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FOUNDRY TRADE JOURNAL
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Trade Unionism and Foundry Progress

The No. 1 District Committee of the National Union of Foundry Workers is to be congratulated on publishing a thirty-page pamphlet entitled "The Foundry and the Foundry Worker,"* and especially on its choice of author, Mr. J. Gardner. Not only does he write well, but he shows a wider knowledge of the industry than many foundrymen. Because of the extreme divergence in types of output, ranging as they do from the making of a shoe protector to a 100-ton ingot mould, or a zip fastener to a manganese-bronze propeller for an ocean-going liner, employer and employee (both are, or should be, workers!) find but little of mutual interest. Mr. Gardner is obviously knowledgeable on most phases of castings production. If we interpret his views correctly, he is a thorough-going believer in mechanisation, and sees in it the possible recovery of the "50 per cent. production of rainwater pipes, baths and others building furnishings and appliances" [now being made of asbestos cement and plastics] through intense mechanisation. He anticipates the extension of mechanical handling facilities to the heavy jobbing foundries, and has great faith in the Randupson process. In this connection he says: "The loam moulders who made the 'Queen Mary's' propellers could make the same job in sand and cement without the need for 15,000 bricks and 30 tons of steel and even reinforcing. Propellers of 26 tons weight are being made by the Randupson process, and the moulders on the job have no doubt about its further development."

He is appreciative of and enthusiastic as to the research which has been put into the foundry industry by the metallurgist and engineer in the last two decades. One interesting comment, though enumerated in guarded terms, is that "there are more workers employed on the production of non-ferrous than on ferrous castings." The author has some interesting views on the employment of women in foundries. They now form 15 to 20 per cent. of the industry's personnel, and "must be accepted as co-partners in a unity of foundry employment." The author's views on apprenticeship training are as near as makes no matter to those of the Institute of British Foundrymen and the employers' associations. On questions of good housekeeping, it was particularly satisfying to us to realise that at long last authoritative trade union opinion is interesting itself in ameliorations of working conditions. Up to now it has been left to the Factory Department to follow in the wake of enlightened employers to improve conditions. Here, indeed, employee co-operation is essential, for just as people of uncleanly habits can quickly mar a perfectly adequate home, so too can the best efforts at foundry "good housekeeping" be torpedoed by slatterns.

We thoroughly endorse the author's statement that "a foundry can be made as healthy and attractive as any other branch of engineering." After commending the use of the Hydro-blast, the author makes an appeal for the provision of clothes lockers in duplicate, thus endorsing a plea which we have been making for the last twenty years. As would be expected, Mr. Gardner has much to say about wages and trade union politics. We exclude the former from our columns as a matter of settled policy, whilst of the latter we know but little. The argument for one big all-embracing foundry trade union seems sensible, especially if it results in better service to its members. We think the time has arrived when the trade unions should, as Mr. Gardner indicates, seek to give service to members in many fields quite apart from wages and hours.

* Price 6d. from the Secretary, 1221, West George Street, Glasgow.

Contents

NOTES FROM THE BRANCHES

London Branch, East Anglian Section.—At a meeting held in the Central Library, Ipswich, on September 28, Mr. C. H. Kain presiding, useful time was spent discussing defects liable to occur in four types of castings. Speciments of these were available for detailed inspection. They included a large cast-iron piston, showing porosity in the bottom ring seat; various cast-iron brake drums with widespread pinholing; a 12 per cent. silicon cast-iron acid-resisting valve casting carrying a draw and the point section of a small heating radiator which leaked on test due to a spongy area. This was the last meeting of the session; the new session will open next March.

London Branch.—The next meeting is to be held at 2.30 p.m. on March 28 at the Charing Cross Hotel. Mr. Malcolm Brown, works manager of Hadfields, Limited, of Sheffield, is lecturing on the subject of "Steel Castings." Members are specially invited to bring friends to this meeting, as the matter is of wide interest to all foundrymen, both ferrous and non-ferrous.

Scottish Branch, Falkirk Section.—The opening meeting proved to be a successful one, both from the point of view of speaker and attendance. Mr. R. R. Taylor, of Larbert, presided over a very satisfactory gathering of members and visitors, and, after thanking the members for the honour they had conferred on him by electing him President, called on Mr. Thos. Tyrie, B.Sc., the newly-elected President of the Scottish Branch, and Scottish Superintendent of the B.C.I.R.A., to address the meeting.

Mr. Tyrie complimented the Section on their enthusiasm as illustrated by the attendance, and expressed the hope that this would increase as the session advanced and the Committee's plans unfolded. Thereafter, the chairman introduced Mr. Arthur Grounds, B.Sc., general works manager of Scottish Tar Distillers, Limited, Falkirk. Mr. Grounds gave an interesting Paper on "Plastics and Their Possible Use as a Substitute for Cast Iron." From the outset, the speaker expressed his regret that such talk had been allowed to go about on what was referred to as the coming "plastic age." Strictly speaking, plastics were not entirely new, but rather were now being more fully developed, although the manufacturers of plastic materials themselves were very quick to correct this entirely erroneous conception of their product. As far as cast iron was concerned, there were many limitations prohibiting plastic materials from superseding it in any but a few instances. Mr. Grounds then outlined the various types of plastics in a knowledgeable manner, giving a description of their composition, properties, and manufacturing treatment. The entire Paper was illustrated with a variety of samples, which themselves gave rise to numerous questions.

Many members complimented Mr. Grounds on his treatment of this very controversial subject, and plied him with many questions on applicability of plastics in various spheres. On the call of the President, a hearty vote of thanks was accorded the speaker.

BOOK REVIEW

Patternshop Organisation and Management. By A. H. Squire. Published by Charles Griffin & Company, Limited, 42, Drury Lane, London, W.C.2. Price 7s. 6d. net.

Dumas, père and fils, showed plainly that literary ability ran in families, but until the production of this, the reviewer did not expect it would "go with the job." The author is foreman patternmaker at the Soho foundry, whilst his predecessor, the late Mr. F. C. Edwards, was a prolific contributor to the technical Press. It should be realised, *ab abnitio*, that this is not a treatise on patternmaking, but on organisation and management, and therefore many of the principles enunciated are equally applicable to other phases of industry. Naturally, the patternshop has its own special difficulties, especially in the establishment of systems of payment by results. Here the author offers some interesting approaches to the subject, but he cannot yet be credited with an ideal solution, as too much is related to the quality of the patternmaker and too little value to the job to be performed. If the reviewer understands the system described correctly, the result should—granted a fair-minded foreman—be equitable to the employee, but the urge to-day is to relate cost in such a way as it matters but little who makes it. Data accumulated over years seems to be the best solution to date.

The title of Chapter V—"Patternshop Mechanisation"—could with more truth be called "Modern Equipment of Patternshops." A surprising omission in this chapter is any mention of those marvellous copying machines which have been described by Mr. Vickers in his recent Papers. The important chapter on upkeep of patternshop tools sees the author at his best, and the reviewer commends the close study of this by all who may be saddled with this responsibility.

The reviewer quite appreciates the excellent layouts shown for both the patternshop and the stores, but would suggest that the inter-relationship of these departments and with each other should be given more study. Surely, the best method is to have the shop and stores separated from each other by a covered roadway wide enough to carry a glass office. Here can be established a control for patterns entering the works from outside, to and from the foundry, and from and to the patternshop and stores.

The author suggests the twice-daily provision of tea. The reviewer suggests its substitution by beer, as he believes that four lashings of tea—which this usually involves—is unhealthy and should be discouraged. The indexing is adequate, and the illustrations prolific.

There are too few worth while books on patternmaking, and this one, though somewhat contentious in parts, makes a contribution of outstanding usefulness to the literature of the subject.

V. C. F.

MODIFICATION BY HEAT-TREATMENT OF CAST STRUCTURES AND PROPERTIES*

Castings can be heat-treated to give reliable mechanical properties

By H. T. ANGUS, Ph.D., M.Sc.

