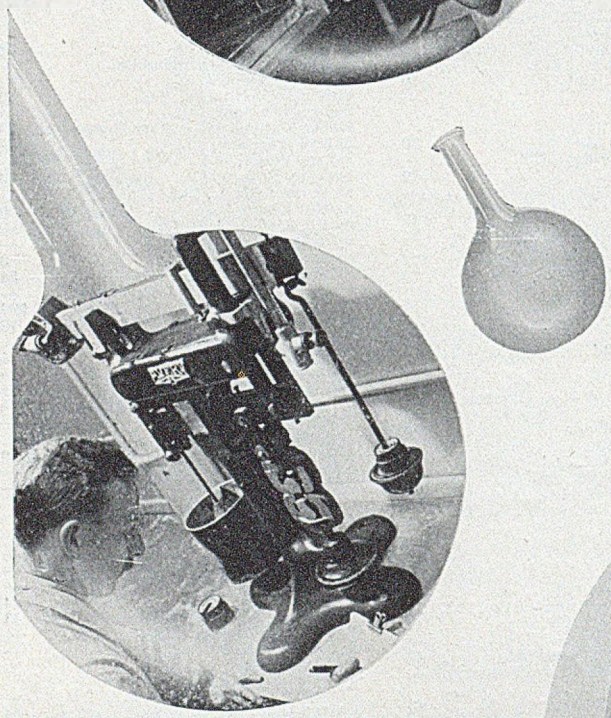

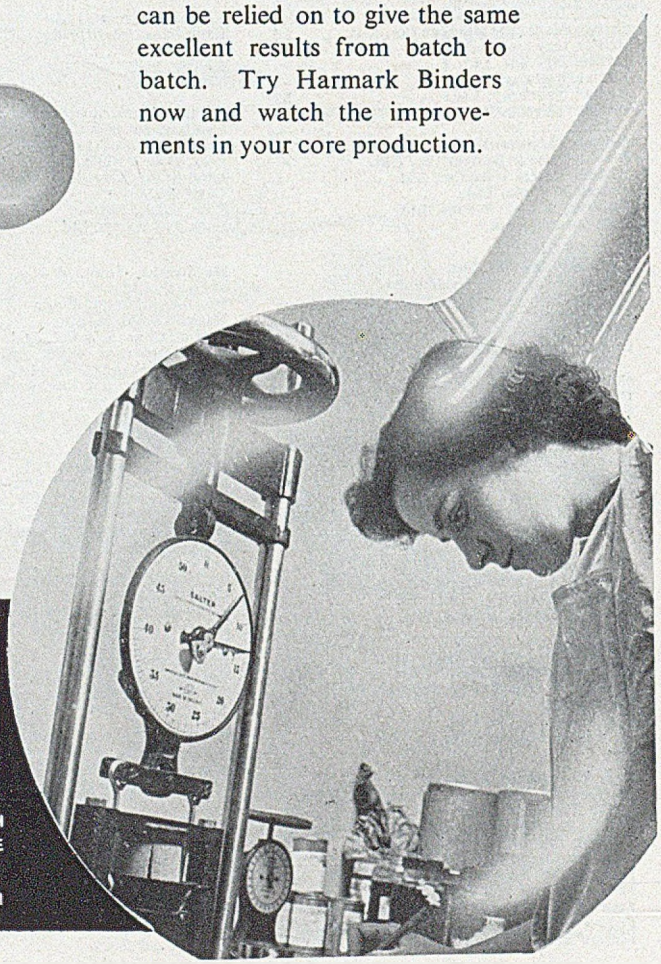

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FOUNDRY TRADE JOURNAL
Established 1902
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49, Wellington Street, London, W.C.2. 'Phone: Temple Bar 3951 (Private Branch Exchange) Grams: "Zacatecas, Rand, London"

American Technology—II, Non-ferrous and Heat Transfer

There was only one paper on light alloys amongst the American Foundrymen's Society preprints—a review by Mr. L. W. Eastwood of the plant available for melting both aluminium and magnesium alloys. A committee of the American Foundrymen's Society has for some time been studying the possibility of evaluating rapidly the quality of 85:5:5:5 red brass and 88:8:4 bronze by using chilled blocks. The authors of the report of this committee, all from the University of Michigan, are satisfied that the results they have obtained can be correlated with quality. A second paper deals with the refining of secondary copper. The authors experimented with oxygen instead of air, but found little of real value. They state that the order of impurity removal was aluminium; manganese; silicon; phosphorus, iron and zinc. The series was completed with a study on the effect of various elements on the grain-size of cast copper alloys. Cooling rate is of paramount importance, but 5 per cent. lead is stated to be a good refiner; so is 5 per cent. tin, but to a lesser extent. Two per cent. of nickel and 5 per cent. zinc had negligible effects.

Much attention is being given in the States to heat transfer. This subject is directly associated with cleaning costs and surface quality. Mr. Victor Paschkis, whose work on this subject is so universally appreciated, has turned his attention to the complicated subject of heat flow in moist sands. Herein apparently there is the additional factor of convection. Some work carried out by Schwartz and Mr. W. K. Bock suggests that Chvorinov's observations that the freezing time of steel castings is proportional to the square of their volume to area ratio, and approximately independent of other conditions, cannot be reconciled. The American conclusions are "the relation between the time to cool to the solidus (not the eutectic temperature to which supercooling depresses the solidus) can be approximately represented by a line corresponding to the time being proportional to roughly the 1.5 power of the V/A. A similar relation exists for the actual freezing time. Neither the relation between time spent in super-cooling, nor the freezing time corrected for super-cooling, can be represented satisfactorily by a straight line." The research staff of the Naval Research Laboratory, Washington, headed by Mr. H. F. Bishop, have found much to help them in Paschkis' work, when studying the solidification of steel from sand and chill walls. Reinforced by very extensive experimental evidence, the authors have been able to give a clear picture of the phenomena they have investigated.

This research department has also, in a second paper, disclosed the results obtained during an investigation on the solidification of grey iron in sand moulds. As is the case with steel, "solidification progresses in a wave-like fashion by the travel of 'start' and 'end of freeze' waves. Austenitic dendrite 'start' and 'end' waves travel in sequence, *i.e.*, the 'start' wave completes its travel to the centre of the casting before the 'end' wave begins, thus creating a semi-solid condition throughout the entire casting. Eutectic formation proceeds by the travel of 'start' and 'end' waves in conjunction, *i.e.*, as a narrow band. In each case the 'start' waves move through isothermal liquid." The incidence of these waves is modified by superheat, carbon equivalent and coal dust. The above constitute a very interesting contribution to a subject which warrants an extended study, both here and in the U.S.A., for it is fundamental to good casting production.

Scrounging for Scrap

In an effort to maintain production levels in the face of a widespread shortage of pig-iron, Walsall foundries are melting down metal railway sleepers and lamp posts, and are collecting farmyard scrap metal. Although many small consumers have not been hit by the shortage, some firms are staving off the threat of short time by what they call "scrounging round."

Rail delays are adding to the foundry manager's headache, and it is feared that the quality of some castings will suffer.

Mr. Norman Fox, joint managing director of Sydenham & McOustra, founders, has described the pig-iron shortage as terribly acute. He explained that the firm were breaking up old Diesel engines and obtaining old ploughs and outworn agricultural equipment from farms. His firm has purchased a quantity of metal railway sleepers, rented a field and engaged workers solely to break scrap. "There was no doubt that the railway sleepers saved us from shutting up," said Mr. Fox.

Miss L. Verity, secretary of the Walsall Chamber of Commerce, and of the National Association of Malleable Ironfounders, is gathering information from manufacturers of castings so that the Chamber can make representations on their behalf.

Employment Statistics

At April 16 the number of unemployed was 253,000, a decrease of 21,900 since March 12 and the lowest figure since last July.

The latest Ministry of Labour employment statistics provide fresh evidence of the redistribution of labour under the rearmament programme. In the basic industries as a whole, the number employed decreased by 5,000 during March, in spite of an increase of 2,000 in coal-mining manpower.

There were increases of 2,000 in the number employed in both the chemicals and allied trades and the metals, engineering, and vehicle groups. The total working population increased by 11,000, all of whom were women, to 23,225,000.

Record I.C.I. Sales

An increase of over 25 per cent.—from £174,600,000 in 1949 to £220,800,000 last year—in the consolidated sales of Imperial Chemical Industries, Limited, is reported in the company's annual report. Last year's sales reached the highest value in the company's history. Exports attained the record figure of £48,400,000, or 25 per cent. more in value than in 1949. The increase in total volume is estimated at 19 per cent.

The directors state that the year was notable for record outputs of many of the company's products, and that the benefits are now being felt of the production from new plants and extensions built under the post-war capital construction programme, a number of which came into operation for the first time during the past year.

Spray Equipment

Leaflets issued by H. T. Watson, Limited, Croft Street, Widnes, Lancs, are devoted to precision nozzles of different types for air conditioning, and spray nozzles for many other purposes, including metal cleaning and degreasing, cooling, descaling, rinsing, washing and gas-cooling.

Festival Foundry

In the gallery of the Machinery Hall at the South Bank Exhibition there is an exhibit designed to give to the layman an appreciation of ironfoundry practices. This has been done by installing at the right-hand side a Constructional cupola from the spout of which issues a good imitation of liquid metal filling a hand shank. Next, there is a cast-up mould with the runner still showing the red-hot "metal"—a clever contraption this. Then there is the cored-up mould ready for closing and finally the pattern and core boxes for a mincing machine. This exhibit has been arranged by John Harper & Company Limited of Willenhall and is a very creditable contribution to the exhibition. Adjacent to this is a big picture of a Stone's manganese-bronze propeller—a finished one is located elsewhere. On the ground floor, pressure die-castings are in production, but owing to an insufficient pressure, the castings show too much flash.

South Bank Route Map

In order that their members can assist drivers who do not know London too well to avoid the worst-congested areas as much as possible and to enter and leave the South Bank area when required to do so as directly and easily as possible, the London and Home Counties Area of the Traders' Road Transport Association have reproduced a special leaflet containing two maps. The first shows the main traffic routes whilst the smaller shows in greater detail the actual South Bank festival site vicinity.

The map is folded so as to fit conveniently into the driver's pocket. Supplies can be obtained from the area secretary, Traders' Road Transport Association, Limited, 146, New Bond Street, W.1, price 4s. per dozen post free. The minimum order which will be accepted is for half a dozen.

Avoidance of Wasters

Whoever wishes to see a good picture of the fires of Hell should witness this sight—

"The time-limit having expired and been announced by the time-keeper, the head-founder and master-workmen, attired in their clumsy felt dresses, open the mouth of the furnace with iron hooks, exclaiming 'Allah! Allah!' The metal, as it begins to flow, casts a glare on the men's faces at a hundred paces distance. The viziers and sheikhs, donning white shirts, sacrifice the sheep on either side of the furnace. The metal flows from channel to channel and prayers are said once again and so on till the end, when seventy robes of honour are distributed and increases of pay granted. The Grand Master of the Artillery gives a feast in honour of the Grand Vizier."—Extract from "In the Days of the Janissaries" (dealing with 17th century Turkish foundry practice), by Alexander Pallis (Hutchinson, 18s.).

Latest Foundry Statistics

The production of iron castings for the first three months of this year, according to figures issued by the Ministry of Supply, amounted to 927,476 tons, which includes 35,171 tons of malleable. At this level, the output over the first quarter of last year was increased by 46,733 tons, which means that the industry has been running at the record yearly production of 3.7 millions.

History and Development of Aluminium Silicon Alloys*

By E. Scheuer, Dr. rer. nat.

This Paper starts with the history of aluminium/silicon alloys from their first preparation roughly 100 years ago, to their first industrial application in 1920, utilising the enhanced properties produced by the modification treatment. Since that date, they have held an important position in the aluminium casting field owing to excellent castability, the last 30 years having seen the development of a family of alloys on the aluminium/silicon basis, supplying as much as 80 per cent. of the total aluminium alloy castings produced. The theoretical aspects of the modification process are dealt with in some detail, following with the development of other aluminium/silicon alloys combining the good casting properties of the eutectic alloy with better machinability and greater stiffness, of which DTD. 424 is the most popular example. Another group of alloys discussed is those which count among the strongest aluminium casting alloys existing, and which derive their high resistance to deformation from heat-treatment. Finally, the Author deals with special applications of aluminium/silicon alloys, including a group developed for pistons which exploits the low coefficient of expansion and high wear-resistance produced by silicon additions, and the few specific cases where aluminium/silicon alloys are utilised in the wrought form.

Introduction

There is a considerable attraction in the detailed study of the history of a single technical or scientific development as opposed to a general systematic study of a wide field.

The historic development of a special problem gives interesting examples of how scientific and technical conceptions proceed on their path from accidental laboratory observations or mere ideas to precisely described theories or reliably operating technical processes.

Further, the concentration on one single case offers an opportunity of getting a more lively and, as it were, a more fullblooded picture of the subject than can be provided in the textbook treatment necessary in order to cover a vast field in a short time.

The development of the aluminium/silicon alloys from a laboratory product to the diverse group of technical casting alloys which now are produced in many thousands of tons monthly has been chosen for this lecture, not so much because of their particular merits but because of the Author's association with their history, which makes it easier to trace the developments. The history of the aluminium/copper or aluminium/magnesium alloys would probably be just as interesting to follow.

But even in dealing with this limited subject there is need for restraint in the selection of the matter to be presented in this lecture because of the wealth of interesting features.

It was therefore decided, apart from giving the general history, to select two features for close consideration: on the scientific side the modification process and some other structural features, and on the technical side the heat-treated alloys. The detailed consideration of casting properties which is also very interesting will have to be left for other occasions, because it is too large a subject and also because it is very frequently discussed.

* Paper given to the Slough section of the Institute of British Foundrymen, Mr. R. B. Templeton presiding. The Author is chief metallurgist and head of laboratories International Alloys Limited, Aylesbury.

History

Aluminium/silicon alloys have been known according to literature for about 100 years. The first ones were prepared by the two founders of the science and technique of the metal, Wöhler and St. Claire Deville.[1] These alloys are reported to have contained at least 10 per cent. silicon and were produced from potassium silico fluoride by reaction with liquid aluminium.

Since 1891 and up to 1920, various authors* have made aluminium/silicon alloys with silicon contents up to points beyond the eutectic composition, partly by melting together aluminium and silicon, partly by simultaneous electrolytic reduction of aluminium and silicon from molten fluoride mixtures. Regarding the properties, they all report that the alloy up to about 10 per cent. is malleable and stronger than pure aluminium, and higher silicon additions produce rather brittle alloys. The strong embrittling influence of iron, if it is present in concentrations above about 1 per cent., is also reported.

Regarding the structure of the alloys there is little information available in these Papers. One micrograph produced by Vigoroux shows clearly what one would now call a modified structure with primary aluminium dendrites, in spite of a reported silicon content of 14.82 per cent.

Frilley[2] in a Paper dealing with a systematic survey of silicon alloys, points out that he found differences between aluminium/silicon alloys produced in the electrolytic cell and those produced by melting together aluminium and silicon. When an aluminium alloy containing 9 per cent. magnesium 2 per cent. silicon was made up using an aluminium/silicon hardener made in the electrolysis, he found an alloy with good strength and ductility. If the same alloy was prepared using aluminium/silicon alloy made by melting together the components, a brittle, useless alloy resulted. He also

* Minet A., *Comptes Rendus* (1891), 215; Minet, A., *Journal de l'Electrolyse* 1, 10, (1895); Vigoroux and Arrivaut, Procès verbaux de la Société des Sciences Physiques du Bordeaux, Nov., 1901; Fraenkel, W., *Z. Anorg. Chem.*, 58, 154, 1908; Frilley, *Rev. Met.* 8, 57 (1911); Roberts, *J. Chem. Soc.*, 105, 1383 (1914); Schirrmeister, *Stahl and Eisen*, 35, 875 (1915).

Aluminium Silicon Alloys

TABLE I.—*Mechanical Properties of Unmodified and Modified Aluminium/Silicon Alloy.*
Silicon content: 13 per cent. Sand cast test bars 12 mm. dia.

State.	0.2 per cent. Proof Stress tons per sq. in.	U.T.S., tons per sq. in.	Elong., per cent.	B.H.N. (10/500/30).
Unmodified	4.5–4.6	8.3– 9.5	1.5–2.5	50–55
Modified ..	4.9–5.4	11.4–13.9	4 –10	55–60

observed certain differences in the chemical behaviour of these alloys during analysis. To explain these differences he put forward the hypothesis that an aluminium/silicon compound is present in the electrolytic alloy where the components are brought together in the nascent state, whilst no such compound is formed by melting together the components. He concludes that as soon as one would be capable of deliberately producing this compound "industry will be in the possession of a metal endowed with the most interesting properties."*

Fraenkel[3] who first investigated the constitutional diagram of the aluminium-silicon series, did not find any compound, but his alloys were made by melting together the components.

On reading this Paper one can only admire Frilley's intuition. The observations on which he bases his conclusions are, in the light of present knowledge, without importance and might even be erroneous. So is his theory of the formation of an Al/Si compound. But the problem he posed to metallurgy: to produce deliberately the type of aluminium/silicon alloy which is formed in the electrolyte cell, is a real one, and this conclusion, derived from doubtful and unimportant facts and a wrong theory—namely, that this variety of aluminium/silicon alloys possesses properties interesting from the industrial point of view—is surprisingly correct.

In 1920, when Pacz invented the modification process, there was really not much known about the properties of aluminium/silicon alloys, and no industrial application of silicon as an intentional alloying component in aluminium alloys could be found by the author. It had been revealed in scientific papers that the aluminium/silicon alloys up to the eutectic composition (10 to 15 per cent. Si) combined strength with malleability, unlike the aluminium/copper alloys, malleability of which was much reduced as strength increased. They were as light as pure aluminium and were stated to be chemically resistant. Alloys up to 7 per cent. silicon were considered suitable for wrought products, and up to 10 per cent. suitable for cast products.[4 5 6]

The industrially important aluminium casting alloys up to that time were the 8 per cent. copper alloy similar to the present 3L11 and the 2 per cent. copper-12 per cent. zinc alloy similar to the present 3L5 or LM3 alloy.[7 8]

The beginning of the industrial development of the aluminium/silicon alloys proper was the discovery by A. Pacz[9] of the fact that the structure and properties of cast eutectic aluminium/silicon alloys can be profoundly altered by treating the liquid

* Regarding old literature, the Author found Zay Jeffries' Paper, *Chem. Met. Engg.*, 26, 750, 1922, very useful.

† Reduced linearly to about half size in reproduction.