SUMMARY

An examination is made of the effect of solidification structures upon the heat-treatment and properties of two cast commercial steels, a medium carbon, and a high carbon high silicon steel.

For the medium carbon steel figures are given for mechanical properties obtainable with various heat-treatments, and the effect of the production of heavily segregated dendrites and associated non-metallic inclusions is discussed.

For the high carbon high silicon steel, the properties and structures obtainable with normalising and spheroidising are given, and the production and distribution of temper carbon is discussed with relation to the cast structure, composition and heat-treatment.

If any apology were needed for the reintroduction of this subject, it could be found in the fact that even to-day steel castings for stressed parts are sometimes supplied in the "as-cast" state. When it is realised that castings can be heat-treated to give reliable mechanical properties, little inferior to wrought steel, and therefore complex assemblies can frequently be replaced by a single casting—sometimes less in weight and invariably requiring fewer man-hours, it is surprising that engineers have not given closer consideration to the use of both straight carbon and low alloy steel castings in the fully heat-treated condition.

The chemical heterogeneity of castings has been the subject of a great deal of study and the persistence of basic cast structures, even after heavy forging, is well known. This Paper deals briefly with various heat-treatments and their effect, without hot or cold work, both on micro-structure and mechanical properties of two grades of carbon steel casting; a hyper eutectoid high silicon steel and a medium carbon steel, both made in acid electric furnaces by the duplex process of continuous pouring, for the production of small castings weighing about 50 lbs.

During the process of solidification[1] the primary dendrites are formed with their main axes at right angles to the cooling isothermals and the primary dendrite structure consists of the higher melting point constituent, richer in iron than the mother liquor which becomes progressively poorer in iron, so that when

* Paper read at the Forty-first Annual Meeting of the Institute of British Foundrymen. The Author is Chief Chemist and Metallurgist, Parkinson Stove Co., Ltd., Stechford, Birmingham.

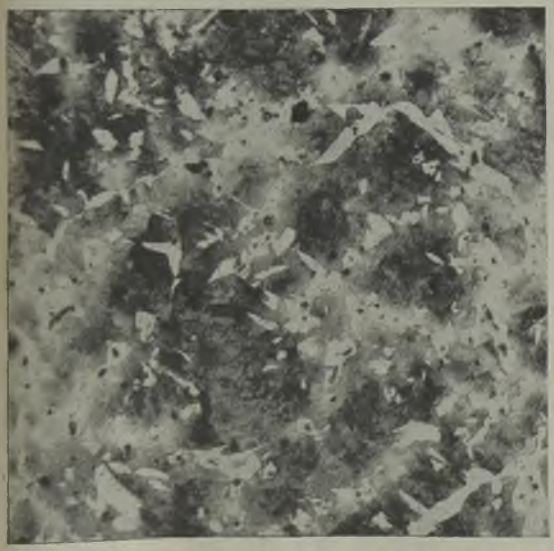

FIG. 1.—INCLUSIONS IN AS CAST STRUCTURE. × 150.

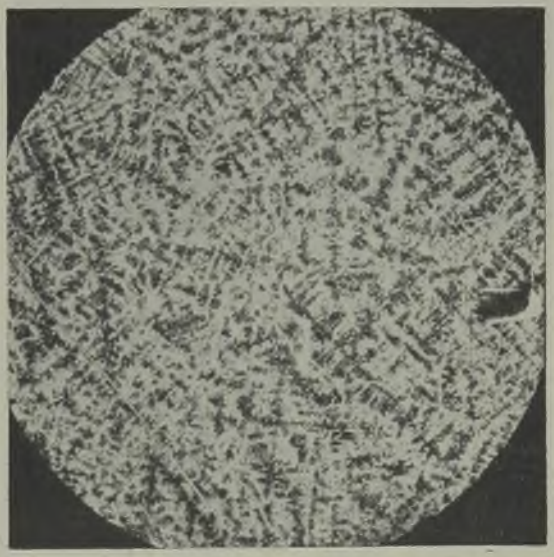

FIG. 2.—AS CAST ETCHED OBERHOFFER'S REAGENT. × 8.

Modification by Heat-treatment

solidification is complete each dendrite consists of a core relatively rich in iron, upon which has been built successive layers steadily reducing in the concentration of iron. Upon reaching the solidus, the resulting austenite, even in a pure iron carbon alloy, will contain appreciable variations in carbon concentration, but, owing to the high mobility of the carbon, these will partly even out at low rates of cooling.

With impure complex alloys of the type under consideration, the position is different and, while originally the same areas that were rich in carbon were also rich in silicon, phosphorus, etc., the mobility of these other elements is much less than that of carbon, and differences in concentration will remain even after redistribution of carbon, and will materially affect both the extent of that redistribution and also the effect of subsequent heat-treatment.

On cooling to the austenite change point (A_{r3} and A_{cm}), a further redistribution of carbon occurs with the formation of pearlite and the rejection of pro-eutectoid ferrite or hyper-eutectoid cementite. Up to this stage, both hypo-eutectoid and hyper-eutectoid alloys may be regarded as structurally similar, but now, structurally and mechanically they separate.

Hypo-eutectoid Steel. Medium Carbon

Typical analysis: 0.38 to 0.43 C, 0.25 to 0.5 Si, 0.75 to 0.85 Mn, and less than 0.05 per cent. S and P.

All tables have been obtained from "keel" specimens, 1¼ in. by 6 in. by 7 in., cast in green sand and which before pouring received a ladle addition of 0.06 per cent. aluminium. All fall within the limits of composition quoted at the beginning of the section. The figures quoted have been found to be re-

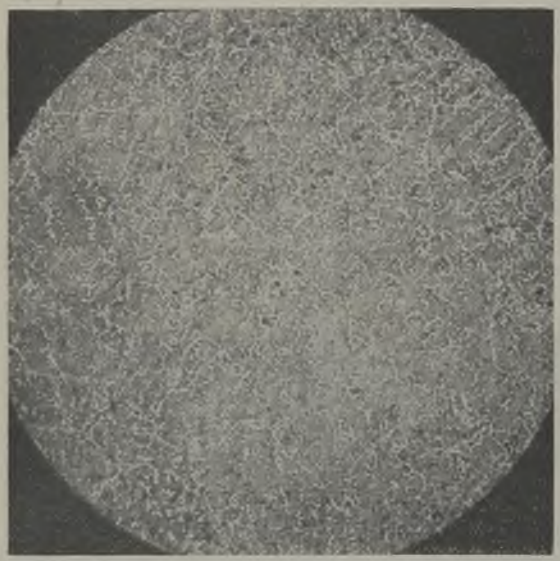

FIG. 3.—AS CAST ETCHED PICRIC ACID IN ALCOHOL. × 8. SAME AREA AS FIG. 2.

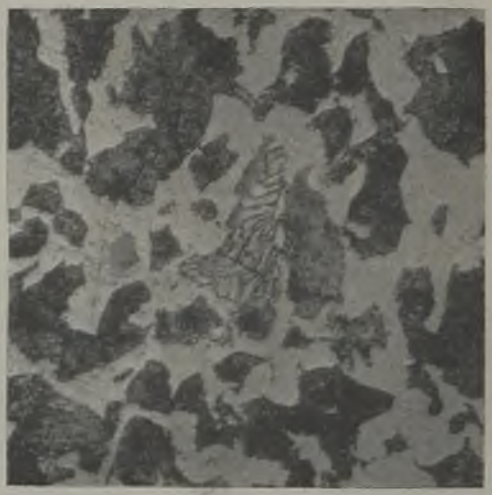

FIG. 4.—NORMALISED 3 HOURS AT 940 DEG. C. × 600.