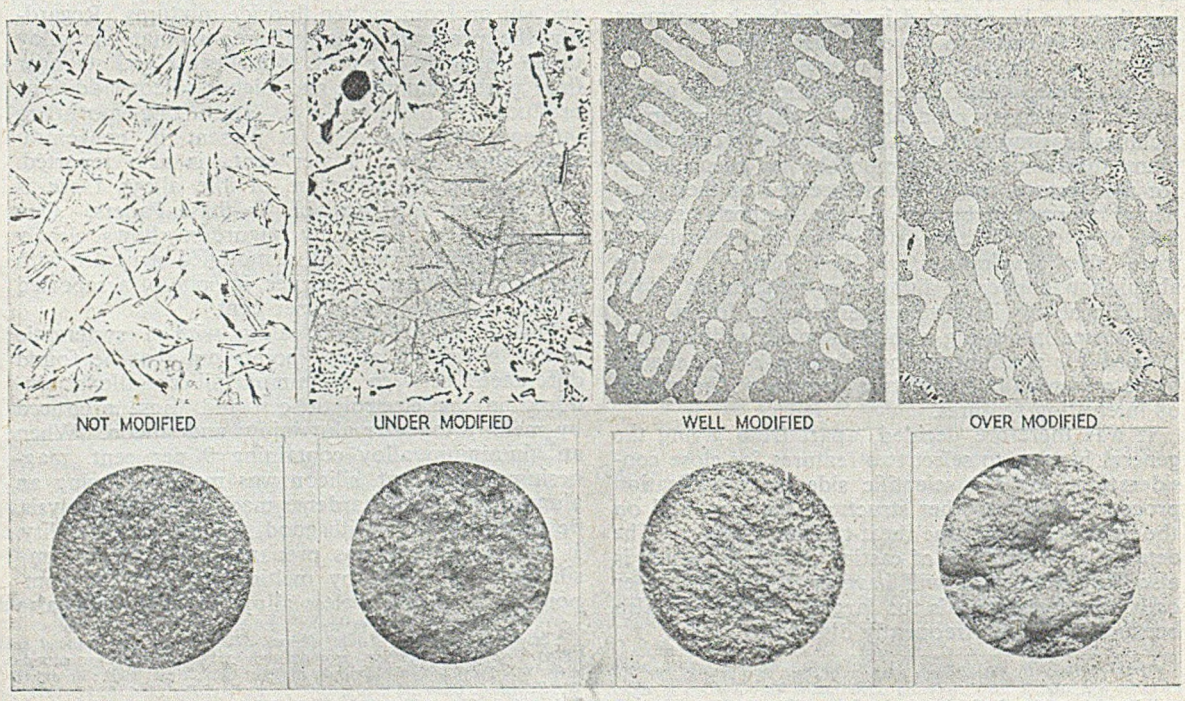

FIG. 1.—*Structure of Eutectic Aluminium/Silicon Alloys in Various Stages of Modification. Top row:—Microstructures* (×100).† *Bottom row:— Fractures (about natural size).*

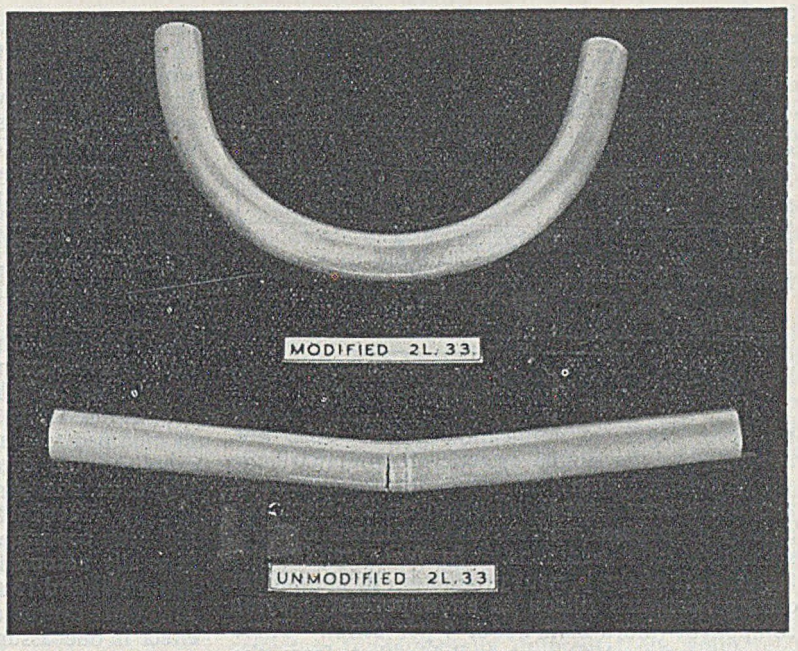

FIG. 2.—*Bend Test-pieces showing the Effect of Modification on the Ductility of Eutectic Aluminium/Silicon Alloy.*

metal before casting with certain fluorides, especially sodium fluoride. The extent of the improvement in structure is demonstrated in Fig. 1 and the change in mechanical properties in Fig. 2 and Table I.[10]

The technical qualities of the modified eutectic aluminium/silicon alloy were found to be not only equal to but better than those of the aluminium casting alloys in use at the time. Table II taken from a survey published in 1921[11] gives the mechanical properties of the two aluminium casting alloys then in general use, i.e., 8 per cent. copper alloy (now L11 type) and 2 per cent. copper-12 per cent. zinc alloy (now L5 type) in comparison with the modified aluminium/silicon alloy (now L33 type).* Both in tensile strength and elongation the aluminium/silicon alloy is the best of the three alloys. But there were other and still more important advantages. In actual foundry work it became clear that this new alloy had very much better casting properties than the known ones. It filled the most intricate and thin-walled castings without difficulty and was quite free from the foundry defects of hot shortness and leaking which occurred very frequently with the aluminium casting alloys then in use. It was confirmed in practice that silicon would not, like copper, considerably reduce the resistance of aluminium to corrosion. The alloy could, therefore, be recommended for purposes where the aluminium/copper and aluminium/zinc/copper alloys were unsuitable because of the danger of corrosion.

The metallurgists and the foundrymen got to work on the alloy and great efforts were made to understand and control the new modification process which was necessary to make the alloy useful, and to exploit its excellent casting properties. They are still busy after 30 years during which this alloy has achieved and maintained an important position in the range of aluminium casting alloys practically in the same form in which it was originally introduced. A very substantial degree of control over the modification process has been achieved during that period, and the advantages and limitations of the alloy have now become fairly clear.

In spite of many dozens of scientific investigations and much theorising, however, the nature of the modification process is not yet fully understood. As regards exploitation of foundry properties, these have been found to be so interesting that in order

* The present specification limits for the three alloys are added for comparison.

TABLE II.—*Comparison of Mechanical Properties of Modified Aluminium/Silicon Alloys with Normal Aluminium Casting Alloys in Use before* 1922. Sand Cast Test Bars.

Type.	Czochralski 1922.					Designation.	B.S. specifications.				
	Nom. comp.			Typical figures ½ in. unmachined.			Nom. comp.			Min. limits* A.I.D. bars 1 in. dia.	
	Cu.	Si.	Zn.	U.T.S.	Elong. per cent. on l=10 dia		Cu.	Si.	Zn.	U.T.S.	Elong. per cent. on 2 in.
Al Cu ..	8	—	—	7.5	1–2	4L11 ..	7	—	—	7 5	1.5
Al Cu Zn ..	2	—	10	9.4	2–4	3L5 .	3	—	13	9	2
Al Si ..	—	13	—	12.5	5–10	3L33 .	—	12	—	10.5	5

* Machined to 0.564 in. dia.

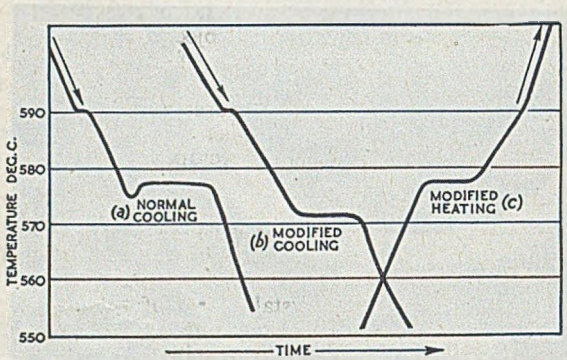

FIG. 3.—*Diagrammatic Cooling and Heating Curves for Hypo-eutectic Aluminium/Silicon Alloys.*

to cover fields of application which were not accessible to the simple eutectic aluminium/silicon alloy, a large family of other aluminium/silicon alloys has been created, all based on the improved casting properties imparted to aluminium by substantial silicon additions. In fact, by far the largest part of the present production of aluminium castings contains silicon as an important alloying component (more than about 4 per cent.). There are no statistical figures available, but from the statistical survey of the U.S.A. Bureau of Mines one can derive a minimum figure of 50 per cent. of the castings produced in the U.S.A. being aluminium/silicon alloys. The real percentage is, however, much higher, and is probably not far from 80 per cent. of all aluminium castings produced in the whole world.

It is proposed to describe first the work on the modification process and the structure of the modified alloy, then the developments and investigations concerning the improvement of casting properties by the addition of silicon and, finally, the way in which the mechanical properties of the original modified eutectic have been altered to meet the requirements for different applications.

Modification Process

Pacz's invention was taken up by competent and active organisations in U.S.A., Britain, France and Germany, and soon a considerable amount of scientific and technical information became available.

Confirming an assumption which suggests itself to any chemist when observing the reaction between the molten alloy and sodium silico fluoride and the subsequent increased oxidisability of the liquid aluminium in air, it was soon found by the Americans that metallic sodium added to the melt also produced the modification effect.[12]

It was further found by various observers that the modification effect disappeared gradually on prolonged standing of the liquid metal before casting, or on remelting. This was correctly interpreted as loss of sodium through oxidation by air. The analytical proof was only supplied much later.[13]

Another important observation, also made by the Americans, was that the eutectic arrest on freezing of the modified alloy was about 10 deg. C. lower than that of the normal alloy. However, on melting, the eutectic arrest of both states were at the normal temperature[14] (Fig. 3). This pointed to supercooling effects, but supercooling effects of a kind which had not previously been described. In the well-known normal case of the supercooling of metals, the lowered freezing point is only observed before crystallisation starts. Theory and observation agreed that as soon as crystallisation had started the inoculating effect of the first crystals produced would remove the possibility of further supercooling, and the temperature would rise again to the proper freezing point. The "sustained" supercooling of the modified aluminium/silicon alloys was interpreted by Scheuer,[15] Scheil,[16] and Thall and Chalmers[17] as a consequence of the rapid envelopment of the silicon crystals by the aluminium crystals in which they are embedded.

A difference in composition between the eutectic in modified and unmodified alloy was already indicated by the eutectic concentrations reported by Vigoroux and Arrivaut[18] (above 14.82 per cent.) and by Fraenkel[19] (10 per cent.). This difference has been confirmed since then, and the figures now generally accepted are 10.7 per cent.[20] for unmodified metal and 13 to 14 per cent. for modified metal. This shift can be easily explained as a supercooling effect if one assumes that silicon is the component which is subject to supercooling.

The structure and properties of the modified alloy are also produced by rapid solidification even when no sodium is present. In this case, too, the "sustained" supercooling is produced[21] and the eutectic concentrations shifted just as in the case of sodium addition. Thall and Chalmers[24] showed that the sustained supercooling, and consequently the small silicon grain and the shift of eutectic concentration can be explained as the consequence of rapid solidification on the basis of the relative heat conductivity and latent heat of fusion of aluminium and silicon.

There seems little doubt now that supercooling of the silicon crystallisation is the mechanism responsible for the modified structure. What remains to be explained is the way in which the addition of the modifying agent (Na, Li, etc.) produces this supercooling. It is about this point mainly that the battle of theories and experimental researches is raging. Many hypotheses have been suggested

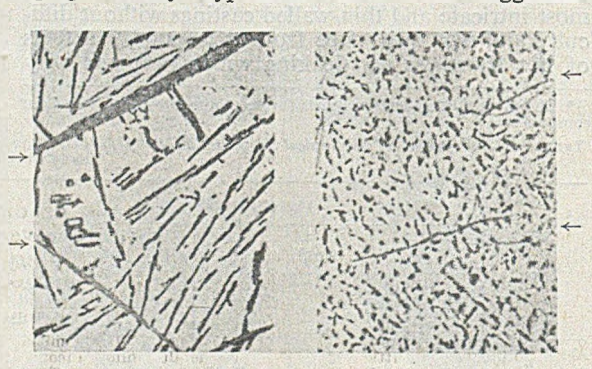

FIG. 4.—*Plate-like Crystals of Al/Si/Na Compound indicated by Arrows (after Scheil & Zimmermann). (a) (left) Unmodified alloy;* × 200. *(b) (right) Modified alloy;* × 400.

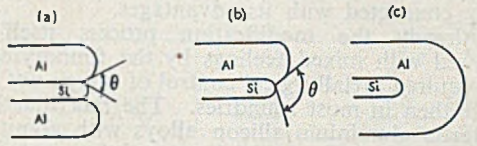

FIG. 5.—*Effect of Sodium on Aluminium/Silicon Eutectic Solidification (after Thall & Chalmers). Reduction of the Surface Tension of the Al/Si Solid Interface results in increase of the Angle θ, see Fig. 5(b). This favours the complete Sealing-off of the Silicon Crystal as shown in (c).*

and abandoned, others are still under critical examination.

Probably the first serious attempt at explanation which was put forward was based on the very limited solubility of sodium in aluminium.[22] The hypothesis was that the liquid sodium, when precipitated from the melt during cooling, forms a thin layer round the silicon crystals which separates them from the melt and prevents them from growing. Similar effects of colloid additions producing fine grain are known in electroplating. Some experiments with other eutectics supported this hypothesis, but the fact that a metal highly soluble in aluminium, namely lithium, produces a modification effect, is incompatible with it.[23] Further, it has been found lately that the " sustained " supercooling effect is absent in these analogous experiments.[24]

This hypothesis has been revived lately in a slightly different form. It had been suggested rather early that the silicon in modified form is different from the one in normal structure. This has been disproved by X-ray investigation.[25] There were, however, indications of various kinds pointing to the presence of a compound* of sodium, silicon and aluminium in modified aluminium/silicon alloys.[26 27 28] The existence of this compound has recently been established[29 30] (Fig. 4).

The suggestion put forward recently[30] is that this compound acts as protective shell to the silicon crystals in the same way as according to Gwyer's suggestion the sodium would do. The Author has considerable doubts as to the correctness of this hypothesis. The compound seems to be present in cases where there is no modification effect[31].

One of the latest hypotheses is that the effect of sodium consists in reducing the surface tension on the aluminium/silicon solid intersurface[32] (Fig. 5). This would automatically result in the more rapid inclusion or sealing off of growing silicon crystals into the growing aluminium crystals and therefore in the peculiar kind of " sustained " supercooling typical for the modified alloy. A positive proof of this effect of sodium on the surface tension of the solid crystals forming will be difficult to achieve.

The endeavour to find the clue to the mystery of modification, apart from producing all these hypotheses, has produced a considerable number of interesting investigations on subjects related to the problem, *e.g.*, on determination of small quantities of sodium, on the constitution of aluminium/sodium alloys, and on eutectic structures generally. This work will be of value in other respects owing to new and original methods developed and can only be mentioned here in passing.

Summing up the position as to the theory of the modification process, it is still only possible to guess as to the mechanism of the effect of sodium. What is known is that it leads to a sustained supercooling effect in the crystallisation of silicon.

Recently another important eutectic casting alloy, cast iron, has proved to be capable of undergoing an apparently similar modifying effect,[33] in this case the addition of cerium or magnesium produces this effect. The analogy is not yet fully established, but the fact that sustained supercooling has been observed makes it very probable.

A point, the meaning of which is quite obscure but which might still be found to have some importance, is that so far all the effective modifying agents: sodium, lithium, magnesium, cerium, are strongly reactive metals.

It should be emphasised that the modification effect is fundamentally different from grain refining effects as produced in aluminium alloys and other metals by addition of titanium, boron, zirconium, etc. These affect mainly or even exclusively the aluminium crystals, *i.e.*, the matrix of the structure, and are in all probability due to nuclei produced in the melt before and during the solidification of the metal. No supercooling effects are to be expected in these cases, nor have any been reported.

Other Structural Features

In an alloy which owes it properties to the fine structure of the modified aluminium/silicon type it was important to avoid introducing other coarse structural constituents. The deleterious influence of

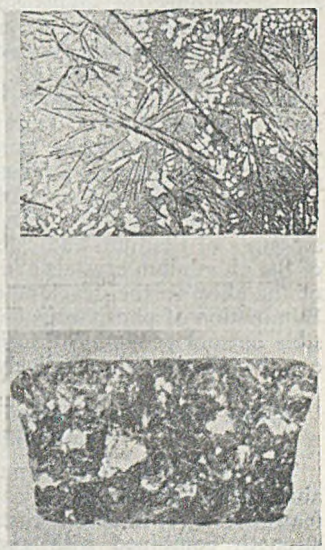

FIG. 6.—*Influence of Brittle, Plate-shaped Constituents on the Fracture of a Ductile alloy; Eutectic Al/Si Alloy, with 1.5 per cent. Fe; (a) (upper) Microstructure (×100), (b) (lower) Fracture (natural size). The Fracture occurs entirely through the Brittle Plates of the Fe / Al / Si Compound.*

* The Author would like to point out that he came across this compound many years ago without recognising it. The compound crystallises in thin brittle plates similar to the aluminium/silicon iron compound as shown in Fig. 4, and has the same deleterious effect on the mechanical properties. In the cases in question it was simply identified as the iron/aluminium/silicon compound, but the Author and his colleagues were surprised that the expected high iron content was not confirmed by analysis.

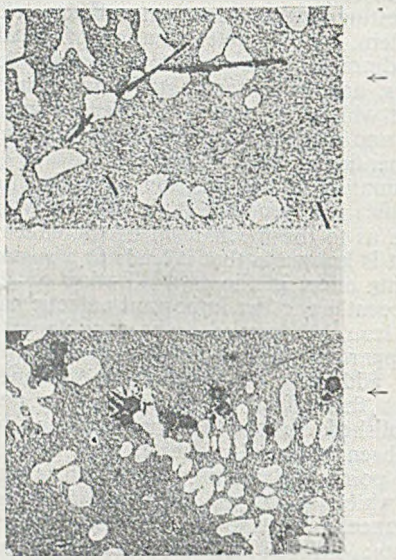

FIG. 7.—*Structural Compensation of the Iron Content. (a) (upper) Al/Si eutectic containing 1 per cent. Fe, Without Additions (×70). (b) (lower) Same alloy with 0.5 per cent. Mn altering the shape of the Iron-rich Crystals (×70).*

iron in aluminium/silicon alloys is due to the appearance of such a constituent which is generally given the formula Al_5 Si Fe, and which crystallises in large brittle plates (Fig. 6*a*). The fracture of an alloy with 1.5 per cent. iron is almost entirely through these plates (Fig. 6*b*) and as little as 0.6 to 0.8 per cent. iron produces an appreciable deterioration in the elongation (Fig. 6). Pacz found a brilliant means of overcoming this danger. He altered the nature and shape of this constituent by incorporating suitable amounts of manganese or cobalt in it (Fig. 7). Later chromium was found still more effective. This structural compensation method should be capable of application in other cases, but the Author is so far not aware of any.

In the course of the work aiming at full control over the modification process the influence of other small impurities has been discovered. Minute amounts of phosphorus have been shown by the Author to have strong influence on the crystal shape of silicon in the normal form and also the ease with which the alloy can be modified. Small amounts of titanium and calcium influence the size of the aluminium crystals and with this the tendency of the alloy to the development of local shrinkage. Elimination of phosphorus has only been made possible but not economical during the war[34]. Calcium can be eliminated effectively.

Other Aluminium/Silicon Alloys with Good Castability

The great and early popularity of the modified aluminium/silicon alloys was due mainly to two features:— (1) Excellent castability; (2) high tensile strength combined with good ductility. It was, however, recognised from the beginning that the alloy had also some shortcomings which are in a way connected with its advantages.

Already the modification process itself was viewed with mixed feelings by the foundrymen as it required metallurgical control of a type not available then in most foundries. The fact that hypo-eutectic aluminium/silicon alloys with about 5 to 7 per cent. silicon also had most of the good casting properties[35] and a good ductility without needing any special treatment was utilised in the introduction of this alloy which originally was called No. 43 and is now the 00.5 or LM.18. This alloy is suitable for decorative work and for corrosion resisting holloware.

Another limitation arises from the softness of the eutectic aluminium/silicon alloy. The high strength of the modified material is not due to high resistance to deformation, but rather to the high ductility which results in the fracture occurring considerably higher up the stress strain graph of modified material than of the unmodified material (Fig. 8). This effect, by the way, is satisfactorily explained as a result of the fine silicon grain. The proof stress of the aluminium/silicon eutectic is rather lower than the one of other casting alloys. Similarly, the fatigue resistance of the aluminium/silicon alloys is comparatively low.

Material of these mechanical properties is not always desirable in engineering work, where rigidity and high fatigue stress are very important requirements. Further, a soft alloy presents certain difficulties in machining, as it tends to be torn rather than cut by the tool.

The first attempt to combine the greater rigidity and better machinability of the known aluminium copper alloys with the castability of the aluminium/silicon alloys was made by Dix and Lyon[36]. Their aim was to find an alloy which was free from hot shortness and at the same time easy to machine and of reasonably good mechanical properties.

Knowing that the aluminium/copper alloys had a high proof stress and the aluminium/silicon alloys were free of hot shortness they simply experimented with copper and silicon additions in various proportions (0 to 6 per cent. and 0 to 9

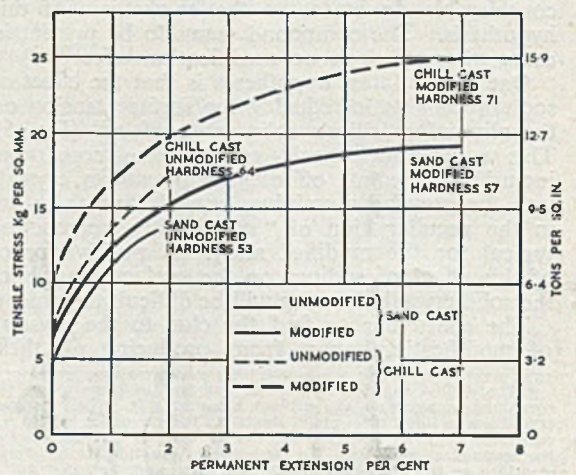

FIG. 8.—*Load-extension diagram of Alpax Castings for different Cooling Rates.*

TABLE III.—*Comparison of Modified Aluminium/Silicon Eutectic Alloy with Aluminium/Copper/Silicon and Aluminium/Copper/Zinc Casting Alloys.*
Sand Cast Test-bars.

Alloy.	Type of test-bars.	P.S., tons per sq. in.	U.T.S., tons per sq. in.	Elong., per cent.	B.H.N.	Fatigue limit, Woehler, tons per sq. in.	Reference.
2L33	A.I.D. ..	3.5–4	10.5–12	5–10	50–55	2.7	Intal. Tech. Inform. Sheet
DTD 424 (LM.4)	A.I.D. ..	4–6	9–11	2–3	65–85	6.4*	ALAR data sheet
Cetal	½ in. dia. ..		11–14	5–3	65–90		Zeerleder, 1934, p. 28

* 0.4 in. dia. bars machined to 0.330 in. dia.

per cent.* respectively) and searched for an alloy which combined the two advantages. They found a range of compositions which possessed the required combination of properties to a reasonable degree, and this was in the region 3 to 5 copper and 3 to 5 silicon. This range of composition is very near to the one which was revived immediately before the war and, during and after the war, became so very popular under the name of DTD.424. In the time between 1922 and 1939 this type of alloy was in use to some extent for permanent mould casting, and furthermore it was a custom with the founders to add a few per cent of silicon to any aluminium alloy which did cause difficulties in the foundry through hot shortness and shrinkage. A silicon-containing alloy of the copper/zinc type was also introduced on the Continent under the name of Cetal about 1925. It contained between 2 and 10 per cent. of zinc, 2 to 4 per cent. of copper, and about 6 to 8 per cent. silicon. Silicon (about 2 per cent.) was also added to the 4 per cent. copper casting alloy introduced in America under the designation No. 195 in the heat treated form, in order to reduce the very pronounced hot shortness of this alloy.

Alloys with Improved Mechanical Properties, especially those produced by Heat Treatment

Another way of making the aluminium/silicon alloys stiffer was to retain essentially the modified aluminium/silicon eutectic and incorporate in it small additions which were able to produce the properties required either with or without heat-treatment. The first addition of this kind was copper. An addition of about 0.8 per cent. had the effect of improving the hardness, the proof stress and the fatigue limit appreciably without heat-treatment and without changing the general character of the alloy. The machining of this harder alloy was, as expected, also easier than with the copper-free alloy (Table IV).

Better results were obtained with even smaller additions of magnesium. Magnesium in this alloy goes into solution in solid aluminium as magnesium silicide, which even with as little as 0.1 per cent. magnesium is capable of age hardening effects. Between 0.1 and 0.3 per cent. magnesium in sand cast test-bars already produces effects similar to 0.8 per cent. copper. The increase in fatigue limit is even considerably better than in the alloy with 0.8 per cent. copper. If these alloys are heat-treated by the normal solution and precipitation treatment the change in mechanical properties is profound. Instead of a soft and ductile alloy we obtain a high-strength alloy with elongation of the order of 1 per cent., which very generally speaking resembles cast iron rather than bronze in its mechanical behaviour. Whilst the magnesium content calls for slightly more care in the metallurgical treatment in the foundry owing to dross formation and slight metal mould reaction, these alloys are still free from hot shortness. This is of

* (With and without a small manganese addition.) Compare U.S. Pat. Pacz 1572502, Jeffries 1572489.

TABLE IV.—*Aluminium/Silicon Alloys with Higher Mechanical Properties. Sand Cast.*

Type.	Alloy.	Nom. comp., per cent. Cu	Mg	Si	Mn	P.S. Tons per sq. in.	U.T.S. Tons per sq. in.	Elong., per cent.	B.H.N.	Fatigue limit Woehler Tons per sq. in.	Reference.
Eutectic Alloys	BS. 1490 .. .. LM.6 } Modified 3L33 }	—	—	12	0.3	4.0	11.0	8	55	2.75	1
	Cu-Silumin	0.8	—	12	0.3	(6.0)	(11.4)	(3)	(60)	(3.5)	2
	Alpax-Beta	—	0.3	12	0.3	4.75	12.5	4.0	70	3.6	1
	Alpax-Gamma preceptn. treated	—	0.3	12	0.3	7.0	13.0	3.0	75	3.6	1
	Alpax-Gamma fully heat treated	—	0.3	12	0.3	15.5	18.0	1.0	105	4.7	1
Hypo-eutectic Alloys	BS. 1490. LM. 8. Fully heat treated	—	0.5	5	—	13	15	—	85–100	—	1
	Alcoa 356. T7. Fully heat treated	—	0.3	7	—	13.5	15	2	75	4.0	3
	Alcoa 355. T6.1. Fully heat treated	1.3	0.5	5	—	15.5	17.5	1	90	4.5	3
	BS. 1490. LM. 4. DTD. 424. Fully heat treated	3	0.1	5	0.5	16.5	17	0.5	125	(5.34)	4

1 A.I.D. Sand Cast bars 1 in. dia. machined to 0.564 in. dia. 0.1 per cent. Proof Stress, Elongation on 2 in.
2 ½ in. dia. bars, cast horizontally, unmachined or skimmed, 0.2 per cent. Proof Stress, Elongation on 11.3 a
3 ½ in. dia. bars, cast horizontally, unmachined or skimmed, 0.2 per cent. Proof Stress, Elongation 2 in.
4 Flat fatigue specimens cast from castings subjected to alternating bend test.

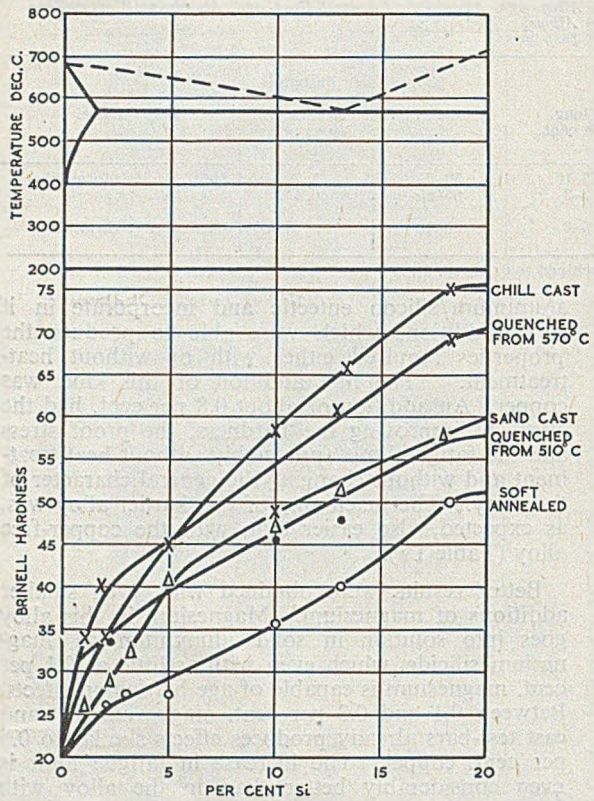

FIG. 9.—*Comparison of the Constitutional Diagram and Hardnesses of Aluminium/Silicon Alloys after Various Treatments.*

particular importance in the heat-treatment of castings. In the quenching process, if it is to be effective, considerable internal stresses are set up and partly retained after complete cooling and even precipitation treatment. These stresses can cause heavy damage to slightly unsound castings by extending otherwise insignificant hot tears so that they become visible and dangerous cracks. It has, therefore, been the practice to avoid quenching large and intricate aluminium castings made from alloys which tend to produce hot tears. These limitations do not exist in eutectic aluminium/silicon, and very large castings have been quenched in water without any difficulties arising from cracking.

Just as hypo-eutectic aluminium/silicon alloys were developed in order to avoid modification and render the production of certain castings easier, hypo-eutectic varieties of the heat-treated magnesium containing aluminium/silicon alloys have appeared, both in the U.S.A. and here. The U.S.A. varieties are No. 356, containing 7 per cent. Si, and No. 355 containing 5 per cent. Si, 1.5 per cent. Cu. The British variety is now known as L.M.8 and contains 5 per cent. Si.

It might be worth mentioning that plain aluminium/silicon alloys also respond to heat-treatment. The effect is due to the change in the solubility of silicon in solid aluminium which ranges from about 1.5 per cent. at 500 deg. to very low amounts at 300 deg. The changes in mechanical properties are not inconsiderable, as Fig. 9 shows. An interesting feature is that the fatigue limit of ordinary L.33 alloy is raised from about 3 to about 6 tons per sq. in. by solution treatment with or without precipitation treatment (Wöhler test). In the case of solution treatment only, this leads to a very ductile casting with a fatigue limit equal to that of high-strength alloys.

The heat-treated DTD.424 alloy also belongs to the field of the hypo-eutectic heat-treated alloys. Very high mechanical strength can be obtained by giving this alloy the normal solution and precipitation heat-treatment. The improvement is mainly due to the copper content. If magnesium is present, as it is very often from the duralumin scrap used in making up the alloy, the precipitation treatment can be replaced to some extent by natural ageing of 1 to 3 weeks' duration.

Even without solution heat-treatment the normal casting in this alloy shows a slow age hardening effect, according to the conditions under which it cooled after solidification.

Special-purpose Alloys

A property which is of no great importance in other fields was the main reason for the very general application of aluminium/silicon alloys in the field of pistons for combustion engines. When the engineers tried to use the lightness of aluminium in order to reduce the inertia stresses produced by the reciprocating movement of the piston, they found themselves faced with the difficulty that a cold aluminium piston in a cold iron cylinder has a larger clearance than a hot piston in a hot cylinder, because the aluminium alloys have about twice the coefficient of thermal expansion of cast iron. This led to difficulty in starting up engines with aluminium pistons. Eutectic aluminium/silicon alloys have 15 per cent. smaller coefficient of expansion than other aluminium alloys, a difference which seemed worth while to the piston engineers. Ordinary aluminium/silicon alloy was, however, not suitable for the conditions in the motor. An alloy with high hardness was required. Good surface finish in turning was necessary. Resistance to wear by gliding over the surface of the cast iron cylinder liner, hardness and proof stress had to be sufficient at elevated temperatures.

Two alloys on the basis of eutectic aluminium/silicon alloy were developed to meet their requirements. Both achieved hardness and machinability by addition of copper and magnesium simultaneously. The type favoured in Germany relied more on the copper, of which 4 per cent. was added. The type favoured in America, which eventually superseded the German type, had only 1 per cent. copper but somewhat more magnesium. Nickel, which since the work of Rosenhain has the reputation of increasing the mechanical strength at high temperatures, is present in both alloys.

One has gone even farther in reducing the coefficient of thermal expansion and developed hypo-eutectic casting alloys containing up to 22 per cent. silicon. They have a coefficient of expansion half-

way between those of normal aluminium alloys and cast iron, and equal to that of certain special cast-iron alloys which can be used for cylinder liners. The structures of these alloys, which, apart from magnesium, also contain additions like copper, nickel, manganese, cobalt, chromium, all producing hard inclusions, show a large number of primary silicon crystals embedded in a comparatively fine (not modified) complex eutectic. The important point in developing and handling these alloys in the foundry is to ensure that these primary silicon crystals are small and uniformly distributed. If large, they have a strong tendency to accumulate in the top of the casting. This aim can be achieved by rapid cooling and control of the composition, but so far only pistons up to passenger car size have been produced successfully and the alloys have never been really popular. They may now be abandoned altogether.

For inexpensive and easily manufactured pistons a hypo-eutectic piston alloy (as in the general casting field and in the field of high-strength alloys) is widely used, which is nearer to the silicon/copper ratio of 424, but contains magnesium as well.

Whether low expansion or good casting properties are the reason, the vast majority of motor vehicle pistons is now made in aluminium/silicon alloys. Only for very-high-duty pistons, especially in aircraft, the silicon-free "Y" alloy piston with its higher mechanical strength at elevated temperatures, is preferred. The properties of the silicon-containing piston alloys are summarised in Table V.

TABLE V.—*Aluminium/Silicon Piston Alloys.*
Chill cast.

Alloy.	Nominal composition.						Proof Stress tons per sq. in.	U.T.S., tons per sq. in.	Elong., per cent.	B.H.N.	Coeff. of therm. exp., deg. C. × 10^{-6}	Reference.
	Cu.	Mg.	Si.	Ni.	Mn.	Co.						
Lo-Ex*	0.8	1.2	12	2.5	—	—	17–19	19–20	0 –0.5	125–135	19	ALAR
KS.245*	4.5	0.7	14	1.5	0·8		10.9	12–13	0.2–0.3	115–135	20–21	Aluminium Taschenbuch, 1936
KS.280	1.5	0.5	22	1.5	0.7	1.2	10.9	10.5–11.8	0.2	120–140	17–18	
Hypo-eutectic 7Q5*	7	0.25	5.5	0.3	0.3		18–21	19–22	0–1	130–150	22	ALAR

* Fully heat-treated.

Wrought Alloys

Aluminium/silicon alloys have not gained any considerable importance in the form of wrought articles. The alloys up to eutectic silicon contents can be easily extruded, rolled and forged. But the properties of the alloys in this form are by no means better than the ones of alloys based mainly on aluminium crystals containing dissolved Cu, Mg_2Si or Mg_3Al_2. Nor are the magnesium containing heat-treatable aluminium/silicon alloys attractive for wrought products. Small quantities of eutectic aluminium/silicon sheet have been used by the chemical industry as aluminium/silicon alloys are more resistant than pure aluminium to certain chemicals (acetic acid, fatty acids).

Only one wrought aluminium/silicon alloy, Lo-Ex, has been used extensively in this country and Germany in the form of forged cylinder barrels and pistons.

Conclusion

This is the story of the aluminium/silicon alloys up to the present time. Each technical and scientific idea follows its own individual line of development, yet one can still point out in this story some features which occur fairly frequently and should be noted.

First aluminium/silicon alloys were known for a considerable time without being applied technically, but only after the invention of Pacz were they equipped with properties sufficiently attractive to arouse technical interest. As soon as the interest was aroused, however, it did not limit itself to the particular alloy to which this invention applied.

Second, the merits of the modification process, high as they are, were not in the end the ones which conquered the widest field for the aluminium/silicon alloys. The casting properties proved to be more important still and they were essentially independent of the modification process.

Third, a property which at first was given little consideration, *i.e.*, the thermal expansion, opened a further large field of application for the aluminium/silicon alloys.

Fourth, the modification process as a new metallurgical phenomenon, has proved to be a stimulating subject for research. From this work valuable scientific methods and results of significance beyond the original problem have issued. Similarly, the fact that the aluminium/silicon eutectic possesses excellent casting properties started research work on the connection of eutectic composition and casting properties.

Fifth, another process analagous to the modification has been discovered and found useful in the field of cast iron.

Acknowledgment

The Author is indebted to Mr. J. Wood, M.Sc., for helpful criticism, and he thanks the directors of International Alloys, Limited, for permission to publish this Paper.

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(*References concluded on page* 578)

Income Tax for the Individual

Particulars of Current Rates

By Fred J. Tebbutt

This article is to show at a glance the position of the individual taxpayer in respect of income tax, for current application, account having been taken of the new poundages, allowances and so forth, contained in the 1951 Ways and Means Resolutions (Budget) to be included in the Finance Act 1951, when the Bill becomes an Act. For Schedule D (Business profits; Persons on own account) the new provisions will apply in relation to income in year ending April 5, 1951, or earlier date according to the financial year ending date of the firm concerned (*e.g.* December 31, 1950), the tax arising therefrom being payable in two equal instalments on January 1 and July 1, 1952. For Schedule E (Employments; Pay as you earn) the new provisions apply against current earnings from April 6, 1951, but effect was not given to them until May 25, 1951.

Speakers and writers often allude to income tax as if the rate for all taxpayers is the standard rate. But of course there are three rates, two "reduced" rates and the "standard" rate. The lowest operates on the first £50 of "taxable income" (Note: "taxable income" is total income less the "personal allowances," of which more later), then another "reduced" rate applies, being on the next £200 of taxable income, and only then does the "standard rate" come "into the picture," operating against anything over £250 taxable income.

The chief "personal allowances" are now, "earned income" allowance one-fifth (this applies up to £2,000 p.a., thus a maximum deduction of £400 off total income); for each individual £110; for wife £80, now changed from £70 (thus for man and wife £190 instead of formerly £180); for each child £70 (changed from £60). Incidentally, the child's allowance is greater than it has ever been. But against these slightly increased deductions, the tax poundages have been increased, so that now the lowest rate is 3s. (increased from 2s. 6d.) on the first £50 of taxable income, the next rate 5s. 6d. on the succeeding £200 of taxable income (increased from 5s.), and the standard rate now becomes 9s. 6d. (changed from 9s.).

How Different Classes of Taxpayers Stand

Whether income is investment or earned income, exemption from tax paying applies unless total income exceeds £135 p.a. Now note the following points:—

If income is all earned, no tax is payable by a single person unless total income exceeds £137 10s. 0d.; by a man with wife unless income exceeds £237 10s. 0d.; by a man with wife and one child £325; by a man with wife and two children £412 10s. 0d.; and by a man with wife and three children £500, the deduction of the appropriate personal allowances leaving for any such person, taxable income "nil."

Now, take the question of standard rate paying; if the total incomes of the five classes as above, do not exceed the figures now about to be given, only the two reduced rates apply. For instance, suppose the income of a single person is £450; of a man with wife £550; of a man with wife and one child £637 10s. 0d.; of a man with wife and two children £725; and of a man with wife and three children £812 10s. 0d., the deduction of the appropriate personal allowances leaves for any such taxpayer a taxable income of £250, so the tax in each case payable is £62 10s. 0d. (£50 at 3s., £200 at 5s. 6d.). It will thus be seen that only when the figures given are exceeded does "standard rate" of 9s. 6d. apply, that is to any amount of taxable income in excess of £250.

If the total incomes of the five classes mentioned do not exceed £200, £300, £387 10s. 0d., £475, £562 10s. 0d. respectively, only the 3s. rate applies, incomes of these figures giving a taxable income of £50, when the personal allowances are deducted, thus in each case the tax payable would be £7 10s. 0d. (£50 at 3s.).

Further Useful Points

It should be noted that in working out the figures above, only the "personal allowances" given earlier, have been taken into account. If any taxpayer is eligible for any other personal allowance (there is a conditional housekeeper allowance of £50; also dependant relatives allowance of £50) then of course in these particular cases the figures might be slightly different. There are also "wear and tear allowances" for machinery and plant (this term is widely used, including motor vehicles and fittings and fixtures) which would apply similarly, so that in such cases the taxable income would be lower, and the limits of income correspondingly higher than the marginal figures given.

With the standard rate raised, the top rate of Sur-tax chargeable for 1951-52 on incomes over £20,000 has been reduced to 10s. in the pound to prevent the combined top rate (income tax and sur-tax) exceeding 19s. 6d. in the pound. If the wife has earned income that attracts the one-fifth earned income allowance as well as the man's, there is also a special allowance of four-fifths of such income, up to a maximum of £110. This is additional to the £80 included in the husband's personal allowance of £190 for any income (*i.e.* for a married couple).

THE TOTAL SHARE CAPITAL of Joseph Evans & Sons (Wolverhampton), Limited, which first began the manufacture of pumps in 1810, has been acquired by the Pulsometer Engineering Company, Limited, Reading. Each organisation will continue to operate separately.

In combination, production will be speeded up, efficiency increased, and developments kept abreast of all modern requirements, providing jointly a comprehensive range of reciprocating, centrifugal, turbine, and vacuum pumping plants, together with refrigerating and water-purification installations.