TABLE I.—*Influence of Heat-Treatment on the Properties of Medium Carbon Steel.*

Spec. no.		Yield, tons per sq. in.²	Ultimate, tons per sq. in.²	Elongation, per cent.	R. of A., per cent.	Brinell.	Izod, ft.-lbs.
4032/6	As cast	—	47.5	8.5	8.1	212	3 : 3 : 3
8	15 mins. at 880 deg. C.	28.3	44.7	13	13.2	210	17 : 18 : 16
9	30 „ at 880 „	29.2	44.8	15	14.6	197	17 : 17 : 17
10	120 „ at 880 „	27.6	44.6	15	17.6	207	19 : 16 : 17
11	15 „ at 950 „	28.4	44.9	17	20.2	199	17 : 15 : 16
12	30 „ at 950 „	28.6	45.5	18.5	24.0	203	19 : 16 : 17
13	120 „ at 950 „	28.4	45.9	20	27.2	210	19 : 18 : 19

presentative of actual figures taken from castings where the maximum section does not exceed 1 in. Although owing to mass effect they cannot be representative of much heavier sections, a very large number of assemblies to which the following results will apply, fall within this range of sections.

In the as-cast state these steels consist of large, coarsely angular ferritic areas in a matrix of coarse pearlite (Fig. 1). A macro etch may reveal columnar dendrites running from the cooling edge for an appreciable distance before a more random orientation occurs. Where two sets of opposing dendrites meet, there may be a very definite line of weakness. Even where cooling has been fairly rapid, there is a tendency for segregates to be rejected to this "no man's land," and unless adequate normalising or annealing be carried out, these segregates remain to vitiate any subsequent heat-treatment. Figs. 2 and 3 show precisely the same area—scratched for identification purposes of a sample in the "as-cast" state. Fig. 2, etched with Oberhoffer's reagent, shows clearly the fundamentally dendritic nature of the structure, while Fig. 3, etched with 4 per cent. Picral, shows how the angular ferrite follows roughly the light areas in Fig. 2. Such clearly marked dendrites are often accompanied by inclusions which are clearly visible in this case.

The degree to which this heterogeneity affects the subsequent heat-treatment depends upon the cleanliness and purity of the steel and also upon the time and temperature of the subsequent operations. The interdendritic areas are the home of segregates and

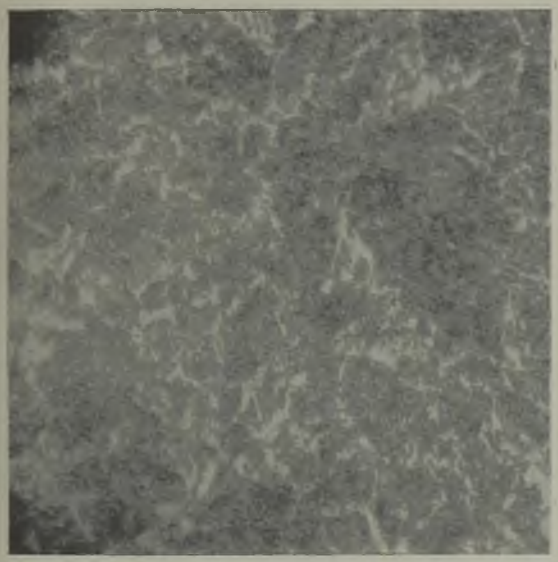

FIG. 5.—NORMALISED, HARDENED AND TEMPERED SPECIMEN. × 600.

FIG. 6.—ABNORMAL TENSILE FRACTURE SHOWING INTERLOCKING OPPOSED DENDRITES. × 4.5.

TABLE II.—*Influence of Water Quenching on the Properties of Medium Carbon Steel.*

Spec. no.	Heat-treatment. 1.	2. Temp., deg. C.	2. Time, mins.	3. Temp. deg. C.	3. Time, hrs.	Yield, tons per sq. in.²	Ultimate tons per sq. in.²	Elongation, per cent.	R. of A., per cent.	Brinell.	Izod, ft.-lbs.
4054/8	As cast	820	80 WQ	640	2½	36.6	54.0	15	18.8	239	13:11:13
4054/11	,,	820	80 WQ	640	2½	37.0	54.8	15.5	21.4	239	12:12:10
4054/9	,,	840	80 WQ	640	2½	40.25	58.0	14	17.25	265	10: 9: 9
4054/12	,,	840	80 WQ	640	2½	38.4	55.8	15	21.4	251	10:10:12
4054/10	,,	880	80 WQ	640	2½	35.9	53.5	16.5	25.7	244	12:10:10
4054/13	,,	880	80 WQ	640	2½	36.5	53.8	16.5	19.3	251	12:11:13

Modification by Heat-treatment

inclusions, and where the latter are numerous the persistence of the original chemical heterogeneity is greatly increased, and may seriously lower the mechanical properties obtained after normal heat-treatment.

A single normalising treatment of about 3 hrs. at 940 deg. C. followed by air cooling will refine the cast structure from that shown in Fig. 1 to that shown in Fig. 4, and will improve the mechanical properties very considerably, as shown in Table I.

The bars were loaded into the furnace at the required temperature and reached: 880 deg. C. in 15-20 min.

Substantial further improvements in strength, without sacrificing shock resistance or ductility, are attainable by quenching and tempering, and the following tables illustrate the effect of such treatment on castings without and with prior normalising. The normalising treatment was carried out as before, and for the second heat-treatment the castings were placed in the furnace with a normal load and reached temperature in 40 min. This period is *not* included in the times quoted, which are soaking times. The actual specimen temperatures were determined optically. Following this the specimens were quenched for 35 secs. in water at 60 deg. C., and immediately tempered at 640 deg. C. for 2½ hrs. (soaking time), and slowly cooled.

FIG. 7.—TENSILE FRACTURE CF. FIG. 6. LOCAL ZONE OF LOW ELONGATION AT DENDRITE JUNCTION. × 4.5.

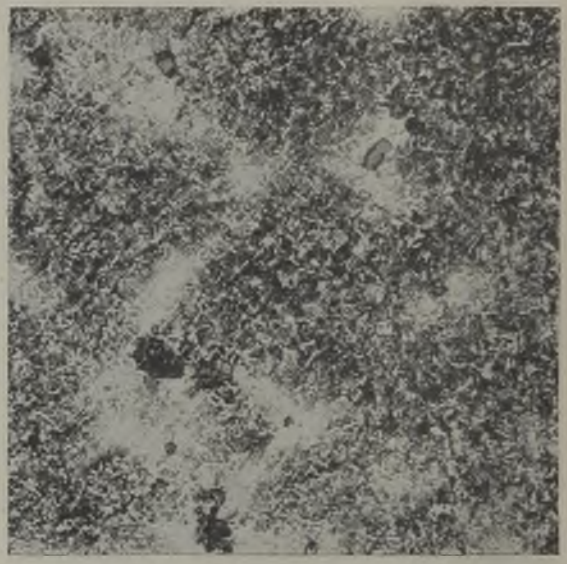

FIG. 8.—INCLUSIONS ASSOCIATED WITH DENDRITIC STRUCTURE PERSISTING AFTER HEAT-TREATMENT. × 150.

and 950 deg. C. in 20 min. respectively. The times quoted in the table are actual soaking times. The temperatures were determined optically, and were maintained within ± 10 deg. C. Specimen air cooled to black heat in 15 mins.

Even the shortest anneal (15 min. soak at 880 deg. C.) improves shock resistance remarkably, and there is little further improvement in this respect even on soaking for 2 hrs. at 950 deg. C., but, on the other hand, even at 15 min. at 950 deg. C. shows a substantial improvement in ductility over 2 hrs. at 880 deg. C., and for this reason the higher temperature is to be preferred for the most satisfactory all round annealed properties.

From these figures it will be seen that there is quite a wide range of heat-treatment within which good mechanical properties are obtainable, and that provided adequate soaking time is allowed before quenching, good properties are obtainable without prior normalising. A typical microstructure of a fully heat-treated specimen tempered at 640 deg. C. is shown in Fig. 5.