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I.B.F. Conference Works Visits

Establishments in the north-east to be visited during the Newcastle-upon-Tyne Conference of the Institute of British Foundrymen, June 12 to 15

(*Continued from page* 546)

R. & W. HAWTHORN, LESLIE & COMPANY, LIMITED, NEWCASTLE-UPON-TYNE

THE ST. PETER'S ENGINE WORKS of R. & W. Hawthorn, Leslie & Company, Limited, which are to be visited by the members, are situated on the north bank of the river Tyne about one mile downstream from the bridges at Newcastle-upon-Tyne. The present site of some 19 acres was acquired in 1870 for the purpose of extending the marine-engineering side of the business which had commenced in the year 1820 with the building of several small sets of engines for fitting on board steam-packets running on the river. Since 1870, the history of the establishment has been one of consistent development. For instance, in the last few years, this firm has taken a prominent part in the research into the burning of low-grade fuels, including boiler oil in Diesel engines, for which purpose a test plant has been continuously in operation since 1945.

The company are licensees for the manufacture of all sizes of marine Diesel engines of the Doxford, Sulzer, and Werkspoor types. The variety in size and design of these engines provides a suitable and economic form of propulsion for all types of ocean-going vessels. Furthermore, in many cases their design is such that they are readily adaptable for the burning of low-grade fuels. The Doxford engine is a 2-stroke engine incorporating the opposed piston principle, and, due to the comparatively low revolutions at which it is designed to operate, it offers an extremely efficient direct drive propulsion unit for practically all types of vessels. The Sulzer engine, a 2-stroke single-acting crosshead design with either 600 or 720 mm. diameter cylinder bore, produces a range of power to cover ships of all sizes. In addition, Sulzer designs provide a wide choice of both 4 and 2-stroke trunk piston engines. The third type, the Werkspoor engine, is a 4-stroke single-acting engine with under-piston supercharge and has proved its reliability over many years of service and is eminently suitable for vessels of moderate horse-power.

The building of turbine machinery by the company dates from the year 1910 when the torpedo boat destroyer, H.M.S. Zulu, was built and engined for the Admiralty.

From this most successful beginning, there has been built up in these works an organisation with the necessary plant and technique for the construction of this class of machinery and for the progressive incorporation of all the developments which have taken place in the last 40 years aimed at greater efficiency, reliability, and economy. Actually, a total of 1,335,500 s.h.p. has been built since the beginning of the second world war. In the field of research, the company is a founder member of the Parsons and Marine Engineering Turbine Research and Development Association (P.A.M.E.T.R.A.D.A.), and is thereby fully informed of all developments in turbine propulsion. In particular, by its membership of the Association, the company is taking part in the research into the possibilities of the gas turbine for marine use, for which purpose the Association have under construction an experimental unit.

FIG. 6.—*General view of the Foundry of R. & W. Hawthorn, Leslie & Company, Limited.*

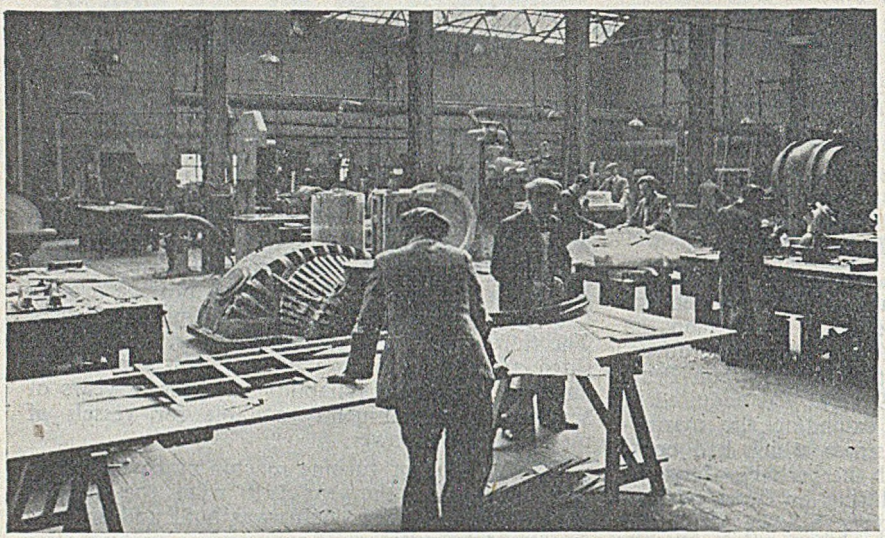


FIG. 7.—*Pattern shop of R. & W. Hawthorn, Leslie & Company, Limited.*

In addition to the other main lines, the St. Peter's works are equipped to produce the most modern boilers of all types for both marine and land use, including the Foster-Wheeler and Yarrow types which are examples of the most modern practice and efficiency in their high working pressures and superheat temperatures. Condensers of all sizes for both marine and land work are also built.

Shops to be Visited

The various shops to be visited severally by the members are as follow:—

Foundry

The foundry, which supplies most of the castings to the works, is partially mechanised and has a main bay 320 ft. long. Approximately 50 per cent. of the iron, gunmetal, and aluminium castings produced are machine-moulded. A controlled ventilating system and gas-fired space heating have been recently installed. The adjoining chemical and metallurgical laboratory includes in its equipment a 50-ton testing machine. Patterns are made in a large well-lighted patternshop equipped with the latest types of woodworking machinery. Views of both foundry and patternshop are shown in Figs. 6 and 7.

Boiler and Welding Shop

The machinery in this shop has been completely modernised so as to provide complete welding equipment for the construction of fabricated parts now increasingly used for marine machinery, including turbine casings, gear cases, condensers, Diesel engine bed-plates, columns, and other principal parts. The re-equipment includes the provision of a large gas-fired stress-relieving furnace and a shot-blast plant. Full provision for the moving of the extra weight required under modern conditions is made by the use of powerful overhead travelling cranes.

Valve Shop

Many of the castings produced in the foundry proceed to the valve shop for machining and fitting. Large quantities of valves are built for other shipbuilding and engineering concerns.

Machine Fitting and Erecting Shops

These shops, being the focal point of so many of the activities in the works, are the subject of continuous modernisation.

The shops are served by a number of overhead travelling cranes capable of lifting up to 120 tons and large concrete test beds are installed in the erecting shop for the full power testing of Diesel engines by means of the latest type of dynamometer. Equally efficient facilities are also available for the steam testing of turbines. The associated coppersmiths' shop, brassfinishers' shop, blacksmiths' shop, and forge include in their equipment a range of modern hydraulic pipe-bending machines and pneumatic hammers. The manufacture of turbine blading to a very high standard of accuracy is an important feature of modern turbine design and, in the blade shop, special study has been made of the equipment and control necessary to achieve this end.

NOBLE & LUND, LIMITED, FELLING-ON-TYNE

The Noble & Lund firm of machine-tool manufacturers was established in Newcastle-upon-Tyne in 1886 in a small way by Mr. Harry Noble, an experienced machine-tool designer, and Mr. Pearson Lund, a practical machine-tool engineer. In 1894 the business had progressed to such an extent that more room was necessary and the firm moved to new premises at Felling-on-Tyne. It is on this same site that gradual expansion during sixty-five years to a floor space of some 100,000 sq. ft. has raised the number of workpeople employed from 12 to about 500, producing a large variety of machine tools for delivery to almost every country in the world. During these long years of experience, the tendency has been to equip the works to build the largest sizes of machine tools and, by cutting out some of the smaller lines, to give more attention to the design and construction of those specialities.

The chief products are heavy machine tools for steelworks, marine engineers, and heavy-engineering shops. These include planing machines, lathes, plano-milling machines, ingot trepanning machines, ingot parting machines, and railway-shop machine tools. A special line of the famous "Fluifeed" cold-sawing machines is manufactured in these works. These machines are made in sizes with from 11 to 72 in. dia. blades and have been supplied all over the world for cutting steel and non-ferrous metals. One of these machines is shown in Fig. 8.

Foundry Work

Patterns for all castings used by the firm are manufactured in a patternshop where a large variety of work is undertaken. The foundry itself produces all the iron castings used by the firm and is capable of an output of about 2,000 tons of high-quality castings per year. Green-sand and dry-sand moulds produce castings weighing from a few pounds to about 20 tons, the work being of a jobbing nature due to the variety of machines manufactured.

The heavy machine shop is, naturally, equipped mainly with the company's own lines in machine tools. The planing machines, one of which is shown in Fig. 9, include those capable of machining jobs up to 10 ft. wide and 40 ft. long, whilst a heavy-duty chuck lathe will swing 15 ft. and a double-ended screw cutting lathe takes shafts up to 60 ft. long. Another machine shop deals with all the lighter type of work employing a large number of various types of lathes, slotting, milling, shaping, and grinding machines. The gear-cutting department produces gears up to 8 ft. 9 in. dia. by both the rack-cutter and pinion-type cutter generating machines. Bevel, spur, worm, and double helical gears are produced and a tooth rounding machine is to be shown in use.

The saw department undertakes reconditioning and sharpening of circular-saw blades, and brazing, setting and sharpening of bandsaw blades. "Fluifeed" sawing machines in use include the dual-purpose machine, the main feature of which is that idle time is eliminated by the provision of two tables and vices, so that work can be set up and clamped on one table while work is being sawn on the other. The light fitting shop is engaged wholly in the production of "Fluifeed" cold sawing machines from the 11 to 16 in. dia. blade to 24 to 28 in. blade sizes as well as automatic saw-sharpening machines. All the remainder of the firm's products are assembled in a large erecting shop.

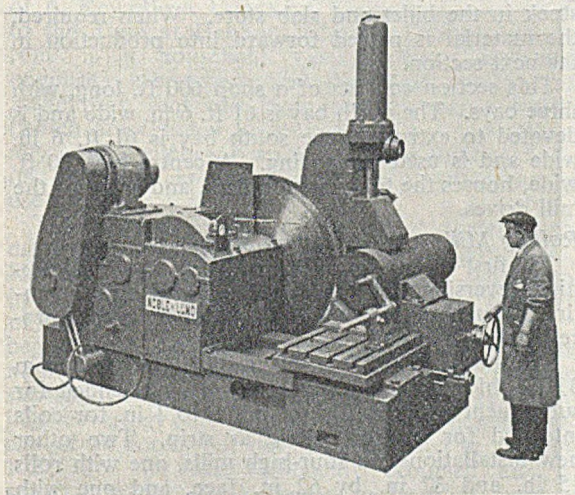


FIG 8.—*Large Circular Sawing Machine made by Noble & Lund, Limited, fitted with a 60-in. dia. Blade.*

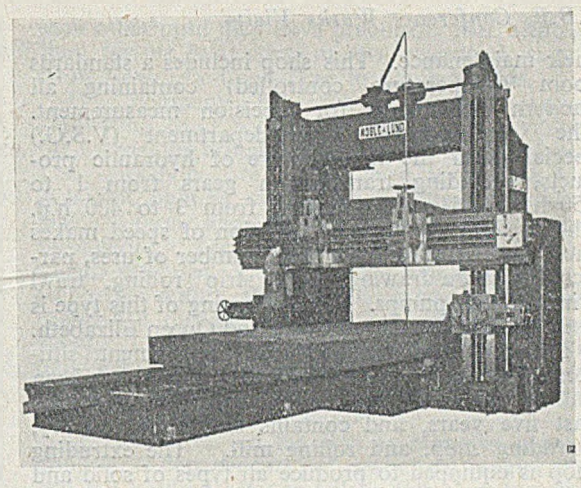


FIG. 9.—*13-ft. wide Planing Machine manufactured by Noble & Lund, Limited, weighing about 135 tons.*

The visit by members of the Institute of British Foundrymen to this compact factory will allow sufficient time to visit all departments and study the processes in the manufacture of machine tools. The largest machine under construction will be an ingot-parting machine designed to part the ends from ingots weighing up to 250 tons.

VICKERS-ARMSTRONGS, LIMITED, ELSWICK AND SCOTSWOOD WORKS

The Elswick and Scotswood works of Vickers-Armstrongs, Limited, extend for approximately two miles on the north bank of the river Tyne, and cover an area of over 125 acres. The Elswick works has a world-wide reputation for the manufacture of hydraulic machinery, but nowadays almost every class of general engineering product is undertaken, including clearing-type presses of all-welded construction and a whole range of printing presses up to newspaper size. The machine tools installed cover a wide variety of general-purpose and specialised machines of the latest precision types, including some of the largest vertical boring machines and plano-milling machines in the country.

The iron and steel foundry is 750 ft. long divided into three bays, and is fully equipped for both metals. The fettling of castings is carried out in separate shops at a lower level. An important section of the works is the tool room, which is responsible for the preparation of jigs and fixtures and

their maintenance. This shop includes a standards room (temperature controlled) containing all modern instruments for precision measurement. The variable-speed gear department (V.S.G.) specialises in the manufacture of hydraulic products, including transmission gears from 1 to 250 h.p. and pumps ranging from 3 to 400 h.p. The capacity for infinite variation of speed makes these very suitable for a large number of uses, particularly wire-drawing, cold strip rolling, trawl winches, and pumps. V.S.G. stearing of this type is used on both the Queen Mary and Queen Elizabeth.

The cast- and wrought-metals department, situated at the west end of the Elswick works, has been entirely reconstructed and re-equipped over the past five years, and contains the brass foundry, extruding shop, and rolling mill. The extruding shop is equipped to produce all types of solid and hollow rod and sections, a speciality being hollow rod for the ball-bearing industry. The rolling mill is equipped with mills of the latest design, two of which are driven by V.S.G. hydraulic units. It produces the wide variety of rolled sheet and strip in copper and brass for home and overseas markets.

Non-ferrous Works

Much of interest to the foundrymen visitors will be concentrated in the non-ferrous section which is described in some detail in what follows:—

The early buildings were of stone, timber, and cast iron and these were demolished to make way for the modern steel-framed buildings now housing some of the most up-to-date equipment in the country for casting, rolling and extrusion of copper, brasses, and bronzes.

When these alloys were first cast and wrought at Elswick is obscure, but it is known that casting, rolling, and forging of brass for use in the company's products was in progress at the end of last century. Not long after, an extrusion press was installed and, with some modifications, was in operation until 1947. A second press was in use during the 1914-1918 war and rolling mills were laid down together with the necessary casting shops, principally for cold-rolling of cartridge metal.

The change from war- to peace-time production after 1918 affected all shops in the brass department. The foundry added aluminium-alloy castings for the motor-car industry to their output at this period.

In 1928-1929, electric-induction melting furnaces were introduced. They replaced the coke- and oil-fired crucible furnaces. In 1929, a new 1,000-ton extrusion press was erected with improved facilities for making extruded tubes. This led to the concentration of the brass department in a group of shops at the west end of Elswick works.

The outbreak of war in 1939 enforced a postponement to the execution of planned extensions, but, before the end of the war, the broad outline of the scheme had been completed. Demolition began in the foundry in the spring of 1946. Now the transformation is complete with the last items of plant installed and working.

In planning the grouping of shops and layout of equipment, full advantage has been taken of the space available, despite the limitations of the site, to achieve a straight-line flow of production from raw materials to finished products. The metal stores have been placed to serve the needs of both the sand foundry, to the west, and the electric-melting shop, to the east. From here the billets and slabs pass through an intermediate stock store to the extruding shop and rolling mills respectively.

Non-ferrous Foundry

The foundry is in four bays, intended for green-sand moulding and coremaking, light dry-sand and heavy dry-sand moulding and for the cleaning and dressing of castings. The sand, delivered by rail into bunkers on the north wall, is prepared in a sand-preparation plant in the middle of the shop. The cores and dry-sand moulds are dried in modern, gas-fired stoves at the west end. Close by is the casting site for heavy castings, with pits for large moulds and long liner moulds. An automatic shake-out dislodges the castings from the moulds, the sand passing back to the sand-preparation plant, while the castings go to the shot-blast and return along the north bay, by way of the cleaners and dressers, to inspection and despatch sections.

Metal is melted in oil-fired, tilting, crucible furnaces. At the east end of the middle bays, an area is devoted to chill casting of gunmetal and phosphor bronzes into solid or centrifugally cast cored bars. Here, also, is a 10-cwt. capacity Birlec rocking-arc furnace, for melting copper hardener alloys and other high-melting-point products.

To the east of the stores is the electric melting shop, with three 150-k.v.a. and nine 75-k.v.a. Ajax Wyatt low-frequency induction furnaces. Mounted in front of the furnaces are copper-lined water-cooled moulds, for casting the shapes and sizes to meet the programmes of the presses and mills.

The material is cut to the appropriate lengths and awaits the result of the control analysis while in stock in the billet and slab store. When required, the material is passed forward into production in the next section.

This section consists of a shop 600 ft. long, with three bays. The north bay is 61 ft. 6 in. wide and is devoted to extrusion, the south bay is 61 ft. 6 in. wide and is used for rolling. A centre bay, 30 ft. wide, houses the tool room, offices, and some of the mill drives.

Rolling Mills and Extruding Shop

The first unit in the rolling mill is a powerful, two-high, reversing, hot breaking-down mill, and the entire throughput of the mills undergoes its first processing on this mill.

The metal rolled on this mill is reduced from 3¼ in. thick down to ¼ in. for blanks intended for subsequent sheet rolling, or down to ⅛ in. for coils intended for further rolling as strip. Two other new installations are four-high mills, one with rolls 15 in. and 37 in. by 62 in. face, and one with rolls 7½ in. and 18 in. by 18 in. face.

A combined annealing and pickling unit for sheet and strip is in use. Other mills deal with hot rolled sheet and the temper rolling of sheets and strip is

carried out on two-high mills. There are also large gas-fired annealing furnaces with an electric charging machine.

In the extruding shop there are two presses, one of 1,000 tons and one of 1,500 tons capacity. On the larger press the maximum solid rod made is 6 in. dia. and maximum hollow rod is 6 in. o.d. by 4¾ in. i.d. Water is supplied to the presses at 3,000 lb. per sq. in. pressure from a pneumatic-hydraulic accumulator. The presses operate at the rate of about 30 extrusions an hour on solids and 20 to 25 on hollow rods. The larger press was built at Elswick works. The output from the presses is further processed according to requirements. Inspection is strict at every stage, and a very high standard, both material and dimensional, is demanded of the finished product.

Ancillary Buildings

Two blocks of ancillary buildings are divided from the main block of buildings by a wide road carrying the railway. One block includes a metal store, metal recovery plant (where furnace dross and ashes are treated for the recovery of metal), and the ablution building. The latter, in addition to the usual washing fountains, includes shower-baths and clothes lockers. This allows the men to change into work clothes on arrival and, at the end of the shift, to bath and change into clean clothes, leaving their work clothes in their own lockers. There is a well-equipped ambulance room, with skilled attendance night and day.

The other ancillary block includes the sub-station, pump house, and millwrights' shop. A uniform system of decoration has been followed throughout and the shops are all well lighted, heated, and ventilated.

A. REYROLLE & COMPANY, LIMITED, HEBBURN-ON-TYNE

Another of the factories to be visited by the foundrymen is the well-known switchgear works of A. Reyrolle & Company, Limited, situated close to the Tyne at Hebburn, County Durham. Reyrolle is a household word amongst electrical engineers everywhere and the great quantity of switchgear sent out from the company's works (which are claimed to have a greater output than any other switchgear works in Great Britain), finds its way into every country where switchgear is used.

The beginning of this important undertaking dates back to June, 1886, when the late Mr. A. C. Reyrolle established a small switchgear workshop in London. Fifteen years later, in 1901, removal of the firm to Hebburn as a "limited company" began what has proved to be one of the most notable developments in the whole district. Work started in two or three existing single-storey buildings covering only a small part of the available site of 5½ acres; but business expanded so that in 1922 this site was sufficiently occupied and a separate second works began to be built upon a new site of 4½ acres not far away. Further growth has been such that factories and offices now occupy about 43 acres, and the extensions have caused the original works and the 1922 works to approach each other until they have practically met, although they lie on two sides of the electrified railway from Newcastle-upon-Tyne to South Shields.

The company has other occupied ground amounting to 3 acres and further land available for extensions bringing the total up to 107.5 acres. The workshops are of the most up-to-date kind in layout, lighting, ventilation, and heating, and the machine-tools and other equipment are modern throughout. Very adequate canteens, with electrically-operated kitchens, are available for all employees within the Reyrolle grounds, and comprehensive medical and welfare services are provided. The total floor-area of the industrial buildings is 920,000 square feet; and the number of employees, which was 10 at the start, and only 58 in 1901, is now about 7,000.

Reyrolle have led the way as pioneers in many important departments of switchgear-engineering and the kindred arts, and their influence has been a preponderating one in the growth of the switchgear-industry as a whole. The company have played a large part in the development of a great variety of protective-systems; and special mention should be made of their adaptation of switchgear to the almost overwhelming stringent requirements of work in coal mines and other places where open sparking might lead to disaster. Flameproof joints, with wide machined flanges, were first designed and developed by them about the end of the first decade of the century, and their provision of boiler-plate switch-tanks in addition has made mining switchgear one of the sturdiest products of the industry.

Possibly their greatest pioneering effort, however, leading to the greatest achievement, was the devising and establishment of metalclad draw-out switchgear. It was in 1906 that the first metalclad draw-out circuit-breaker was put into commercial use, and sheer persistence in what was often enough a very lonely advocacy of the new type was followed eventually by its adoption by more and more other manufacturers.

Reyrolle have kept well abreast of modern requirements and now make open-type switchgear in all economical sizes up to 275 kv. They supply many 132 kv circuit-breakers for the British grid: and have developed a range of circuit-breakers with an oil-content considerably less than that of metal-clad switchgear, as well as a range of air-blast circuit-breakers.

Research and Testing Facilities

It must be obvious that such progress has not been achieved without intense study of the technical problems bound up with the activities of the industry, and the Reyrolle facilities for research and testing include both well-equipped laboratories and a short-circuit testing station. The laboratories contain equipment for heavy-current work; (such as heat-tests and heavy-current development-work in connection with protective-systems); impulse-voltage testing of insulation from a 2,250 kv impulse-generator with a cathode-ray measuring-device; duration-tests of insulation at 150 kv and lower voltages, Schering-bridge tests up to 200 kv, other high-voltage tests up to 600 kv; X-ray examination of

FIG. 10.—*General view of one of the Power-station Switchgear Erection Bays at A. Reyrolle & Company, Limited.*

insulation and other materials; tests of relays, instrument-transformers, and such other activities as acceptance-testing of insulating-materials on their receipt at the works. Chemical and physical laboratories are used for research on new materials and for testing materials already in use to see that they comply with the purchasing specifications.

Short-circuit Testing

In 1929, Reyrolle's established the first short-circuit testing-station to be erected in Great Britain. Its output capacity was doubled in 1934, and it is now one of the largest in the world, having an instantaneous initial symmetrical output of 2,000 mva, and being capable of testing circuit-breakers of all sizes up to 132 kv. The testing-generators and their associated testing-transformers are all of Parsons make.

Since 1929, short-circuit testing has been going on at Hebburn uninterruptedly. In addition, general research into switchgear and allied problems is carried on, and many improvements in the art of circuit-making and circuit-breaking have resulted, including the devolpment of the Reyrolle turbulator, which is an arc-control device applied to circuit-breaker contacts. The results of all the investigations that are continuously going on are scrutinised carefully with a view to their incorporation in the Reyrolle products.

Only some of this company's activities it will be possible to show to Institute members in the short space of time available for the visit. This will begin at the New Town works where all the company's machining and fabrication of parts by welding is done and will be followed by a special route through the assembly shops at the Hebburn works selected with a view to emphasising the important part played by castings in the building of modern switchgear. Figs. 10 and 11 show respectively one of the erection bays at Reyrolle's and the machining of a circuit-breaker top plate.

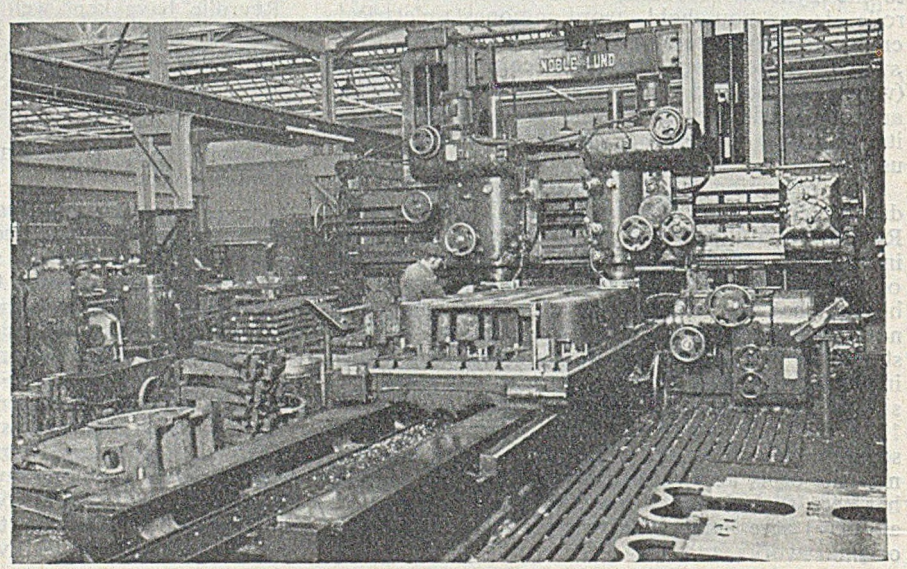


FIG. 11.—*Planer-miller Machining a Large Circuit-breaker Top-plate Casting at the New Town Works of A. Reyrolle & Company, Limited.*

Correspondence

[We accept no responsibility for the statements made or the opinions expressed by our correspondents.]

To the Editor of the FOUNDRY TRADE JOURNAL

THE MORRIES STIRLING PROCESS

SIR,—Mr. J. B. McIntyre of the National Foundry College, having requested me, as Author of the article on the Great Exhibition, 1851*, to furnish more information on the Morries Stirling process, I now submit the following details.

This process seems to have raised quite a stir at the time of the Great Exhibition. My information on the subject was derived mainly from two sources—each a contemporary work published at the time of the Exhibition itself.

The book which gave the clearest details I had borrowed from a friend at a distance. If the information given below is not sufficient for Mr. McIntyre I will gladly borrow it again and copy out the relevant details for him.

Here are various excerpts from the other 1851 publication in my possession relative to the matter mentioned:—

"Mr. Morries Stirling has patented a process by which he associates wrought with cast iron, and alloys iron with other metals; thus, according to his statement, producing a much tougher metal than that which is ordinarily employed. A rail broken, to show the structure of the bar, exhibited the fibrous or toughened top in cohesion with a crystalline centre and fully illustrated these two conditions. Many metallic alloys were exhibited with the other illustrations of the patent processes of Mr. Stirling; and in the central avenue was a bell of very remarkable tone, which showed, by its musical note, the perfection of its molecular composition, this being one of the patent alloys."

(The "central avenue" is, of course, the central avenue of the Crystal Palace).

A general review of iron in the Exhibition said that "before leaving this part of the subject we must mention Mr. Stirling's patented method of mixing together malleable and cast iron, and also of mixing other metals (chiefly zinc) with iron to produce greater strength in the compound."

In another part of this work (which was published in weekly parts during the Exhibition) occurs the following:—

"A subject demanding important consideration is the action of mixtures of other metals with iron—such as those we find adopted by Mr. Morries Stirling—and the combination of wrought iron and cast iron of which variety this gentleman showed two or three pigs, together with many examples of his alloys. Mr. Stirling considers the fluidity of Berlin iron to be due to arsenic—though it is as probably the result of phosphorus; and he has shown that the presence of manganese with cast iron closes the grain, and it is an improvement both to it and to steel. Zinc and tin have been by the same experiments mixed with iron, and these alloys are amongst the other specimens of interest exhibited by this gentleman.

By the addition of calamine to common iron, without the addition of wrought iron, a very superior malleable iron is said to be produced. In the report of the Commissioners we find the average breaking strain of iron alloyed with zinc and with tin, as compared with pure iron, given as follows, the experiments having been made in Woolwich Dockyard:—

Dundyvan best iron broke with a strain per sq. in. of 24.33 tons.

Dundyvan iron, in the proportion of 4 cwt. 1 qr. and calamine 4 lb. do. do. 25.86 tons.

Dundyvan iron, 4 cwt. 1 qr., tin 1 lb. do. do. 23.39 tons."

On the character of these and other alloys Mr. Morries Stirling, in a Paper recently read before the Royal Society of Edinburgh, remarks:—

"The wrought iron made either from the toughened cast, or by the admixture of calamine, is particularly useful for tension rods, chain cables, etc. The addition of antimony and some other metals to wrought iron in the puddling furnace gives a hard and crystalline iron, nearly allied to steel in some of its properties, and is adapted, from its hardness and crystalline character, to form the upper part of railway rails and the outer surface of wheels. When thus united to the iron containing zinc, the best sort of rail results, combining strength, stiffness, and hardness with anti-laminating properties, and being also cheaper than any other kind of hardened rail or tire. Compounds of copper, iron, and zinc are found to be much closer in texture, and stronger than similar compounds of copper and zinc (the proportion of iron not usually exceeding 1½ per cent.), and can be advantageously used as substitutes for gun-metal, under all circumstances, for great guns, screws, propellers, mill brasses, and railway bearings; small additions of tin and other metals alter the character of these compounds, and render them extremely manageable as regards hardness and stiffness. The advantages which these compounds possess over gun-metal are cheapness and increased strength, being about one-fourth cheaper and one-half stronger, and wearing much longer under friction. On many railways the alloy of zinc, iron, copper, tin, etc., have superseded gun-metal for carriage bearings. An alloy equal in tone to bell-metal—cheaper, and at the same time stronger—is made from the alloy of copper, zinc, and iron, a certain proportion of tin being added. The addition of iron seems under most, if not all, circumstances to alter the texture of metallic alloys, rendering it closer, and the alloys, therefore, more susceptible of a high polish, and less liable to corrosion. Other alloys of iron were exhibited, some showing the extreme closeness of texture, others possessing very great hardness, and suitable for tools, cutting instruments, etc., others possessing a high degree of sonorousness."

(This ends the quotation from Stirling's Paper at Edinburgh, but the article goes on as follows—going back now, of course, to the Crystal Palace):—

"A bell upon the stand in Class 1, and another connected with Mr. Dent's clock in the main avenue, were examples of these alloys; the tone of them was very fine, and the cost was stated as less than half that of bell-metal. The fine musical tone of these bells certainly recommends them.

"The British gold, as it is termed, in Mr. Stirling's case, is an alloy of iron, copper, zinc, manganese, and nickel; and in other proportions, the white metal is also produced; the advantages are stated to be increased brilliancy of colour, closeness of texture, and freedom from tarnish. These qualities are highly important, and it is to be hoped, since attention has been directed by this exhibitor to the advantages derived from alloying iron with small quantities of the other metals, that experiments will be repeated on these points for the purpose of ensuring the best results obtainable from those or other combinations."

This appears to be all that the publication gives regarding the processes of Mr. Morries Stirling, and is, of course, entirely quotations from 1851. I trust it may be of use.

Yours, etc.,

May 8, 1951. The Author of the article.

* FOUNDRY TRADE JOURNAL, April 26, 1951.

Correspondence

(continued from previous page)

To the Editor of the FOUNDRY TRADE JOURNAL

PIG-IRON AND NODULAR CAST IRON

SIR,—I should like to prevent the possibility of any misunderstanding arising from statements in Mr. Longden's Paper in your issue of May 10, which says: "Investigators are of the opinion that certain brands of pig-irons vary in their response to magnesium and cerium treatment, as a result of the presence in the iron of comparatively small percentages of residual or accidental elements."

First, whatever may be the position with respect to magnesium, so far as cerium is concerned we have yet to find a case in which, if the process is properly carried out in accordance with the technique recommended by the Association, cerium fails to produce nodular graphite from British pig-irons. To put it the other way round, cerium nodulises every type of such raw material if the correct composition is used. Secondly, it is at present not yet known whether such an effect can be attributed to the presence of trace interfering elements and if Mr. Longden has any evidence of this from investigators of whom he speaks, or of the failure of cerium to nodulise when the correct procedure is employed, we should be interested to hear it.

The cerium content given in Table I for cerium nodular irons is incorrect and is liable to give a wrong idea of the cost of the process. It is, indeed, contradicted by the composition given on the previous page.

There is considerable reference in current technical literature to the nodulising effects of a number of elements (Mr. Longden mentions calcium, lithium, sulphur). In some cases photomicrographs have been produced showing nodules. In no case, however, to our knowledge, has any investigator in any country published details of mechanical tests, chemical analyses and provided any evidence whatever of a workable and practicable foundry process, giving reproducible results for any elements other than cerium and magnesium. It would be unfortunate if such statements were utilised in future as anticipating such events, as this would do a disservice to a cause which I know Mr. Longden has much at heart.

Yours, etc.,
J. G. PEARCE,
Director.

British Cast Iron Research Association.
May 18, 1951.

To the Editor of the FOUNDRY TRADE JOURNAL.

SIR,—I accept the correction made by Dr. Pearce on the statement made in my Paper, "Notes on Cast Iron—Past and Present," that there is, as yet, no evidence of any other element giving reproducible results as may be obtained with the cerium and magnesium process when correctly carried out. The published accounts (not evidence) of the occasional (shall we say accidental) occurrence of nodularised cast iron is of a scattered nature and may be dismissed as not provable. But the continued advances made in the knowledge of cast iron and the improved qualities developed in the metal by the B.C.I.R.A. lead one to expect further discoveries and still further varieties of a no less surprising nature than nodular cast iron.

The cerium content given in Table I is, obviously, a typographical error, possibly at my end. It should read cerium 0.025 per cent. (not 0.25) to 0.055 per cent. (not 0.55), the average of which is 0.04 per cent. as stated on page 487, May 10.

Yours, etc.,
E. LONGDEN.

11, Welton Avenue, Didsbury Park,
Manchester, 20.
May 26, 1951.

To the Editor of the FOUNDRY TRADE JOURNAL

LIFE CYCLE OF PIN MOULD

SIR,—Glancing through a catalogue of "Films of General Scientific Interest," the above title opened up vistas of a tremendous number of impressions per die in some super high-pressure die-casting colossus, churning out office pins at phenomenal speed. How rudely this imagination was shattered in reading the descriptive précis that followed: "Mould growth on cheese, apple—and porridge!"—Yours etc.,

DISILLUSIONED.

May 16, 1951.

House Organs

Nickel Bulletin, Vol. 24 No. 3 published by The Mond Nickel Company, Limited, Sunderland House, Curzon Street, London, W.1.

The wide range of interests covered by the abstracts in this publication are well illustrated in the current issue. Subjects range from those mainly of theoretical interest dealing, for instance, with methods of determination of traces of nickel in catalysts to the more practical papers, as, for example, that dealing with the welding of austenitic steel for high-temperature service. Amongst other interesting abstracts are a paper reviewing experiments on the use of a copper under-coat with nickel-chromium deposits on steel, and another describing applications of cast Monel in chemical plant. Copies may be obtained on application to Sunderland House.

Aluminium News, March 1951. Published by Aluminium, Limited, of Montreal, and available from Aluminium Union, Limited, The Adelphi, Strand, London, W.C.2.

There is always something of real interest in this house organ. This time the reviewer was attracted by an article on a "Perambulating Pub." It relates to a mobile bar carrying seven barrels of draught and 3,500 half-pints of Flowers' beer. The reason for its inclusion was that by using aluminium in its construction there was a 30 per cent. weight saving.

The Iron Worker. Spring edition. Published by the Lynchburg Foundry Company, Lynchburg, Virginia, U.S.A.

This issue is mainly devoted to a history of the Washington family. It is specially interesting to English readers as at that time Virginia was a Royal Colony, and the ties with this country were intimate. Additionally there is an illustrated description of the visit by the Belgian foundrymen's team under the leadership of Mr. Georges Halbart. The set-up and illustration are alike excellent.

Malleable Iron Facts No. 39. Issued by the Malleable Founders' Society, Union Commerce Buildings, Cleveland, 14, Ohio, U.S.A.

Whilst perhaps lacking the punch of some of the earlier bulletins, this certainly by illustration and letterpress does get home the excellent toughness properties of malleable castings. This feature, plus a design impossible to make by anything other than casting, makes it a worth-while issue.

Core Wires Cause Wasters

By "Coroner"

A RATHER unusual type of waster was recently encountered which at first was not easy of explanation. The main bore of a particular cylinder casting carried the minimum of machining allowance, because of the mistaken idea that the less to remove from the casting the better. A number of these castings were finished perfectly in the bore, but others exhibited black marks at a number of places, as if the core was not symmetrical, but bumpy. This could have been occasioned by an imperfect core box, any slight irregularity being imparted to the core.

An examination of the core-box proved fruitless as a means of establishing the cause of the trouble, as the box was a metal one and as near perfect as possible. It was then noticed that the marks were around a diameter and often in two places, one near each end. Cores were next examined and it was found that to impart extra strength to the green core, two wire rings were used, one near to the top and the other near the bottom of the core, corresponding to the marks on the casting. These rings, in some cases, were a little too large for the core resulting in only a thin wall of sand separating them from the side of the core-box. On drying of the core, but even more on pouring the casting, the heat caused the wire rings to expand, setting up a force against the wall of sand and thus pressing it outwards in spots. This, combined with the fact that only a minimum for machining was allowed, accounted for the trouble.

As a corrective for this defect, smaller rings were used in the core and the machining allowance on the castings were increased slightly, after which no further complaints were received from the machinist.

Contracts Open

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

DUNDEE, June 7—Cast-iron pipes and castings, for the Corporation Waterworks. Mr. G. Little, engineer and manager, Dundee Corporation Waterworks, 17, City Square, Dundee.

DEPWADE, June 16—Provision and laying of about 2 miles of 4 in. and 3 in. dia. cast-iron pipe mains, for the Rural District Council. A. P. I. Cotterell & Son, 54, Victoria Street, London, S.W.1. (Deposit, £2 2s.)

NEWCASTLE-UPON-TYNE, June 22—Supply and laying complete of about 4½ miles of railway sidings, for the Tyne Improvement Commission. (Deposit, £2 2s.)

SASKATCHEWAN, June 15—Deep well turbine pumps, for the Waterworks Department, City of Regina The Agent-General in the United Kingdom and Europe, Province of Saskatchewan, 28, Chester Street, Belgrave Square, London, S.W.1. The Board of Trade, Commercial Relations and Exports Department, Thames House North, Millbank, London, S.W.1 (CRE(IB)46859/50), should be notified of any action taken.

W. & T. AVERY LIMITED have had plans prepared to erect a new foundry at Walsall Road, West Bromwich.

Board Changes

G. CLANCEY, LIMITED—Mr. Claude Field, works manager, Mr. F. G. Timmins, foundry manager, and Mr. E. R. Dunsby, sales manager, have been appointed directors.

LINLEY ENGINEERING COMPANY, LIMITED—Brig. W. H. Crosland has been appointed chairman in place of Mr. C. F. Minett, who has resigned from that office while retaining his directorship.

CAMPBELL & ISHERWOOD, LIMITED—Mr. D. L. Schofield, Mr. H. P. Jones, and Mr. R. Rawson have been co-opted to the board, and Mr. J. D. Wray has been appointed secretary.

SCOTTISH MACHINE TOOL CORPORATION, LIMITED—Mr. Douglas Sharp, deputy chairman, has been appointed chairman in place of Mr. J. P. Reynolds, and Mr. H. M. M. Hyslop, assistant managing director, has become managing director.

S. SMITH & SONS (ENGLAND), LIMITED—Mr. F. J. Hum, a director and general manager of Smiths Motor Accessories, Limited, and Mr. D. W. Barrett, a director and general manager of Smiths English Clocks, Limited, have been appointed to the board.

Increases of Capital

The following companies are among those which have recently announced details of capital increases:—

RODD ENGINEERING COMPANY (1950), LIMITED, London, E.C.2, increased by £19,900, in 9,900 ordinary and 10,000 6 per cent. redeemable preference shares of £1 each, beyond the registered capital of £100.

F. J. ALLEN, LIMITED, general and mechanical engineers, etc., of London, S.W.1, increased by £10,000, in 2,000 "A" ordinary and 8,000 "B" ordinary shares of £1 each, beyond the registered capital of £10,000.