Higher carbon (0.45 to 0.52 per cent.) greatly increases the hardenability and also the risk of cracking in quenching, but provided a suitable time of soak has been permitted and then the casting allowed to cool to the lowest hardening point before quenching, this risk may be eliminated, and properties ranging

from 55 to 60 tons U.T.S., 10 to 12 per cent. elongation, 280 Brinell, and 15 ft.-lbs. Izod, to 50 tons U.T.S., 17 per cent. elongation, 220 Brinell, and 25 ft.-lbs. Izod, are regularly obtainable.

The foregoing results are found with normal practice. Occasionally, however, cast structures are found which seem unusually resistant to dispersal, and these are always associated with inferior properties and usually also with abnormal fractures. A typical case is shown in Figs. 6 and 7, in which, after normalising for 3 hrs. at 940, water-quenching from 850 deg. C. and tempering for 2½ hrs. at 640 deg. C., the fracture shows interlocking dendrites which have grown from opposite sides of the test-piece. The marked effect on elongation is shown in Fig. 7, where the fracture shows

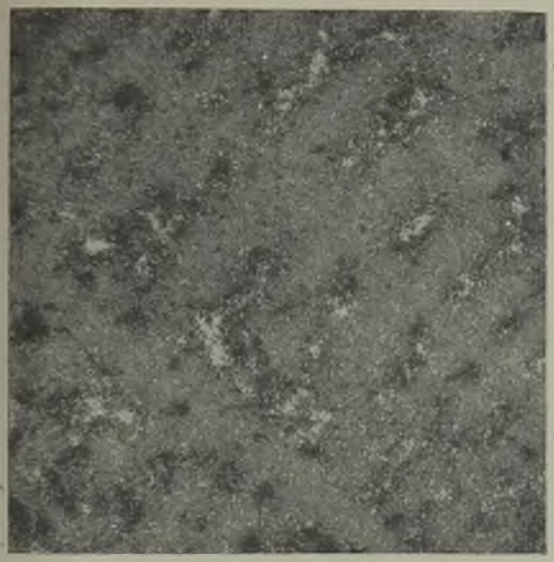

FIG. 9.—DENDRITIC STRUCTURE PERSISTING AFTER HEAT-TREATMENT. INTERDENDRITIC AREAS OF FERRITE. × 65.

that substantial elongation has taken place around the specimen after the zone between the opposing dendrites has fractured.

A typical microstructure is shown in Fig. 8, which gave mechanical properties:—Yield, 28.4 tons per sq. in.; U.T.S., 41.2 tons per sq. in.; elongation, 8½ per cent.; Izod, 20 ft.-lbs. A similar sample shown in Fig. 9 gave: Yield, 29.6 tons per sq. in.; U.T.S., 48 tons per sq. in.; elongation, 13 per cent.; Brinell, 221, and Izod, 15 ft.-lbs. This specimen after complete re-treatment gave: Yield, 30.4 tons per sq. in.; U.T.S., 46.4 tons per sq. in.; elongation, 17 per cent.; Brinell, 212, and Izod, 27 ft.-lbs.

In both these cases the first heat-treatment had fallen well inside the limits covered by Table II, but the response had been sluggish. In both cases also the dendritic structure carried appreciable quantities of non-metallic inclusions.

Non-Metallic Inclusions

The mere presence of non-metallic inclusions to the extent indicated in the photomicrographs is not in itself the cause of poor static mechanical properties, but is rather an index of general segregation in the metal. A very clearly marked dendritic structure as in Fig. 2 is usually only found in carbon steel castings of this size, in association with a large number of inclusions; with a more normal degree of cleanliness, dendritic structures are much smaller, are much more easily dispersed by slow cooling in the mould, and by heat-treatment, and are therefore more difficult to develop in a reproducible manner.

It seems possible to divide inclusions into two classes[2]: (*a*) the relatively small inclusions found in primary ferritic areas which appear to have served as nuclei for the primary iron rich dendrites, and (*b*) inclusions caused by continuous rejection of impurities to the interdendritic regions, and which will be found in association with primary pearlite. Both these forms are shown in Fig. 1.

It is to be expected in this type of casting where cooling after solidification is rapid, that the interdendritic areas will be rich both in carbon and phosphorus. This in extreme cases may give rise to a complete reversal of carbon concentration after heat-treatment, so that the areas which were ferritic in the as cast state become pearlitic, and the interdendritic areas become ferritic. A case of this sort is shown in Fig. 9, where the interdentritic areas are entirely ferritic while pearlite is uniformly distributed over the dendrites. A structure of this type requires much longer heat-treatment to obtain reasonable dispersal—in this case a further normalising for 3 hours, followed by full heat-treatment was necessary.

REFERENCES

[1] N. T. Belaiew, "Crystallisation of Metals."
[2] Benedicks and Löfquist, "Non-metallic Inclusions in Iron and Steel."

(*To be continued.*)

A NEW RHODESIAN FOUNDRY

F. Issels & Son, Limited, of Bulawayo, Southern Rhodesia, are to be congratulated on the completion of fifty years of really useful work directed towards the industrial development of the colony. They have celebrated this fact by the creation of a brand new foundry. It covers 20,000 sq. ft., divided into two bays, one of which is spanned by a 10-ton and the other by a 5-ton overhead electric travelling crane. Metal is brought down in two Meehanite cupolas, whilst heat-treatment of special castings is undertaken in a 40-kw. Birlec electric furnace. Firebars, in which the late Mr. F. Issels specialised in 1894, are now superseded by grate banks, made on moulding machines from special heat-resisting iron. Other plant installed includes a coreblower, sand conditioning apparatus, and a wide range of pneumatic tools.

MIDLAND IRONFOUNDERS' ASSOCIATION

CHAIRMAN'S REPORT FOR 1943

Presiding at the annual meeting of the Midland Ironfounders' Association, the chairman, Mr. A. E. Hurst, J.P., regretted its lateness owing to the difficulty of getting the accounts audited. As members were, no doubt, aware, accountants were very short staffed and their work much in arrears. Unfortunately, the shortage of staff was not peculiar to the accountancy profession. The large number of their workpeople called to the colours, as well as "directed" to other work and districts, had been one of the biggest problems the members have had to contend with, and to this had to be added wage problems, black-out restrictions, harassing controls of raw materials used in the industry, and the like.

Happily, owing to the striking success granted to our Forces, and to those of our Allies, the end of the war in Europe would seem to be in sight, and the Committee had given much time and thought to the various plans for the well-being of the industry when Germany had been defeated. Chief among these was the proposed reorganisation of the industry by the formation of what was to be known as the Iron Federation, *i.e.*, the amalgamation of the C.F.A. with the Pig-iron Producers' Association, with an estimated expenditure, for the first year, of £10,000, on the basis of fifty-fifty.

The majority of the various associations comprising the C.F.A. had expressed their approval of the suggested scheme in principle, though there had been opposition from two of the affiliated associations. The proposals had not yet been finally completed, but the Committee had expressed its approval of the proposed new organisation in principle.

Post-War Outlook

Some anxiety as to the future of the industry had been expressed owing to the apparent unwillingness of boys to enter the industry, as well as the unwillingness of their parents that they should do so. A booklet had been issued by the Institute of British Foundrymen on the matter, and the C.F.A. were preparing a brochure, compiled by an expert, giving particulars of the industry as a skilled trade. It was to be illustrated by photographs of foundries and processes and would be circulated to education authorities, parents, and boys about to leave school. The C.F.A. was in close touch with the Engineering and Allied Employers' Federation and the Ministry of Labour in connection with this matter. It was also suggested that there was need for employers to make working conditions more attractive; foundries should be well lighted, heated and ventilated, and baths and washing facilities and clothing lockers provided and, where possible, canteens.

The Costing Committee set up by the C.F.A. had made considerable progress and the first draft of a complete system of costing was nearing completion. It was hoped this would be of considerable assistance to ironfounders, as special attention was being given to jobbing foundries, whose organisation did not admit of a complicated system of costing requiring a specialised staff to operate.