KRIVERT, LIMITED, manufacturers of electrical and mechanical goods, etc., of Prestwich, Manchester, increased by £900, in £1 ordinary shares, beyond the registered capital of £100.

STONE-WALLWORK, LIMITED, engineers, etc., of London, S.W.1, increased by £215,000, in £1 ordinary shares, beyond the registered capital of £35,000. J. Stone & Company, Limited, held a majority of the issued shares on June 1, 1950.

J.G. SERVICES, LIMITED, Government, public or private contractors, founders, etc., of London, W.1, increased by £900, in £1 ordinary shares, beyond the registered capital of £100.

Changes of Name

The undermentioned companies have recently changed their names. The new titles are given in parentheses.

SCOTT ENGINEERING, LIMITED, Erdington, Birmingham (R. Flamank, Limited).

MANCHESTER ENGINES & PLANT, LIMITED, Manchester (Equipment, Limited).

ADLAM-CHELLE, LIMITED, bottle-washing equipment manufacturers, etc., of London, E.C.2 (Chelle, Limited).

AUTOMOTIVE ENGINEERING COMPANY, LIMITED, Twickenham (Automotive Engineering, Limited). At June 27, 1950, Sheepbridge Engineering Company, Limited, held 87,387 shares out of 87,389 issued.

IT IS REPORTED that Spanish wolfram production in 1950 amounted to only 753 tons, compared with 819 tons in 1949. In January, 1951, only 40 tons were produced.

NORMAL WORKING has been resumed by engineering workers employed by Wallsend Slipway & Engineering Company, Limited, who had been observing a ban on piecework and overtime as a protest against the exclusion of pieceworkers from the recent wage agreement. An offer from the management has been accepted by the workers.

Imports and Exports of Iron and Steel in April

The following tables, based on Board of Trade returns, give figures of imports and exports of iron and steel in April. Figures for the same month in 1950 are given for purposes of comparison and totals for the first four months of this year and of 1950 are also included.

Total Exports of Iron and Steel

Destination.	Month ended April 30		Four months ended April 30.	
	1950.	1951.	1950.	1951.
	Tons.	Tons.	Tons.	Tons.
Channel Islands	519	604	2,822	2,584
Gibraltar	168	97	615	221
Malta and Gozo	611	228	1,973	870
Cyprus	709	454	2,763	1,680
Sierra Leone	409	283	1,425	895
Gold Coast	1,455	2,018	10,511	6,338
Nigeria	5,232	5,046	19,229	19,698
Union of South Africa	15,920	10,429	52,504	48,478
Northern Rhodesia	1,814	1,685	9,289	5,757
Southern Rhodesia	6,154	3,707	25,326	10,796
British East Africa	6,256	6,671	31,452	29,722
Mauritius	508	1,205	3,081	2,664
Bahrein, Kuwait, Qatar and Trucial Oman	504	355	2,328	2,756
India	6,792	10,137	27,380	34,623
Pakistan	8,018	8,041	23,715	30,901
Malaya	6,335	6,581	25,905	24,090
Ceylon	3,082	3,427	12,632	10,749
North Borneo	346	209	2,555	974
Hongkong	4,413	5,025	18,204	23,023
Australia	16,489	33,205	96,688	129,094
New Zealand	11,134	14,172	55,104	48,433
Canada	15,522	27,721	35,397	76,316
British West Indies	6,259	7,152	23,314	19,144
British Guiana	503	445	2,546	1,775
Anglo-Egyptian Sudan	1,189	1,140	6,013	3,417
Other Commonwealth	1,028	1,834	5,328	4,370
Irish Republic	7,924	8,514	29,628	30,758
Soviet Union	45	165	295	1,650
Finland	2,905	2,536	20,253	13,439
Sweden	8,176	10,103	29,689	33,318
Norway	7,213	7,644	25,956	23,811
Iceland	254	185	1,610	788
Denmark	13,490	8,340	53,704	32,957
Poland	114	11	616	380
Germany	20	72	151	418
Netherlands	6,484	8,998	27,217	31,272
Belgium	860	1,150	5,027	4,879
France	1,448	266	8,163	3,356
Switzerland	819	906	4,705	3,989
Portugal	2,099	2,263	6,458	7,070
Spain	413	657	3,361	1,549
Italy	536	2,462	2,768	7,565
Austria	181	37	384	173
Hungary	16	—	215	23
Yugoslavia	814	2,534	3,012	4,700
Greece	933	396	2,545	1,142
Turkey	878	458	3,794	1,203
Indonesia	2,557	544	6,669	2,196
Netherlands Antilles	824	336	3,941	1,180
Belgian Congo	129	130	509	611
Angola	55	142	1,094	793
Portuguese E. Africa	332	527	1,463	1,392
Canary Islands	102	121	747	450
Syria	236	13	455	488
Lebanon	2,110	2,453	4,724	5,550
Israel	936	2,138	5,695	8,897
Egypt	5,170	4,124	24,714	14,018
Morocco	3	17	217	1,255
Saudi Arabia	58	39	948	116
Iraq	982	1,675	15,364	8,303
Iran	5,356	7,541	39,235	29,438
Burma	984	1,138	3,588	4,754
Thailand	323	1,591	2,459	5,872
China	29	597	600	4,074
Philippine Islands	394	85	4,975	1,287
USA	1,407	20,987	4,486	75,154
Cuba	30	564	441	1,913
Colombia	442	361	2,010	2,863
Venezuela	4,029	4,190	14,184	11,158
Ecuador	56	113	961	351
Peru	311	1,319	2,865	3,946
Chile	2,721	1,152	6,215	4,067
Brazil	1,881	1,724	10,714	7,854
Uruguay	1,099	1,591	3,212	6,795
Argentina	5,978	6,921	25,126	19,847
Other foreign	926	2,021	6,528	7,124
TOTAL	216,511	283,722	921,849	975,644

Total Imports of Iron and Steel

From	Month ended April 30.		Four months ended April 30.	
	1950.	1951.	1950.	1951.
	Tons.	Tons.	Tons.	Tons.
India	24	—	22,963	1
Canada	3,214	2,628	13,056	14,511
Other Commonwealth and Irish Republic	85	95	687	444
Sweden	1,134	2,063	4,385	6,881
Norway	4,334	5,165	15,140	16,175
Germany	9,754	1,587	32,064	5,174
Netherlands	4,377	2,792	21,805	15,510
Belgium	8,429	12,408	31,455	40,832
Luxemburg	3,846	5,404	12,186	27,132
France	21,637	15,745	74,319	80,570
Austria	1,294	4,881	2,255	4,952
USA	3,760	3,198	23,830	13,624
Other foreign	810	141	2,640	625
TOTAL	62,698	56,107	256,785	226,431
Iron and steel scrap and waste, fit only for the recovery of metal	204,193	55,847	801,927	249,912

Exports of Iron and Steel By Products

Product.	Month ended April 30.		Four months ended April 30.	
	1950.	1951.	1950.	1951.
	Tons.	Tons.	Tons.	Tons.
Pig-iron	4,040	2,415	10,670	10,049
Ferro-alloys, etc.—				
Ferro-tungsten	137	36	401	217
Spiegeleisen, ferro-manganese	118	6	834	530
All other descriptions	90	85	601	447
Ingots, blooms, billets, and slabs	795	688	1,416	3,621
Iron bars and rods	430	1,145	1,772	3,458
Sheet and tinplate bars, wire rods	217	308	1,103	4,710
Bright steel bars	3,054	3,402	13,457	15,741
Alloy steel bars and rods	973	1,768	4,835	5,672
Other steel bars and rods	14,797	21,663	77,639	83,299
Angles, shapes, and sections	10,801	18,892	48,461	70,203
Castings and forgings	805	923	3,198	3,434
Girders, beams, joists, and pillars	5,858	4,554	20,185	14,858
Hoop and strip	7,206	5,553	29,199	23,822
Iron plate	187	264	902	723
Tinplate	16,915	21,194	77,033	86,853
Tinned sheets	165	368	931	1,055
Terneplates, decorated tinplates	29	54	112	424
Other steel plate (min. ⅛ in. thick)	20,920	28,539	93,714	100,304
Galvanised sheets	9,050	5,803	38,190	22,885
Black sheets	12,663	14,671	43,454	49,228
Other coated plate	960	991	3,925	3,064
Cast-iron pipes up to 6 in. dia.	6,677	7,872	25,049	23,895
Do., over 6 in. dia.	7,391	8,214	28,602	23,568
Wrought-iron tubes	26,923	44,804	115,914	131,235
Railway material	24,150	28,009	88,807	84,875
Wire	4,868	6,700	21,782	23,767
Cable and rope	2,391	2,863	11,350	10,082
Wire nails, etc.	1,261	3,714	5,464	10,858
Other nails, tacks, etc.	373	1,019	1,655	3,567
Rivets and washers	398	635	2,396	2,250
Wood screws	283	293	1,121	1,254
Bolts, nuts, and metal screws	1,901	2,737	9,964	9,511
Baths	851	1,208	4,315	4,512
Anchors, etc.	483	868	2,949	2,999
Chains, etc.	807	1,066	3,239	3,529
Springs	885	530	3,264	2,052
Hollow-ware	5,527	3,320	31,091	13,298
TOTAL, including other manufactures not listed above	216,511	283,722	921,849	975,644

European Industrial Output

Materials Shortage Retards Expansion

Europe is likely to be prevented by a shortage of basic materials from achieving this year an otherwise possible 13 per cent. increase over its 1950 level of industrial production. This conclusion is reached in the "Economic Survey of Europe," published in Geneva last week by the United Nations Economic Commission for Europe. Like its predecessors, this fourth annual survey prepared by the Research and Planning Division of E.C.E. calls attention to the persistent lag of European agricultural production behind industrial production.

The "Survey" stresses that the fall in United States demand in 1949 and the steep rise in 1950 were one of the causes of the present strain in world supplies of raw materials from overseas. But it says that Europe itself is largely responsible for the fact that, compared to pre-war, the output of all basic materials in Europe has risen substantially less than industrial production and that in some cases, such as coal, sulphur, timber, and iron ore, production has fallen considerably.

In 1950 European output of hard coal was 557 million tons, 23 million tons less than in 1938 and only 2¼ per cent. more than in 1949. This year, despite the addition of large imports to a slightly increased coal production in western Europe, coal consumption in western Europe could scarcely rise more than 5 per cent. above that of 1950, the "Survey" states. Meanwhile, unless very energetic measures are taken to produce more iron ore and coke, to increase scrap collection, and to use, in place of scrap, whatever varieties of ore are available, steel output is unlikely to rise much above the level of the last quarter of 1950.

Need for Changed Policies

Adequate increases in the production of these basic materials call for changed policies in European countries, the "Survey" states. Greater investment is needed in both British and German coal mines, and their present antiquated wage systems should be better designed from the point of view of incentives. The "Survey" suggests that certain prices, such as those for European scrap and for Ruhr and British coal, might well be raised to encourage production increases as well as economies in non-essential uses.

Greater economy in demand for electric power might be encouraged by narrowing present price advantages for increased consumption and by introducing relatively higher prices for peak load power. The "Survey" points out that various advantages should also accrue through the relaxation of policies of discrimination in favour of domestic consumers.

Discussing the crucial influence of U.S. economic activity on the world economy and that of Europe in particular, the "Survey" shows the greatly increased share of the United States in the world consumption of all basic materials, and warns that "while Europe maintains a steady rate of industrial expansion, there will always be a strain on world supplies of industrial materials whenever an American boom is superimposed."

The U.S. recession of 1949 and the later, but only partially consequential, deflation in some European countries "weakened markets and retarded the increase in production of all materials." Although world industrial capacity continued to expand, the process of long-term readjustment of raw materials supply to industrial requirements was brought to a halt. Then, the "Survey" continues, the spurious surpluses of 1949 gave way to sudden shortages when the recovery in demand brought world industrial capacity nearly fully into operation in 1950

While this threw into relief the long-term problems, according to the "Survey," there is little evidence that adequate national or international measures will shortly be applied to encourage production of basic materials, to achieve their rational distribution, or to control the danger to Europe of "an acute cost-inflation induced by the rise in prices of primary commodities imported from the outside world."

In 1951, world production of non-ferrous metals, other than aluminium, is unlikely to rise by more than 5 to 7 per cent. above 1950. Prudent cutting of non-essential uses of these non-ferrous metals and firm policies to prevent private hoarding are therefore essential, the "Survey" states. It stresses the need to remove uncertainty about the continuity of demand if primary production is to be adequately developed. The "Survey" adds that European countries should take a more active interest in the development of new sources of supply for many metals.

Iron-ore Imports

Imports of iron ore in April and the first four months of the year, with comparative figures for 1950, are shown below. There were no imports of manganiferous ore during the first four months of this year. In the first four months of 1950, 10,901 tons of manganiferous ore were imported, against 3,000 tons in the corresponding period of 1949.

Country of origin.	Month ended April 30.		Four months ended April 30.	
	1950.	1951.	1950.	1951.
	Tons.	Tons.	Tons.	Tons.
Sierra Leone	32,000	30,900	254,008	140,340
Canada	—	—	5,525	—
Other Commonwealth countries and the Irish Republic ..	49	2,906	3,340	7,997
Sweden	285,471	258,188	1,123,573	957,949
Netherlands	—	805	2,703	4,095
France	40,637	28,883	124,385	134,543
Spain	43,163	61,287	248,618	262,468
Algeria	43,613	71,010	507,415	377,853
Tunis	40,270	49,840	156,827	158,220
Spanish ports in North Africa	50,450	28,600	170,963	122,140
Morocco	43,305	15,758	117,744	78,068
Other foreign countries	8,700	7,404	20,810	27,325
TOTAL	587,658	555,737	2,735,911	2,279,998

Pulley Blocks

To the existing three light-capacity electric chain pulley blocks in their My-Te-Min range (designed to handle loads of up to 400 lb., 600 lb. and 1,200 lb. respectively), Geo. W. King, Limited, of Hitchin, have now added two further models, one of 2,400 lb. and the other of 3,600 lb. capacity. All blocks in the range are made to the same basic design. Operation is extremely simple, by pendent cord control, and both hook and trolley suspension models are available. Thus the blocks may become part of an overhead runway system or be mounted permanently in one place. Safety devices give complete protection against mishandling. Any irregularity in the feeding of the chain automatically stops the motor. The additional motor brake provides double safety and makes possible close and accurate positioning of the hook. Safety limit switches are fitted for top and bottom lifting positions, whilst bearings are heavy-duty throughout. The gears are precision-ground, housed in a totally enclosed oil-bath gearbox. The chain of high carbon steel is proof-tested to twice safe working load.

Adjustable Matchplate Frames*

A new development designed to increase foundry output by simplifying and speeding up the handling of pattern equipment, involves the use of adjustable inter-fitting matchplates, designed and manufactured by the Efficiency Match Plate Company, 4013, North Richmond Street, Chicago 18.

Featuring a high degree of versatility, this device consists of interchangeable matchplate sectional frames with parallel sides and ends. Longitudinal and transverse dividers may be used for holding various sizes and shapes of matchplates, or the unit may be used without dividers in order to hold a full-size matchplate. Made in cast aluminium, the frames are light in weight, yet rugged enough to take normal abuse in the shop.

Construction

The inside edges of the frame sections are grooved to ensure rigid and tight inter-fitting of the complemental plastic (or any other composition) matchplate sections. Two or more matchplates can be inserted, depending upon their sizes. This is accomplished by using combinations of divider bars, which are provided in four types—longitudinal, half longitudinal, transverse, and half transverse.

Thus, one can make up combinations of matchplates in quarter sections, transverse half sections, and longitudinal half sections. Since the frame is constructed sectionally and assembled with screws, it takes less than a minute to make insertions, removals, or replacements (Fig. 1). Patterns mounted on wood can be inserted, as well as plastic or other composition matchplates.

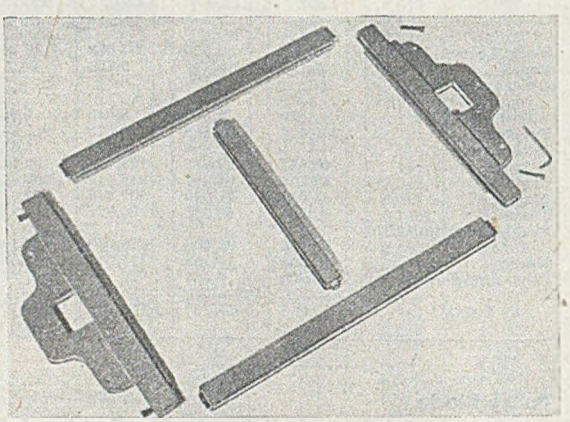


FIG. 1.—*Sections used for the Assembly of a Matchplate Frame.*

Pattern Production to Suit

Brass processing frames for the quarter-, half-, and full-size sections have also been developed for use by the plastic pattern makers and foundries for casting these unframed matchplates in full-size or sectional sizes. When sectional plates are made in these processing frames, they are provided with tongues that fit into the grooves of the aluminium matchplate frame.

Thus, when the matchplate is removed from the processing frame, it is ready for immediate insertion in the aluminium matchplate frame at the foundry. Obviously, this arrangement minimises the time and trouble ordinarily involved in the handling of matchplates.

(*Continued at the foot of column* 2)

* Abstracted from *Modern Medals.*

Only one aluminium frame is required for all of the various sections. This equipment is designed for use in the standard 12-in. by 18-in. box or for any special flask sizes required, and is specially suitable for use in volume production involving a wide variety of loose-pattern work. Advantages claimed by the manufacturer include decreased plate cost, decreased moulding costs, and increased production.

Personal

MR. O. W. HUMPHREYS has been appointed a director of the research laboratories of the General Electric Company, Limited.

SIR JOHN CRAIG, chairman of Colvilles Limited, who is to receive an honorary degree of LL.D. from Glasgow University, is being presented with his robes by the workpeople.

GENERAL SIR JAMES STEELE, a member of the Iron and Steel Corporation of Great Britain, was one of 12 recipients of the insignia of commander of the Order of St. John at an investiture held in London on May 17.

MR. FRASER YORKSTON, outdoor representative of Jones & Campbell, Limited, Torwood, Foundry, Larbert (Stirlingshire), has received a gold watch from the firm on completing 50 years' service.

MR. STANLEY BENNET, managing director and secretary of Alder & Mackay, Limited, gas-meter manufacturers, MR. E. G. CLEMENT, of MacTaggart, Scott & Company, Limited, marine, hydraulic, and general engineers, and MR. IAN MACKENZIE, of Mackenzie & Moncur, Limited, heating engineers, have been elected directors of the Edinburgh Chamber of Commerce for the ensuing year.

MR. R. C. DYMOCK, an executive director of Colvilles, Limited, has been elected chairman of a committee to supervise training schemes in the Scottish area of the British Iron and Steel Federation. MR. E. T. CROSHER, a director of the Rivet Bolt & Nut Company, Limited; MR. C. D. ASH, of Babcock & Wilcox, Limited; MR. D. RAMSAY, deputy works manager of Colvilles, Limited; MR. J. BRYDEN, a director of Smith & McLean, Limited; MR. J. MONTGOMERY, a director of the Clyde Alloy Steel Company, Limited; MR. W. GILLIES, works manager of the Lanarkshire Steel Company, Limited; MR. J. DUNBAR, works manager of Bruntons (Musselburgh), Limited; MR. J. MCCOLL, of Frederick Braby & Company, Limited, and MR. P. M. THOMAS, a director of William Beardmore & Company, Limited, have been elected members of the committee.

Obituary

MR. M. D. DYKES, proprietor of Barclay & Mathieson, iron and steel stockholders, of Glasgow, died on Friday, May 18.

THE DEATH IS ANNOUNCED of Mr. Percy Tweedale, who until his retirement six years ago was the Lancashire representative of E. S. Lord, Limited, Core Compound manufacturers. He died on May 22 at the age of 71.

MR. FRANK LESLEY ROBERTSON, a former consultant for steelmaking with John Summers & Sons, Limited, Shotton, Chester, died recently. Born in 1887, he was educated at Glasgow University and gave many years to developing the instrumentation of the steel furnace.

MR. ALBERT E. NICOL, who retired two years ago after 27 years as manager of the electroplating department of Walker & Hall, Limited, Sheffield, has died at the age of 69. An authority on electroplating, he was a lecturer and demonstrator at Sheffield University evening courses.