Costing of Government Contracts

The C.F.A. had not found it possible to negotiate a scheme for the industry, as suggested by the Contracts Department of the Ministry of Supply, whereby, in return for an agreed percentage of profit on Government work, costing of contracts would be done away with. Members should, if they so desired, negotiate direct with the Contracts Department of the Ministry on this matter. The members of member associations supported a protest by the Federation of British Industries against the basic principle adopted by the Government for assessing private profit on a capital turnover basis.

Post-War Trading

The absence of any information as to Government proposals for peacetime production was causing anxiety in this and other industries. Throughout the industrial world boards of directors were anxiously considering plans for post-war activities, but such planning was held up by the absence of definite pronouncements by the Government on such vital questions as the distribution of labour, the availability of materials and the extent to which controls would be retained. There was also the question as to whether manufacturers were to be free to supply the market or if the Government would still seek to control business by placing orders, both for home and export trade, in bulk, and the control of material by allocation on a priority basis.

The question of new entrants to the foundry trade was also a matter members should address their attention to. Was the industry to be consulted about the disposal of Government-owned and operated foundries, and what steps could be taken to prevent them being acquired by, say, American firms or, for that matter, even German firms? It would seem that prompt action was required in this matter, either through the N.I.E.F. or the C.F.A.

C.F.A. Questionnaire

The C.F.A. *questionnaire* was designed to supply the Government with up-to-date information regarding the foundry industry, covering the number of workpeople occupied at the present time and also those who could be employed when working to capacity under normal conditions. Particulars were also asked regarding turnover on essential work and what replacements and new plant would be required. A considerable number of members had already made returns, and from them it was obvious that the members of the Association had been responsible for a very large share of the production of essential war work from the foundry industry. The foundry space occupied and the present number of employees, together with the output, clearly showed the important position which the members of this Association occupied in the foundry industry, and the chairman appealed to those members who had not made

(*Continued on page* 142, *column* 2.)

SAND RECLAMATION AT THE MORRIS FOUNDRY

It is constantly being stated that the foundry industry will, after the war, experience a shortage of skilled moulders. One way of overcoming this, where manufacturing conditions permit, is to form the whole mould of oil-sand cores. This process, however, becomes uneconomic unless steps are taken to reclaim and re-use the sand. In this connection the experience of the Morris cylinder block foundry will be of real interest, as the management has, after much experience, provided a workable solution. When this foundry was transferred from Cowley to a new site at Coventry, it was decided to change over from the dried mould method of manufacture using a two-part box to what may be called the all-core process.

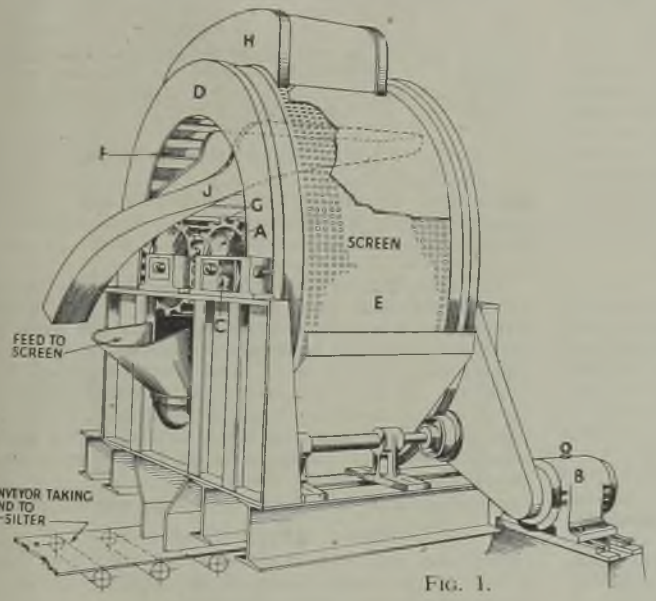

FIG. 1.

While the former method uses naturally bonded sand, the latter uses dried silica sand mixed with oil bond and dried in core stoves, the mould being made up of a number of outside sections or blocks assembled together. Where inner cores only are made of oil sand, it is the usual practice to send this away to the used-sand dump without any attempt at reclamation. When, however, the entire mould was made of oil sand, it became necessary to consider ways and means of reclaiming this sand for re-use.

Reducing the Lump Cores

It was found after experiment that a serviceable sand for outside "cores" could be obtained by reducing the lump cores to free-flowing sand without burning off the residual bond, the sand simply being mixed with a fresh oil bond in the usual way. This made it unnecessary to use heat in the reclaiming process. Various types of plant were used for reclaiming, with little success; at last, however, a machine was designed, based on a wealth of hard-earned experience, which has now been well proved in production.

The principle adopted in this machine, detailed in Fig. 1, is the use of two crushing rolls driven by electric motor and geared together by mangle-type gears, the latter being necessary as one of the rolls is carried in spring-supported bearings. These rollers are mounted inside a large motor-driven revolving drum, the periphery of which consists of a perforated sheet-metal screen of suitable mesh. The sand is fed into the screen by shovel or feeder, the fines discharging straight through the perforations of the drum. The lumps remaining in the screen are then elevated by means of blades fixed on the inner periphery to a point where they discharge by gravity and fall between the two crusher rolls. To prevent the "riding" of lumps of cores, as would be the case if the rollers were smooth, the surfaces have provided sharp-angled strips which act as jaws. The lumps are thus reduced to free sand which passes through the screen. Any portion of the lumps not being sufficiently reduced to pass through the screen is re-elevated, together with newly-fed material, and the process is repeated.

The pressure between the rolls is adjusted to be sufficient to cause the lumps to disintegrate each other without breakage of original sand grains, a point of importance on account of permeability and other properties of the sand when re-used.

Extraction of Metal

As the cores when made are reinforced by the insertion of sprigs and wires, the extraction of this metal had to be considered. This is achieved by fitting a pair of magnet poles, energised by suitable magnetic coils, round the rising side of the screen drum and extending beyond the position where the sand lumps fall from the elevating blades, thus retaining the metal in contact with the inside of the drum until it passes beyond the ends of the poles and falls away from the drum. A chute is fitted at this point into which the metal falls and discharges outside the machine. As sand contains fine grains and dust caused by old baked bond rubbing off, the sand after passing through the screen is fed into a desilter which consists of a series of cascades through which air is drawn off by a fan, the fine material being collected in a dust separator for disposal. The cascades are housed in a cylinder containing a series of cones. By this means, for any

(*Continued overleaf, column* 2.)

THE NON-FERROUS SCRAP SITUATION

By "Onlooker"

With the end of the war in Europe in sight, the prospects of the lifting of control and a return to reasonably normal conditions of trading grows stronger every day, although nobody, of course, knows what the Government has in mind regarding the immediate post-war period. Price is one of the most vexed questions and there is a tendency to "talk" copper, zinc and lead down to the levels they stood at during the initial period of control from the beginning of September to just before Christmas in 1939. It may be remembered that copper, for example, was advanced from £51 c.i.f. to £62 delivered, an appreciation of about £10 per ton, while lead and zinc increased by about the same amount. What is to be the trend after the war of the virgin metal prices, up or down? It is far from easy to provide an answer, but we have some guide, fortunately, for scrap is still a reasonably free market, inasmuch as the merchants are allowed to handle material and to sell to the consumers. Actually, during the period of nearly five years of price stability in virgin metals, when copper, lead and zinc at any rate have remained at fixed prices, we have witnessed very wide movements in the quotations of the secondary metals, or at any rate of certain grades and types.

Fluctuations in Prices

At first sight it may seem strange that values of scrap, which must after all bear some relation to new metal prices, should fluctuate when the quotations of the latter are unchanged, but it must be remembered that during this war control has consisted in the provision of maximum quotations acting as a ceiling. In the case of the virgin metals, there has been only one seller, *viz.*, the Ministry of Supply, and they have elected to observe the maximum price without any variation. With scrap the matter has been different and there have been changes in value more noticeable in some grades than in others. For this an explanation is found in the fact that, far from there being only one seller of secondary metal, a considerable number of firms have been engaged in this kind of trading and therefore no question of monopoly has arisen. To what extent, if any, the fluctuations, which in the case of brass swarf, for example, have been rather extreme, have been due to manipulation is a matter for discussion, but the checks instituted by the Control have been helpful in keeping the position in some sort of equilibrium. Nevertheless, it is unfortunate, in the opinion of many people, that under the Scrap Order merchants are permitted to acquire metal for sorting and grading without a licence, for this means that there is no real tab kept (apart from stock returns submitted to the Control) on the tonnage they purchase. However, when all these cross-currents have been considered, the fact remains that

(*Continued at foot of next column.*)

SAND RECLAMATION AT THE MORRIS FOUNDRY

(*Continued from previous page.*)

given length, the thickness of the sand curtain is only a third of what it would be if passed over louvres. The sand is passed to a conveyor for discharge to the shop storage bunkers.

It is interesting to note that the carbon content of silt removed is of the order of 16 per cent., whereas that of the reclaimed sand is only about 4 per cent. Naturally, this demands a little more, say 5 per cent., core oil than virgin dried silica sand, yet, considering what has been effected, must make this well worth while. If no sand reclamation is practised, there is the cost of carrying the used sand to the local dump, and the cost of new sand and its preparation. Naturally, these costs will vary in different localities, but they will, indeed, have to be low to rule out of consideration modern methods of reclamation. In Table I is given the screen tests of the sands used in the Morris foundry.

Table I.—*Screen Tests of New and Reclaimed Sands*

	Up to 30	30/60	60/90	90/120	Through 120
Sea sand ..	0·4	13·5	80·0	3·40	2·7
Quarry sand	10·7	82·6	6·4	0·45	—
Reclaimed sand	16·4	44·8	35·5	3·00	0·3

The plant and process above described have given entire satisfaction over a long period at the Morris foundry, and equally satisfactory results are expected when other types of bonding materials are used. Electromagnets, Limited, of 1, Bond Street, Hockley, Birmingham, 19, who have been in close collaboration in the development of the magnetic equipment, have now been granted the sale and manufacturing rights under patent licence, and all inquiries for further particulars should be submitted to them.

(*Continued from previous column.*)

during the war scrap has been the only free non-ferrous market able to register the fluctuations which have on occasion been quite wide.

The probability is that some of the merchants are quietly accumulating some of the grades of scrap (mostly brass) which are to-day standing at a really low level, for they can argue with some justice that a substantial fall in the quotations of virgin copper and zinc are already discounted. Consumers are buying very cautiously in view of the falling-off in demand for their products and, since there is still a good deal of secondary metal about, the manufacturers have a chance to dictate their own ideas of value to a great extent. As always happens, it is the users who in the long run fix the prices of scrap, either by a policy of holding off, or conversely by allowing themselves to be scared by reports of a shortage into boosting the market up too high.

SOME USEFUL WARTIME DEVELOPMENTS IN WHITEHEART MALLEABLE IRON

Foundry problems in the production of whiteheart malleable castings

By G. R. WEBSTER, A.M.I.Mech.E., A.M.I.Mar.E.

(*Continued from page* 114.)

The method adopted in the organisation with which the Author is connected is by plotting results of a great number of tensile tests as frequency curves; these frequency curves are illustrated in Fig. 33. The test-bars are cast every day all the year round. From the curves the following values for the mechanical properties of the firm's particular whiteheart malleable have been obtained:—

Ultimate tensile strength, 25 to 33 tons per sq. in.
Yield point, 18 to 22 tons per sq. in.
Elongation, 5 to 13 per cent.

They are characteristic figures. The peak values of the frequency curves are as follow:—

Ultimate tensile strength, 28 tons per sq. in.
Yield point, 20 tons per sq. in.
Elongation, 8 per cent.

The most interesting feature is the high value of the yield point. One cannot lay too much stress upon this factor; the yield point figure is of decisive importance to the designer, and is the governing factor for the permissible loading of a casting in service. In most practical cases the importance of the elongation value lies far behind that of the yield point. Considering the ductility expressed by the elongation figure as a criterion for the deformation capacity of a metal, it is seen that this whiteheart malleable cast iron has such a great absorption capacity for deformation energy that structural parts will be distorted and not break in case of over-stressing.

A greater elongation figure means only that a casting which has been stressed over the yield point, that is, which has already undergone plastic deformation, can be distorted to a greater extent before breaking, than a casting with a lower elongation value. In fact. it has a yield point equal to that of a normal cast steel of about 35 tons per sq. in. tensile strength. With these particular properties, it has also a Brinell hardness number of about 160, even in thick sections, and affects its machinability in such a way that the cutting speed and feed used for turning, drilling, etc., are very favourably influenced.

It will be readily seen from the B.S. specification

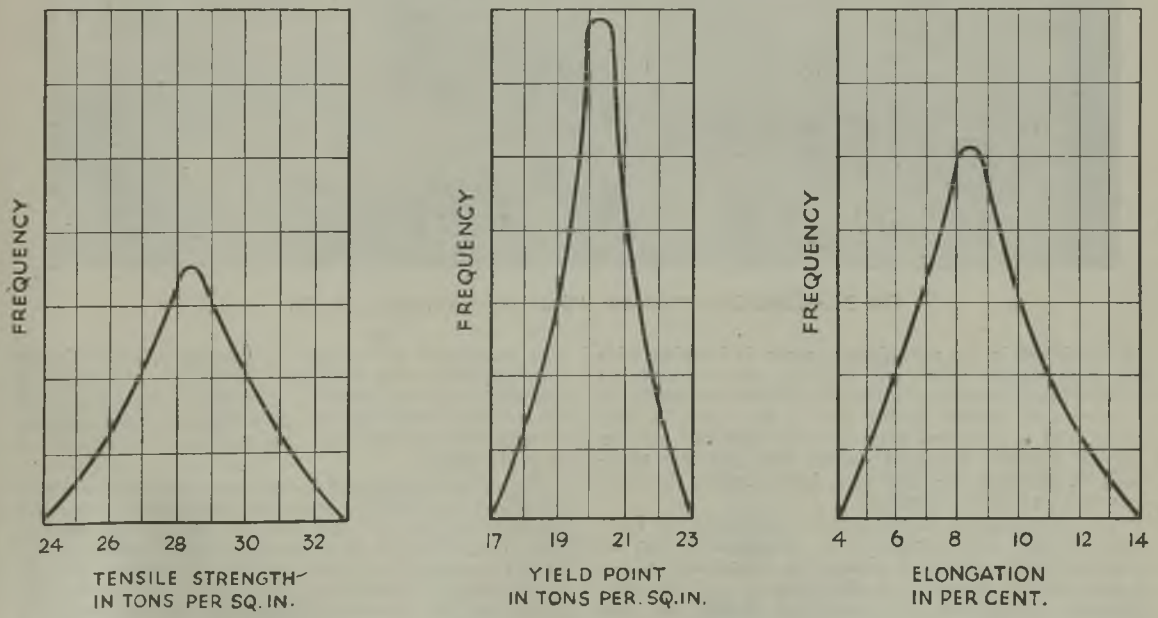

FIG. 33.—WHITEHEART MALLEABLE CAST IRON. MECHANICAL PROPERTIES REPRESENTED BY MEANS OF FREQUENCY CURVES.

Whiteheart Malleable Iron

No. 309 that there have been considerable advances above that specification, which is:—

Ultimate tensile strength not less than 20 tons per sq. in.

Elongation, not less than 5 per cent.

Bend test, 45 deg.

This improvement is generally appreciated throughout the industry and both the Institute of British Foundrymen and the British Cast Iron Research Association have had committees working on this standard matter for some considerable time, and it is confidently expected that a new and better standard will be produced in the near future, more in keeping with the high figures which the industry are now able to put forward, enabling malleable iron to be used to a considerably greater extent than it has been in past years, and it is hoped that this new standard will be carried through soon, to enable the post-war planning to influence the sales to a higher extent throughout the malleable industry.