News in Brief

AS FROM MAY 16, the Newcastle-upon-Tyne district office of the British Thomson-Houston Company, Limited, is at 9, Higham Place, Newcastle-upon-Tyne, 1 (telephone: Newcastle 25040).

THE CONSENT of the Capital Issues Committee has been received by Ransomes, Sims & Jefferies, Limited, agricultural and general engineers, of Ipswich, to issue 250,000 ordinary £1 shares to holders of the company's ordinary stock at par.

E. JOPLING & SONS, LIMITED, steelfounders, of Sunderland, is awaiting a licence for the completion of a new pressing and heat-treatment shop, which is part of a development plan to increase output of steel castings from 70 to 100 tons weekly.

THE COUNCIL OF IRONFOUNDRY ASSOCIATIONS has sent a letter to the Railway Executive protesting against the unreasonable delays which have been experienced during the past winter in obtaining deliveries of raw materials—particularly pig iron and coke.

A FIRE, believed to have been caused by a spent match or cigarette-end falling on to sawdust beneath a bench in the patternshop, last Saturday, caused damage estimated at £3,500, at the Metal Box Company's branch of Lee and Crabtree, Limited, engineers, Wrose Brow Works, Windhill, Shipley.

THE ESCALATOR in the Dome of Discovery is equipped with a Silvertown handrail of reinforced rubber. It was designed and installed by J. & E. Hall, Dartford, and is the largest ever built without intermediate supports. The stairway moves at 90 ft. per minute and carries up to 8,000 passengers per hour.

CELEBRATING THE 25TH ANNIVERSARY of their wedding, Mr. and Mrs. W. H. L. Harrison gave a party last week to over 200 workpeople of the Great Bridge Foundry group. During the evening a presentation of a case of silver cutlery was made to Mr. and Mrs. Harrison by his fellow directors of the company. They were also presented with a silver fruit basket by the employees.

IN THE FACE of worldwide competition, F. Perkins, Limited, Peterborough, has received the first order for British Diesel engines ever to be placed in this country by the French Renault firm. A preliminary order for approximately £300,000 worth of engines for a new range of agricultural tractors to be produced by Renault, the full contract is likely to be worth hundreds of thousands of pounds.

BORAX CONSOLIDATED, LIMITED, Regis House, King William Street, London, E.C.4, announce that they have to increase prices as from July 2 as follow:—Borax, hydrated, all grades and varieties, by £2 10s. per ton; Dehybor (anhydrous borax) by £3 per ton, and boric acid, all grades and varieties, by £3 per ton. Until July 2, orders for normal proportionate monthly quantities will be accepted at prices now current.

A WELL-EQUIPPED CINEMA can be found in the Lincoln Electric Company, Limited, establishment at Welwyn Garden City. Planned as part of the Lincoln training scheme for welders, this cinema seats over 20 student welders and is of excellent technical value in that it is able to show, through a Bell & Howell-Gaumont 16-mm. sound projector, a series of Lincoln films, mostly in colour, covering arc welding fabrication almost from start to finish.

LAST WEEK, MEMBERS of Allied Ironfounders Social & Sports Club Angling Section fished Loch Frandy. Weather conditions were dry with a cold east wind during the night. Results were:—1, Mr. P. Buchanan, Callendar Abbots, 4 lb.; 2, Mr. G. Brown, M. Cockburn & Company, Limited, 3 lb. 12 oz.; 3, (equal) Mr. J. Graham, Falkirk Iron Company, Limited, and Mr. H. Climbie, Associate, 2 lb. 8 oz. Heaviest fish:—Mr. P. Buchanan, Callendar Abbots, 1 lb. 4 oz. The Hill Trophy for 1951 was won by Mr. P. Buchanan.

THE CHAIRMAN of the Transport Services Committee of the Tees-side Chamber of Commerce, Mr. W. V. Goldie, told members of the chamber recently that the supply of railway wagons in the north-east coast area was worse than in any other part of the country. A resolution was ordered to be sent to the Railway Executive affirming that the chamber is deeply disturbed by the continued inability of the executive to provide sufficient empty wagons to meet the needs of the district and asking that the direction of empty wagons to the north-eastern region should be given urgent attention.

AT A MEETING of Huddersfield Chamber of Trade, held last Friday, differing opinions were expressed on the recent committee recommendation to the Government that Britain should adopt the metric system during a 20-year change-over. Mr. B. L. Broadbent, an ironfounder, said any move to foreshorten that time would be strongly opposed by the engineering industry, as tools and gauges would have to be changed and rearmament slowed down. Mr. L. V. Driffield, secretary, suggested that it would be better to start with coinage and work gradually up to metric standards in other spheres.

AS A RESULT of increased costs, the Minister of Works has now authorised an increase of 5s. 6d. per ton in the maximum selling prices of ordinary Portland and rapid-hardening cement in Great Britain and Northern Ireland. Of this increase, 4s. per ton relates to non-returnable packages. The Minister has also authorised an increase of 10 per cent. in the maximum selling prices of asbestos cement building materials manufactured by Turners Asbestos Cement Company, Limited, and Tunnel Asbestos Cement Company, Limited. This, too, results from increases in costs. The increase for cement applies to despatches on and after April 18 last, and for asbestos cement, on and after April 30.

CONSOLIDATED PNEUMATIC TOOL COMPANY, LIMITED, 232, Dawes Road, London, S.W.6, are pleased to announce that arrangements have now been completed with the Duff Norton Manufacturing Company of Pittsburg, U.S.A., for the manufacture in Great Britain of the well-known Duff Norton automatic lowering jack, Model 516, of 5 tons capacity. This model has had a far wider sale, and appeals to more discriminative purchasers, than any other jack in the well-known Duff Norton range. The British model will be interchangeable in all respects with the American model, and is being made to the same specifications and strict limits, as has always been applied by the Duff Norton Manufacturing Company. Repair parts made in Great Britain can be used in any Model 516 jack of American origin.

IN HIS ANNUAL STATEMENT to shareholders Viscount Weir of Eastwood, chairman of G. & J. Weir, Limited, engineers, Glasgow, announced steps taken to secure increased factory space. He reports that new and provisional orders for the company's products are on a record scale. Especially has the demand for Weir auxiliary machinery and Drysdale pumps increased since the war, and a point has now been reached where its satisfaction calls for expansion. As a first step in that process it has been decided to remove from the Cathcart works the manufacture of valves and small fittings required for Weir auxiliaries, and a factory of 83,000 sq. ft. of floor space has been rented at Queenslie Industrial Estate in the eastern suburbs of Glasgow. Occupation of the factory has recently taken place, and it is hoped that production will begin in the autumn.

Publications Received

The Jubilee Book of the National Physical Laboratory. By John Langdon-Davies. Published by H.M. Stationery Office, York House, Kingsway, London, W.C.2. Price 4s.

Those sponsoring the publication of this book were indeed fortunate in their choice of author, for Mr. Langdon-Davies is an accomplished writer. He has not only dealt with complicated subjects in a manner in which they can be understood by the layman, but additionally has made them of absorbing interest to the layman. Moreover, we are all laymen so far as many of the activities of the N.P.L. are concerned. The creation of the laboratory largely resembled that of the British Cast Iron Research Association, as the initial contribution by the Government was but £12,000 for buildings and a five-year annual grant of £4,000. It was fortunate that Bushey House was taken over because the grounds were extensive, and equally so that Mr. (afterwards Sir) Richard Glazebrook was selected as the first director. The opening ceremony was performed by the Prince and Princess of Wales—the future King George V and Queen Mary—on March 19, 1902. We never appreciated until the appearance of this booklet, to what extent the N.P.L. had benefited by private donations. The booklet, which runs to 104 pages, is particularly well illustrated.

Technical Reference Book of Compressed Air Terms and Standards. Published by the British Compressed Air Society, 94-98, Petty France, London, S.W.1. Price 10s. 6d., post free.

It is only the smallest foundry concerns to-day which possess no compressed air supply, so it can be presumed that the bulk of our readers will find interest in possessing this book. There is much scattered information on the subject, but in this book it has all been assembled in orderly fashion. Part I really introduces the subject, but no doubt Part II is the section which has most interest for our readers, as it covers installation and maintenance. Part III—Test Codes—one can leave to the engineering department, but a section of Part IV again has interest, for it includes air consumption tables for pneumatic tools, the maintenance of which is dealt with in a section of Part V. This book is the type of reference work which should find a place in every foundry library.

Materials Handling in Industry. Published by the Anglo-American Council on Productivity, 21, Tothill Street, London, S.W.1. Price 6d.

This is a popular edition of the Report made by a team which visited the States under the leadership of Mr. A. Roebuck. It is eminently suitable for placing in the hands of the operative. It is written in raw, poor English, which is a pity, as we think that the British workman is quite well able to appreciate a good standard of English. If he cannot he will likewise be incapable of understanding the implications of good handling. The matter selected for inclusion is excellent, the illustrations being particularly clear.

Accidents—How they Happen and How to Prevent Them. Vol. 7. Published for the Ministry of Labour and National Service by H.M. Stationery Office, York House, Kingsway, London, W.C.2. Price 9d., plus postage.

In Victorian days, errand boys desiring a real thrill, switched over from the penny dreadfuls and bought the Police News. Now they would be quite satisfied with the ghastly pictures illustrating this and earlier volumes. It can be presumed they have their purpose, but the effect on the reviewer would be to make him "left-handed" through being horror-struck.

Licensing System for Magnesium

Because of increasing defence needs an Order introducing a licensing system for the distribution and use of virgin magnesium and virgin magnesium alloys has been made by the Minister of Supply. It will come into operation on June 11. The new Order—the Magnesium Distribution Order, 1951 (SI No. 891)—provides that any person proposing to acquire, treat, use, or consume any magnesium of this kind must have a licence. The Ministry states that this licensing system is necessary because defence needs will take nearly all the available supplies of these metals for some time to come.

Steps have been taken to increase supplies including long-term contracts with overseas suppliers and the reopening of U.K. magnesium plants which were in operation during the war. First production from these reopened plants will commence in July and will be expanded as quickly as possible to meet the rising demand.

Under the new Order, the requirement of a licence to treat, use, or consume extends not only to metal acquired on and after June 11, but also to stocks held at that date if and when it is intended to treat, use, or consume them. Applications for licences should be made without delay to:—Ministry of Supply, M2(b), Shell Mex House, Strand, London, W.C.2.

The Ministry of Supply will continue to require monthly returns of metal stocks and of estimated future consumption and returns showing past consumption and the purposes for which the metal has been used.

Raw Materials Mission

Mr. R. R. Stokes, the Lord Privy Seal, was smiling when he arrived at London Airport on May 22. He spoke optimistically of the results of his raw materials mission to the United States and Canada. The Minister said that his discussions with representatives of the U.S. Government in Washington had been successful. A friendly co-operation and a determination to do everything possible to help Britain formed the basis of the talks. He assured the Press correspondents present at the airport that the United States was thoroughly appreciative of our problems, particularly in regard to sulphur. He intimated that an announcement on sulphur supplies would be made in Parliament shortly, and was of the opinion that it would be good news. Most of the time in the talks was occupied with molybdenum. Mr. Stokes said that the Americans were going to help us with extra shipping to bring large quantities of iron ore to Britain.

Sulphur from Gas

Henry Balfour & Company, Limited, of Leven, Fife, are introducing into this country a range of plants specially designed for the recovery of sulphur from coal gas. Similar plant could be provided for the recovery of sulphur from blast-furnace gas in Steel Works and also in the flue gases from Power Stations. During the war Germany had her sulphur problem too and a great deal of research on methods of sulphur recovery from gases has been carried out in that country. One of the leading authorities on this particular subject, Dr. Bahr, who was formerly with I.G. Farbenindustrie in Germany, is controlling the design and operation of these types of plants, and the licence for his processes in this country has now been acquired.

LAST SATURDAY the Cleckheaton branch of the Amalgamated Union of Foundry Workers celebrated its centenary.

Raw Material Markets

Iron and Steel

The rapid exhaustion of stocks of iron and steel scrap has thrown upon blast-furnacemen a burden of increased responsibility for the provision of pig-iron supplies in greater abundance, which they are ill equipped to bear. A little more foreign ore is coming to hand, but a much more rapid acceleration will be required before blast-furnace capacity can be fully engaged. In the meantime, deliveries are in arrears and foundrymen experience the utmost difficulty in making up their furnace mixtures.

High-phosphorus iron is by no means plentiful, but this grade is not so scarce as hematite and low- and medium-phosphorus irons, which are more widely used in the engineering and speciality foundries.

Re-rollers are bound to regard with grave apprehension the further decline in ingot production, since they have recently been almost wholly dependent upon British steelworks for their supplies of semi-finished steel.

The position is engaging attention. Deliveries of steel semis from the Continent have fallen heavily into arrears and French and Belgian suppliers are being pressed to implement their contracts. There are hopes that this may soon be possible. In the meantime, however, re-rollers are unable to achieve full production, and even the sheet mills are operating on short supplies of bars and slabs.

A sharp contraction in steel exports is now inevitable. All shipments must now be licensed and, apart from difficulties arising from the lack of shipping space, the issue of licences is severely restricted. A very much bigger proportion of the output of rolled steel is now required for rearmament, and deliveries to other consumers must suffer in consequence. Those users who have been able to accumulate stocks of finished material in any quantity may congratulate themselves, because a steep rise in prices is anticipated in the near future. In some well-informed quarters, a rise of as much as £2 to £3 per ton is indicated. But buyers are more concerned with obtaining supplies than with prices. Big tonnages are on order and makers are unable to entertain offers of fresh business except for distant delivery dates.

Rolling programmes of the sheetmakers and plate mills are heavily overloaded.

Non-ferrous Metals

After a long period of doubt about what was going to happen to the copper price as a result of the additional 3 cents per lb. payable to the Chilean producers, the question was answered last week when the U.S. quotation was lifted to 27½ cents f.a.s. New York. This made it inevitable that the sterling equivalent should be raised in line with the change in the cent price, and so, on Friday, the current figure for copper in the U.K. became £234. At the same time the Ministry of Supply announced a revision in its buying price for rough copper, from £170 to £180. This new figure can only be described as rather more meaningless than the old one, for it is impossible to imagine that anyone in the U.K. can produce rough copper to sell at this figure.

All prices of copper and copper-bearing semis were promptly raised in line with the increased charge for raw material, and these now stand at record high levels.

All maximum quotations for scrap have also been adjusted to match up with the higher price for virgin metal, but it remains to be seen whether this will have an effect on the flow of old metal, which for months past has been so very disappointing. Anyone who has been holding scrap for the rise will certainly do well with copper and brass, or, for that matter, with gunmetal and other alloys of copper. The outlook, however, is uncertain, for there is no knowing whether or not there will be another increase in the price of copper before many weeks have elapsed.

As a result of the additional 3 cents payable to the Chilean producers, it is anticipated that production from Chilean properties will go up, the bulk of this increase going to the United States to assist in the defence programme. Output of copper varies from month to month, but maintains a good average. According to the Copper Institute, the U.S. production of crude copper in April was 91,000 tons, or about the same as in March, but there was a fall in the output of refined copper from 112,900 tons in March to 103,500 tons last month. Deliveries of refined metal to domestic consumers at 114,800 tons were 2,000 tons down on the March total. There was also an increase in deliveries outside the United States from 80,300 tons in March to 87,800 tons in April. Excluding tonnage for the stockpile, deliveries of refined copper for the first four months of this year to U.S. consumers amounted to some 439,000 tons.

Official tin quotations on the London Metal Exchange were:—

Cash—Thursday, £1,120 to £1,130; Friday, £1,125 to £1,130; Monday, £1,147 10s. to £1,150; Tuesday, £1,130 to £1,140; Wednesday, £1,117 10s. to £1,122 10s.

Three Months—Thursday, £1,105 to £1,110; Friday, £1,110 to £1,112 10s.; Monday, £1,125 to £1,130; Tuesday, £1,115 to £1,117 10s.; Wednesday, £1,100 to £1,105.

Catalogues Received

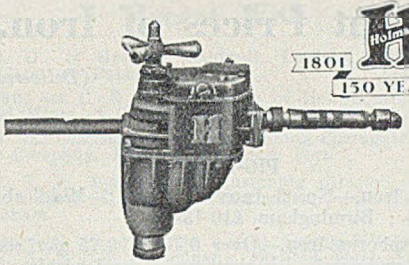
Moisture Removal from Air. The Dryer Division of Birlec, Limited, Erdington, Birmingham, 24, have sent us a very interesting 8-page brochure which describes and illustrates the apparatus (lectrodryers) they manufacture for the provision of dry air. In many industries a humid atmosphere causes corrosion, clogging and contamination. It vitiates process control, harms equipment, and deteriorates product quality. A second leaflet covers the laboratory lectrodryer for providing dry air or gas. Obviously the reviewer looked for foundry application, but could only envisage their desirability in locations devoted to core storage. However, other applications may occur to our readers, as these two pamphlets are available to them on writing to Erdington.

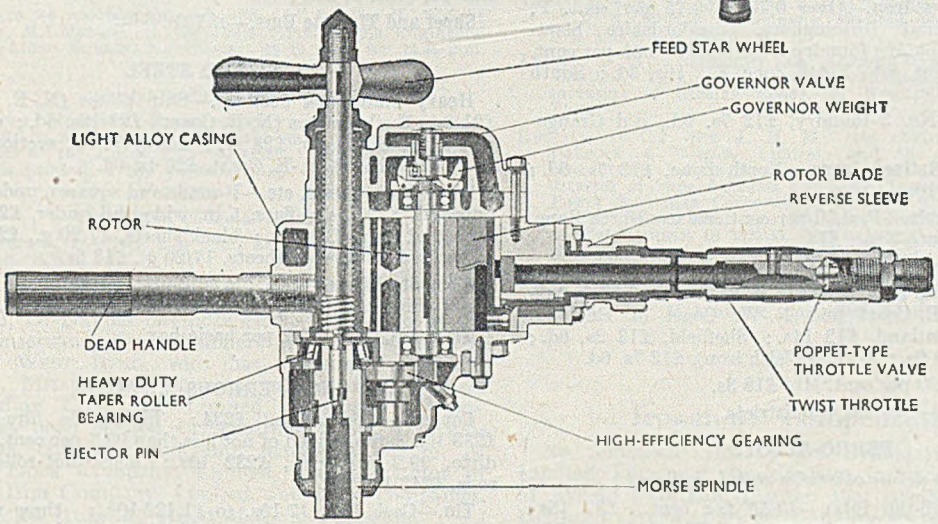
Fans and Blowers. From the Sturtevant Engineering Company, Limited, Southern House, Cannon Street, London, E.C.4, we have received their publication No. 2203, which supersedes No. 2202. It covers a multiplicity of designs, many of which are applicable to foundry practice. It describes and illustrates fans for dust and fume collection, for handling powdered fuel, for wood refuse disposal, and for cooling men employed in hot jobs. Many other applications are also shown. It is available to our readers on writing to Cannon Street.

Vibration Dampers. A leaflet received from Howard Clayton-Wright, Limited, Wellesbourne, Warwick, describes and illustrates the Clayflex Vibro-Dampers. The applications illustrated are mainly in connection with wartime tools. The vibrators also act as levellers.

SEE HOW THEY WORK!

1801 Holman 1951
150 YEARS



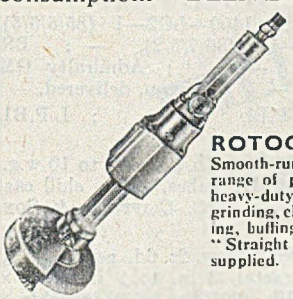


See, too, how *smoothly* Holman Rotodrills run — and for how long without attention. For deep holes or sheet metal work, for woodboring, for tapping and flue-rolling, for drilling and reaming in awkward corners — there's a Holman Rotodrill for practically every job a drill will do and for some that other drills won't do. The vane-type air motor keeps up a *constant* speed, ensuring clean, fast drilling. Stall a Holman Rotodrill and you can re-start it at once. No vibration — low air consumption. **DELIVERY EX STOCK.**

SAMPLE RANGE

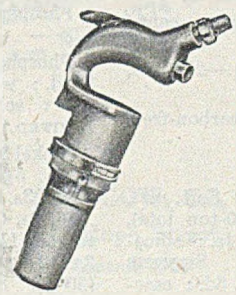
TYPE	R.P.M.	CAPACITY INS.	LENGTH INS.	WEIGHT LB.
HANDHELD 0/5	2,400	5/16	8¼	5½
28	1,200	⅜	15¾	11½
SCREWFEED	REVERSIBLE AND NON-REVERSIBLE			
310 R	700	5/16	11	16½
420 R	350	1¼	13¾	34
870 R	45	3	20	59
CLOSE QUARTER	400	1¼	22	35
WOODBORER 312 R.W.	520	1¼	13⅜	17

NOW is the time to send for details and specifications of the complete range. Please state if interested in other pneumatic tools.