The introduction of elongation expressed in fractions of per cent. seems to us exaggerated, for, as example below shows, a measuring inaccuracy of $\pm \frac{1}{4}$ mm. already results in a difference of $\pm$ 1 per cent. ultimate elongation, *i.e.*, original length of bar 50.8 mm.—length after tensile, 54.7 mm.

(*a*) If quite correctly measured, the elongation is:—

$$54.7 - 50.8 \div 50.8 \times 100 = 7.7$$

(*b*) With a measuring error of $+ \frac{1}{2}$ mm., the elongation is:—

$$55.2 - 50.8 \div 50.8 \times 100 = 8.7$$

This example shows that an elongation figure of either 7 or 8 per cent. should be stated.

Peeling

"Peeling" of whiteheart malleable iron has always been known in the industry, and has re-occurred at infrequent intervals, but not in such proportions as it has comparatively recently, and it has not persisted to the same extent. On no occasion could the actual cause of "peeling" be proved, although it was generally believed to be associated with a high sulphur content of the metal. Another cause of the trouble was considered to be high percentages of dolomite in the annealing ore, although this type of "peel" is usually of a very localised character; the surface of the casting shows signs of its presence without having to break the casting, and can, perhaps, be referred to as "blistering."

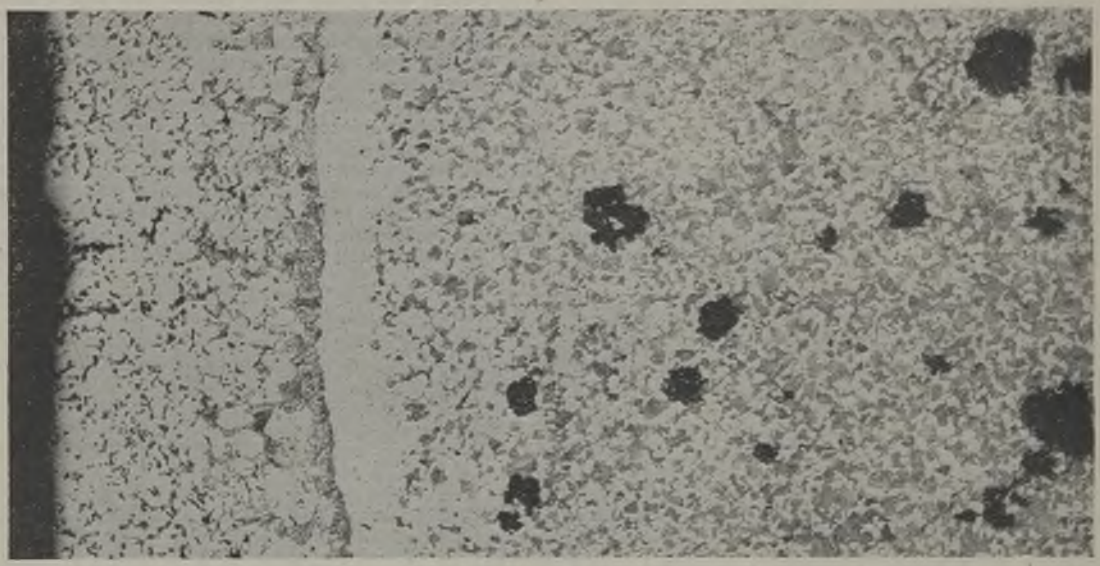

FIG. 34.—EDGE STRUCTURE OF "PEELED" CASTING. × 60.

As on previous occasions no particular reason could be found for this re-occurrence, since the production practice had in no way altered, the charge metals, fuel, metal composition, foundry technique and the tunnel annealing practice (town's gas fired) had not been changed in any way. The cause of the trouble could only be attributed, therefore, to the annealing ore, although no proof was available at the time. A number of preliminary experiments, therefore, were carried out to find the effect of high and low sulphur

contents of the metal. Weaker and stronger ore mixtures, size of the new ore, segregation of new ore from spent ore, so that castings were only surrounded by spent ore, etc., etc. In all the experiments "peeling" and "blistering" still occurred in practically the same degree as they had with the normal practice.

Description of Peel

All "peeled" castings examined show that the "peel" is of a localised character, that is, only certain parts of a casting are affected, whereas the remainder of the casting is quite unaffected. The surface of the "peeled" part is quite as good as the sound part of a casting, and can generally only be detected by a destructive test. The surface of other "peeled" castings had a rough and slightly oxidised area, and the "peel" may be slightly lifted away from the casting (referred to above as "blistering"). The "peel" itself may consist of one or more separate layers of oxidised metal, which can be removed from the surface of the casting quite easily, leaving a fairly smooth surface underneath. Although the previous experiments have not been conclusive as to the cause of "peeling," some did indicate that there was some substance present in the ore which must be responsible for the trouble. A closer examination of the new ore showed a large variety of pieces in the ore, which seemed particularly suspicious. Ore contaminated with pyrites, other characteristic pieces of ore had a white sparkling surface, and still further pieces were found to be very porous and generally had the appearance of coke.

Experiments suggested that the sulphur content of the ore was responsible for the "peeling" produced. The effect of sulphurous gases was tried, and it was confirmed that "peel" could be produced artificially. It was proved that spent pyritic ore (after one anneal) with 3 per cent. sulphur caused "peel" to the same extent as new pyritic ore, with about 5.5 per cent. sulphur, irrespective of whether it was in contact with the casting or not. The thickness of "peel" is heavier in the small $\frac{1}{8}$-in. section, and there is a slight tendency for the "peel" to decrease with an increase in the metal section, of, say, $\frac{1}{4}$ in. to $\frac{1}{4}$ in. The sulphur content of the metal appears to have little influence on the formation of "peel," particularly in the sulphur range 0.165 to 0.280 per cent.

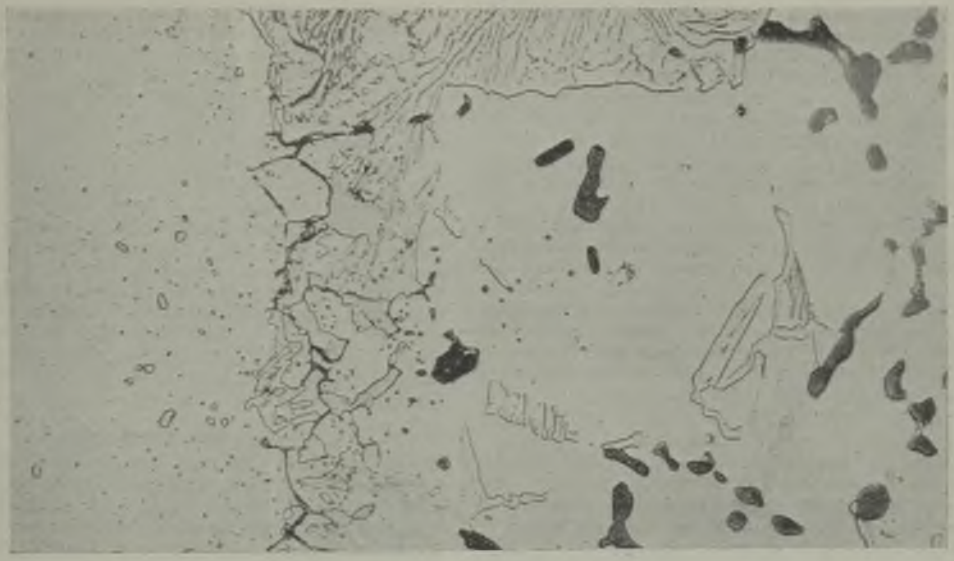

FIG. 35.—SHOWS DENSE BAND OF SULPHIDE INCLUSIONS BETWEEN THE "PEEL" AND THE CORE. × 600.