ROTOGRINDS
Smooth-running and quiet. Full range of precision grinding and heavy-duty types for internal grinding, cleaning castings, polishing, buffing, scaling, fettling, etc. "Straight" or "grip" handles supplied.

CHIPPING HAMMERS
for all classes of work. New designs with easy but precise control. No vibration, no maintenance, no trouble.



H.A.2

The first name for lasting service

Holman BROS. LTD.
CAMBORNE . ENGLAND
TELEPHONE: CAMBORNE 2275 (7 LINES)
TELEGRAMS: AIRDRILL, CAMBORNE
SUBSIDIARY COMPANIES, BRANCHES AND AGENCIES THROUGHOUT THE WORLD

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

(*Delivered, unless otherwise stated*)

May 30, 1951

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2:—Middlesbrough, £10 17s. 9d.; Birmingham, £10 13s.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent. P, £12 9s., delivered Birmingham. Staffordshire blast-furnace low-phosphorus foundry iron (0.10 to 0.50 per cent. P, up to 3 per cent. Si)—North Zone, £12 16s. 6d.; South Zone, £12 19s.

Scotch Iron.—No. 3 foundry, £12 7s. 9d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £13 7s. 6d.; South Zone, £13 10s.

Refined Malleable.—P, 0.10 per cent. max.—North Zone, £13 17s. 6d.; South Zone, £14.

Cold Blast.—South Staffs, £16 10s. 6d.

Hematite.—Si up to 2½ per cent., S. & P. over 0.03 to 0.05 per cent.:—N.-E. Coast and N.-W. Coast of England, £12 7s. 6d.; Scotland, £12 14s.; Sheffield, £13 2s. 6d.; Birmingham, £13 9s.; Wales (Welsh iron), £12 7s. 6d.

Spiegeleisen.—20 per cent. Mn, £18 3s.

Basic Pig-iron.—£10 19s. all districts.

FERRO-ALLOYS

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

Ferro-silicon (6-ton lots).—40/55 per cent., £37 15s., basis 45% Si, scale 14s. per unit; 70/84 per cent., £52, basis 75% Si, scale 14s. 6d. per unit.

Silicon Briquettes (5-ton lots and over).—2lb. Si, £44 2s.; 1lb. Si, £45 2s.

Ferro-vanadium.—50/60 per cent., 15s. per lb. of V.

Ferro-molybdenum.—65/75 per cent., carbon-free, 9s. 6d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., carbon-free, £167; ditto, copper-free, £183.

Ferro-tungsten.—80/85 per cent., 32s. 6d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 34s. 6d. per lb. of W.

Ferro-chrome (6-ton lots).—4/6 per cent C, £66, basis 60% Cr, scale 22s. per unit; 6/8 per cent. C, £61, basis 60% Cr, scale 21s. per unit; max. 2 per cent. C, 1s. 6¾d. per lb. Cr; max. 1 per cent. C, 1s. 7¼d. per lb. Cr; max. 0.15 per cent. C 1s. 8d. per lb. Cr.; max. 0.10 per cent. C, 1s. 8¼d. per lb. Cr.

Chromium Briquettes (5-ton lots and over).—1lb. Cr, £69 4s.

Cobalt.—98/99 per cent., 17s. 6d. per lb.

Metallic Chromium.—98/99 per cent., 5s. 9d. per lb.

Ferro-manganese (blast-furnace). — 78 per cent., £36 1s. 1d.

Manganese Briquettes (5-ton lots and over).—2lb. Mn, £40 15s.

Metallic Manganese.—96/98 per cent., carbon-free, £215 per ton.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft, u.t., £17 4s.; tested, up to 0.25 per cent. C (100-ton lots), £17 9s.; hard (0.42 to 0.60 per cent. C), £19 4s.; silico-manganese, £24 6s. 6d.; free-cutting, £20 9s. SIEMENS MARTIN ACID: Up to 0.25 per cent. C, £22 11s. 6d.; case-hardening, £23 9s.; silico-manganese, £26 14s.

Billets, Blooms, and Slabs for Forging and Stamping.—Basic, soft, up to 0.25 per cent. C, £20 4s.; basic, hard, over 0.41 up to 0.60 per cent. C, £21 9s.; acid, up to 0.25 per cent. C, £23 9s.

Sheet and Tinplate Bars.—£17 6s. 6d.

FINISHED STEEL

Heavy Plates and Sections.—Ship plates (N.-E. Coast), £21 3s.; boiler plates (N.-E. Coast), £22 10s. 6d.; chequer plates (N.-E. Coast), £23 8s.; heavy joists, sections, and bars (angle basis), N.-E. Coast, £20 1s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., untested, £22 15s.; flats, 5 in. wide and under, £22 15s.; hoop and strip, £23 10s.; black sheets, 17/20 g., £29 13s.; galvanised corrugated sheets, 17/20 g., £43 6s.

Alloy Steel Bars.—1-in. dia. and up: Nickel, £37 19s. 3d.; nickel-chrome, £56 6s.; nickel-chrome-molybdenum, £63 1s.

Tinplates.—48s. 3½d. per basic box.

NON-FERROUS METALS

Copper.—Electrolytic, £234; high-grade fire-refined, £233 10s.; fire-refined of not less than 99.7 per cent., £233; ditto, 99.2 per cent., £232 10s.; black hot-rolled wire rods, £243 12s. 6d.

Tin.—Cash, £1,117 10s. to £1,122 10s.; three months, £1,100 to £1,105; settlement, £1,120.

Zinc.—G.O.B. (foreign) (duty paid), £160; ditto (domestic), £160; "Prime Western," £160; electrolytic, £164; not less than 99.99 per cent., £166.

Lead.—Good soft pig-lead (foreign) (duty paid), £160; ditto (Empire and domestic), £160; "English," £161 10s.

Zinc Sheets, etc.—Sheets, 10g. and thicker, all English destinations, £180; rolled zinc (boiler plates), all English destinations, £178; zinc oxide (Red Seal), d/d buyers' premises, £178.

Other Metals.—Aluminium, ingots, £124; antimony, English, 99 per cent., £390; quicksilver, ex warehouse, £73 10s. to £74; nickel, £406.

Brass.—Solid-drawn tubes, 24½d. per lb.; rods, drawn, —d.; sheets to 10 w.g., —d.; wire, 30½d.; rolled metal, —d.

Copper Tubes, etc.—Solid-drawn tubes, 26½d. per lb. wire, 261s. 9d. per cwt. basis; 20 s.w.g., —s. per cwt.

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

Phosphor-bronze Ingots.—P.B1, — ; L.P.B1, — per ton.

Phosphor Bronze.—Strip, 37d. per lb.; sheets to 10 w.g., 39½d.; wire, 40½d.; rods, 36¾d.; tubes, 42d.; chill cast bars: solids —, cored, —. (C. CLIFFORD & SON, LIMITED.)

Nickel Silver, etc.—Ingots for raising, 2s. 6d. per lb. (7%) to 3s. 5¼d. (30%); rolled metal, 3 in. to 9 in. wide × .056, 3s. (7%) to 3s. 11¼d. (30%); to 12 in. wide × .056, 3s. 0¼d. to 3s. 11½d.; to 25 in. wide × .056, 3s. 2¼d. to 4s. 1½d. Spoon and fork metal, unsheared, 2s. 9d. to 3s. 8¼d. Wire, 10g., in coils, 3s. 5¾d. (10%) to 4s. 5¾d. (30%). Special quality turning rod, 10%, 3s. 4¾d.; 15%, 3s. 9½d.; 18%, 4s. 1¾d. All prices are net.

Forthcoming Events

JUNE 2 to 6

Association Technique de Fonderie

24th Annual Congress of the *Association*, at 2, rue de Bassano, Paris, commencing 8.30 a.m.

JUNE 6 to 12

British Plastics Exhibition and Convention, at Olympia London.

JUNE 6

North Western Fuel Luncheon Club

"What are we waiting for, you and I?" by Dr. H. Wright Baker, M.I.Mech.E., in the Joule Room of the Engineers' Club, Albert Square, Manchester, at 12 noon for 12.45 p.m.

JUNE 6 and 7

British Ceramic Society

Refractories Materials Section—Spring meeting:—Technical Papers and works visits in Sheffield and district. Technical sessions at the Royal Victoria Hotel, Sheffield, at 10 a.m. Details printed in the JOURNAL, May 17.

JUNE 7

Institution of Metallurgists

Annual General Meeting, 2.30 p.m., at 4, Grosvenor Gardens, London, S.W.1.

MR. B. O. DAVIES has been elected chairman of the Tees Conservancy Commissioners in succession to MR. GEORGE WEST BYNG, who has resigned for health reasons. MR. STEPHEN FURNESS, chairman of Furness Shipbuilding Company, Limited, Haverton Hill-on-Tees, has been elected vice-chairman. SIR TRISTRAM EDWARDS, chairman and joint managing director of Smith's Dock Company, Limited, and a director of Consett Iron Company, Limited, and other companies, has resigned from the board of the commission.

Recent Wills

BELL, J. G., of Gray & Caldwell, Limited, brassfounders, of Paisley £12,123

RASHLEIGH, SIR C. B. W., chairman of New Consolidated Mines of Cornwall, Limited £4,373

JONES, J. H., chairman of Wolverhampton Corrugated Iron Company, Limited, Ellesmere Port £274,542

SAVEKER, T. J., founder and governing director of T. Saveker, Limited, brassfounders, of Birmingham £22,952

SKELLINGTON, G. H., chairman and managing director of B. K. Morton & Company, Limited, steel and tool makers, of Sheffield £1,820

ADAMS, S. H., co-founder of Adams Hydraulics, Limited, York, and Adamsez, Limited, manufacturers of fireclay goods, of Newcastle-upon-Tyne £16,651

GREENLY, LT.-COL. SIR J. H. M., late chairman of Babcock & Wilcox, Limited, and the British Non-ferrous Metals Research Association, and a director of Cape Asbestos Company, Limited, and Power Securities Corporation, Limited, chairman of the Prime Minister's Panel of Industrialists on Rearmament in 1938-39, and a former member of other industrial and research boards £57,819

WALLWORK, JESSE, chairman and managing director of Bridgewater Estates, Limited, and a former director of Manchester Collieries, Limited ... £104,570

Ironstone Compensation

An announcement by the Byfield Ironstone Com- Limited, Tingewick, Buckingham, ironstone mineowners at Byfield (Northants), states that compensation value has been agreed at £6 per ordinary share of £1.

CLASSIFIED ADVERTISEMENTS

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

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

SITUATIONS WANTED

SKILLED MOULDER (36 years of age), 21 years' experience with ferrous and non-ferrous metals, desires work anywhere. House available soon.—Box 1012, FOUNDRY TRADE JOURNAL.

FOUNDRY MANAGER (36) desires change. Sound practical and technical experience, sand and metal control, mechanised and jobbing, accustomed to training labour.—Box 1011, FOUNDRY TRADE JOURNAL.

FOUNDRY SUPERINTENDENT seeks situation. Experienced control mechanised plant and plate moulding, light castings in grey iron, conversant pattern layout for both sections, experienced cupola and sand control.—Box 1013, FOUNDRY TRADE JOURNAL.

FOREMAN PATTERNMAKER (47), married, now employed with large non-ferrous London founders, sand and die, seeks position of trust where ability and general foundry knowledge, including die design and technical sales experience, are an asset.—Box 1003, FOUNDRY TRADE JOURNAL.

PRACTICAL TECHNICAL REPRESENTATIVE requires position with good firm of Foundry Plant Manufacturers, Founders or General Engineers, etc. Preferably for London or South, but willing to travel extensively if required.—Box 1014, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT

JUNIOR ASSISTANT METALLURGICAL CHEMIST required for Marine Engineering Works in Belfast.—Apply, stating age, experience, and salary required, to Box 1002, FOUNDRY TRADE JOURNAL.

FOUNDRY MANAGER. — Excellent opportunity for energetic man (35/45) capable of controlling modern foundry, capacity 15/20 tons per week light and medium ferrous and non-ferrous castings.—Apply in writing, THE HAMWORTHY ENGINEERING CO., LTD., Poole, Dorset.

CORESHOP FOREMAN required for large Iron Foundry in North-West. Must be fully capable of controlling female labour and handling large quantities of small intricate cores by hand and core blower. Position is a permanent one with good prospects. All applicants must state age, experience, and salary required.—Box 1006, FOUNDRY TRADE JOURNAL.

MANAGER for Gravity Die Casting Foundry. Good salary for first-class ability and personality.—JOHN DALE, LTD., London Colney, St. Albans, Herts.

SITUATIONS VACANT—*Contd.*

PATTERNMAKERS wanted. Wood and metal. Constant employment.—Apply J. H. MAY, 117, Central Street, London, E.C.1.

SKILLED MOULDERS, PLATERS, TURNERS, BORERS, etc., required by Distington Engineering Co., Ltd., Workington, Cumberland.—For further details apply to the LABOUR MANAGER.

REPRESENTATIVE, calling on Foundries and Engineers Lancs. and Yorks., to sell Red Moulding Sand, on commission.—Reply Box 962, FOUNDRY TRADE JOURNAL.

TOOL Room FOREMAN wanted for large Aluminium Founders, Birmingham district, experienced in Die-sinking of Gravity and/or Pressure Die-casting Dies. Age 30/40 years. Capable of estimating hours required for die production from component drawings.—Apply, stating age, experience, and salary required, to the GENERAL MANAGER, Box 1010, FOUNDRY TRADE JOURNAL.

YOUNG METALLURGICAL CHEMIST required for analysis of various ferrous and non-ferrous alloys in large engineering works in East Anglia. Applicants should be 22/25 years of age, with good education and chemical training. Good canteen and transport facilities available.—Replies, stating full details of age, education, experience and salary required, should be made to Box 1008, FOUNDRY TRADE JOURNAL.

FOUNDRY in Leamington Spa district, producing light castings for vitreous enamelling and medium grey iron castings pressure tested, require a FOUNDRY SUPERINTENDENT, with progressive ideas, having qualifications and experience to control entirely floor and mechanised sections. A large development scheme has just been commenced and the appointment is progressive.—Applicants should send full details of experience and qualifications to Box 1004, FOUNDRY TRADE JOURNAL.

NATIONAL FOUNDRY COLLEGE.

APPLICATIONS are invited from suitable candidates for :—

(1) THE TWO-YEAR DIPLOMA COURSE, and

(2) THE ONE-YEAR RESEARCH COURSE,

both courses commencing in the Autumn of this year.

The Courses are of post-graduate standard, although it is not essential for Students to possess a degree. There is liberal provision for awards of College Scholarships.

Full details of entry qualifications and application forms may be obtained from :

THE HEAD,
National Foundry College,
Wulfruna Street,
Wolverhampton.

SITUATIONS VACANT—*Contd*

MOULDER required for bedding in lumpy castings averaging 2 tons. Good piecework rates. 5-day week.—MOYLE, Kingston-on-Thames.

FOUNDRY FOREMAN required for small East London jobbing grey iron foundry. Must have first-class experience and be capable of controlling and training labour. Sound practical experience necessary.—Write, giving details of experience and proven ability. Good prospects for right man.—Box 290, W.B.G., 39, Cheapside, London, E.C.2.

GOOD practical Iron Foundry FOREMAN wanted for large Foundry in North Wales. Must be fully experienced on machine and plate moulding, with semi-skilled labour. The position is a permanent one, ideally suited to someone who wants to settle down. Assistance will be given with housing. No applications will be considered without full details of experience, age, and salary required.—Box 1005, FOUNDRY TRADE JOURNAL.

ESTIMATOR AND RATEFIXER required for well-established Foundry producing high duty and grey iron castings from ¼ lb. to 5 cwts. in weight. Position is a permanent one, in ideal surroundings. Opportunity will be provided to join the Company's pension scheme, and assistance will be given with housing. It is essential all applicants must give experience, age, and salary required.—Box 1007, FOUNDRY TRADE JOURNAL.

FOUNDRY MANAGER, to take charge of Non-ferrous Metal Foundry in Manchester district. Qualifications required include sound practical experience and managerial ability. Applicants should give full particulars of technical and practical experience, together with age, wages required, and when at liberty to commence.—Box 978, FOUNDRY TRADE JOURNAL.

WANTED

ASSISTANT FOREMAN MOULDER, aged 30-35, preferably with experience in production of valve castings and with metallurgical knowledge, for steel foundry in Glasgow area producing 40 tons of electric steel per week. Successful applicant will ultimately take full charge and prospects are good.—Box 1000, FOUNDRY TRADE JOURNAL.

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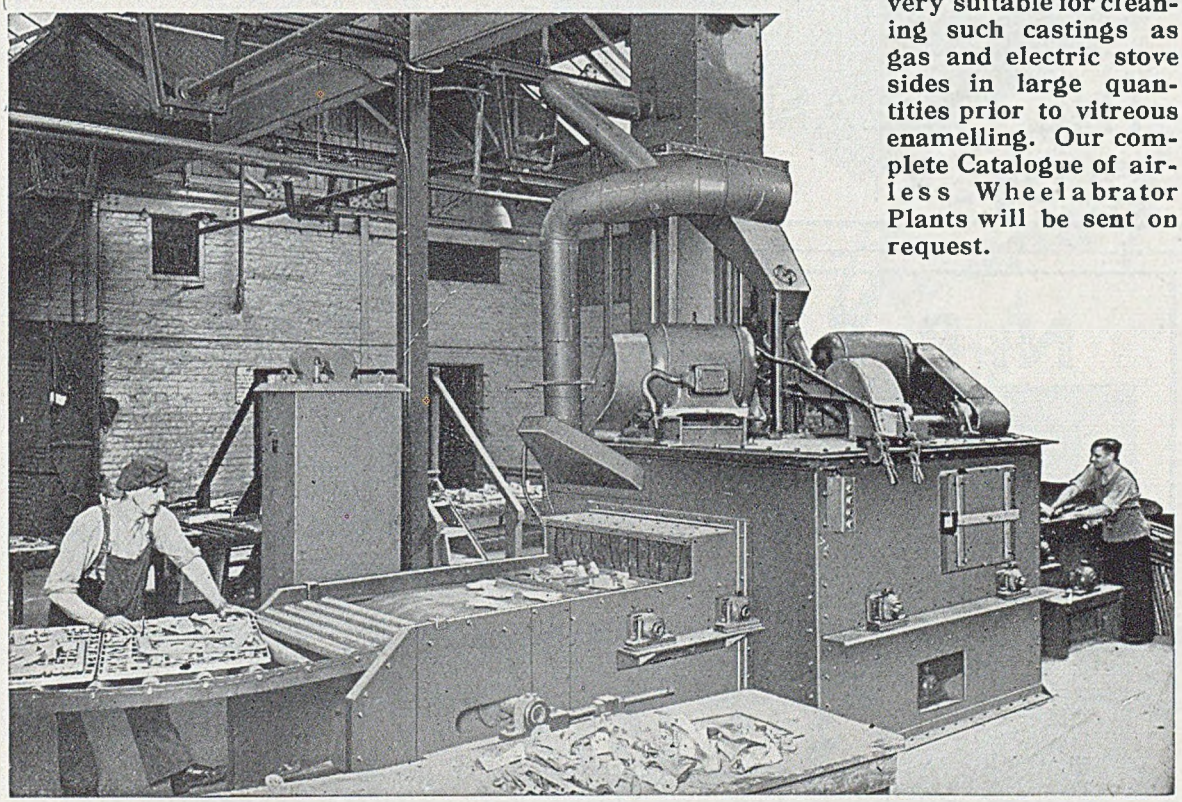

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