Annealing Ore

Representative analyses of the new ore are as follow:—

Fe ...	0.73	0
FeO ...	2.01	1.43
Fe_2O_3 ...	84.94	82.38
SiO_2 ...	6.07	3.94
CaO ...	1.23	0.47
MgO ...	0.74	0.41
S	0.12	0.14

An analysis of the pyritic pieces showed over 5 per cent. sulphur. Pyritic ore (new) with 5.55 per cent. sulphur still contained about 3 per cent. sulphur after one anneal. It is stressed that this new type of ore had never previously been used for production. The

(*Continued overleaf, column* 1.)

SOME USEFUL WARTIME DEVELOPMENTS IN WHITEHEART MALLEABLE IRON

(*Continued from previous page.*)

average sulphur content of the ore varied considerably, as shown by the analysis from various trucks: 0.21; 0.189; 0.169; 0.202, and 0.140 per cent. The extent of "peeling" is slightly higher when using a strong ore mixture, although differences in the thickness of the "peel" as produced by a weak and strong ore mixture, are not as pronounced as would be expected.

The sulphur content of the metal does not seem to influence the thickness of the "peel" to any noticeable degree, although metal with sulphur of more than 0.28 per cent. gives a thinner "peel," particularly on heavier sections. An analysis of the sulphur content of the "peeled" and sound metal beneath the "peel" of one sample which had 0.186 per cent. sulphur in the "as cast" condition, showed that there is a segregation of sulphur from ore through the "peeled" to the parent metal; whereas the sulphur of the "peel" was 0.168 per cent., the sulphur content of the parent metal immediately underneath the "peel" was in the order of 0.387 per cent. This analysis indicates that "peeling" is associated with a segregation of sulphur to the parent metal underneath the "peel," which is so well known in the malleable industry.

Fig. 34 at a magnification × 60 is of a specimen showing the edge structure of a "peeled" casting (as annealed). Fig. 35 (magnification × 600) shows a dense band of sulphide inclusions at the boundary between the "peel" and the sound core.

It has also been found by close observation of different annealing ovens that the extent of "peeling" (percentages of "peeled" castings) is in a certain relation to the sulphur content of the spent ore. To those who have been producing similar products as those mentioned above, this Paper does not claim to present any startling information, though it is believed the work has not generally been previously published; the discussion which may transpire may bring the ultimate possibilities of whiteheart malleable iron to a wider circle of users, and then the Paper will not have been presented in vain.

Grateful acknowledgement is given to the British Cast Iron Research Association for the production of the microphotographs Figs. 25 to 35 inclusive, and to Mr. A. Probst for his assistance in the preparation of this Paper.

(*Continued from next column.*)

tee was instructed to examine the matter in close detail and to take whatever steps were considered desirable through the national bodies.

Several members congratulated and thanked the chairman for the lively interest and amount of work he had put in on their behalf, and a vote of thanks to him was carried with acclamation.

MIDLAND IRONFOUNDERS' ASSOCIATION

(*Continued from page* 136.)

their returns to send them to the secretary, as it was most desirable that the true position of the Association should be established.

The secretary had endeavoured to keep members fully informed on the various questions affecting the industry which had arisen during the year, and was at all times at the service of members who might need his help or advice on any particular matter.

In conclusion, on behalf of the members, the chairman expressed their thanks to Mr. R. H. Halbeard for the time he had given, on their behalf, in attending the various meetings of the C.F.A. and N.I.E.F. in London.

The chairman's report was approved amid applause, and the annual accounts were approved.

The following Executive Committee was appointed to serve for the ensuing year:—Mr. A. E. Hurst, J.P., chairman (Independent); Mr. A. Ashmore (Holbrooks Foundry, Limited); Mr. A. Aston (Revo Foundry Company, Limited); Mr. W. Braddock (Duport Foundries, Limited); Mr. P. Edmunds (W. P. Edmunds, Limited); Mr. J. W. Gaunt (W. & J. Lawley, Limited); Mr. R. H. Halbeard (Thos. Holcroft & Sons, Limited); Mr. W. E. Kenrick (Arch. Kenrick & Sons, Limited); Mr. H. J. Lathe (Chas. Lathe & Company, Limited); Mr. R. E. Nutt (Court Works, Limited); Mr. E. Pitt (Loxdale Foundry, Limited); Mr. W. R. Purdy (Star Foundry Company, Limited); Mr. W. F. Smith (Rood End Foundry Company, Limited); Mr. W. Taylor (Ball Bros., Limited); Mr. W. H. Thursfield (Izons & Company, Limited); and Mr. G. H. Whewell (Bromsgrove Guild, Limited).

Government Surplus Stocks

The secretary reminded the meeting that, at the conclusion of the last war, the Government had over £200 million of raw materials in stock which they disposed of without trying to stabilise prices, and he suggested that it might serve a useful purpose if a resolution could be sent from the Association to the national bodies; he made three suggestions along which the disposal of surplus Government stocks could be controlled at the end of the present hostilities.

Several members supported the comments made by the secretary, and a remit was made to the Executive Committee to give this matter their early consideration and to take whatever steps were considered necessary.

Post-War Trading

A considerable amount of individual comment was made in regard to the emergency period after the present war, and general disappointment was expressed that industrialists had had no lead from the Government as to trading in the immediate post-war period, and considerable anxiety was expressed, both in regard to what was likely to take place in the home as well as the export markets. The Executive Commit-

(*Continued at foot of previous column.*)

SURPLUS GOVERNMENT FACTORIES

TO BE LET ON LEASE

Industrialists who require after the war space of 10,000 sq. ft. or more in surplus Government factories or storage premises, and who are willing to use them for peacetime industrial purposes, should apply forthwith to the Board of Trade. Application forms may be obtained from the Registrar, Control of Factory and Storage Premises, Neville House, Page Street, London, S.W.1, to whom they should be returned. Eventually, the Government will have about a thousand factories to turn over to industry. Some of them will be available before long. The factories are not to be sold, but leased, and the Government will select from the applicants the types of business best suited in the national interest, for particular localities. In special circumstances, however, factories may be sold outright.

In the allocation of factories the criteria of national interest will be:—Establishment of a balanced distribution of industry; re-establishment and expansion of the export trade; maintenance of a war potential; requirements of town and country planning; ability of individual applicants for factories to make efficient use of the factory premises with the minimum of reconstruction; and the claims, on grounds of equity, of firms whose factories have been damaged or destroyed by enemy action, or have been requisitioned by the State under concentration schemes or otherwise. During the war the Government have requisitioned about 20,000 factories, and in the setting free of these premises the same principles will be applied as in the allocation of the Government's surplus factories. Allocation is to begin at once and without regard to the exact time when the factories will be available, so that industrialists may be able to mature their plans.

As a rule, a factory will be let to a selected contractor for 10 years, with an option to the tenant at the end of the period to take a further lease for a long term. The short lease will begin from the date when the Government is able to release the factory from war work, unless the selected tenant is the present occupier, in which event the short lease can, if the parties so agree, begin at once. The initial rent payable under the short lease will be " such sum as the Valuation Office of the Inland Revenue Department may certify to be the rental value in the open market of the factory calculated on 1939 value." The short lease will provide that either party may at some date between the end of the third and the end of the fifth year of the short lease require the rent to be reviewed and put on to the basis of the then current market value to be agreed, or failing agreement, to be settled by arbitration. The short lease will contain safeguards to ensure the use of the factory for the purposes for which it is allocated.

American production of metallic magnesium during the first quarter was, according to the War Production Board, of the order of 41,000 lbs. per month. Recovery of secondary metal reached 3,500,000 lbs. in March, and some curtailment is anticipated.

IRONFOUNDRY FUEL NEWS—XXV

Recent statements by the Minister of Fuel and Power regarding the output of coal from the mines show that there is no likelihood of the fuel supply position being any easier during the coming winter than previously. The indications also are that the coke position may well be worse than it has been before. A report issued by the Ministry of Fuel and Power during September stated that at that time all available coke supplies in the Northern and North-Western Regions of England were being absorbed and that there were no stocks. The ironfounding industry, the bulk of whose solid-fuel supplies are in the form of coke, would, of course, be materially affected by a shortage of this fuel, but the Ironfounding Industry Fuel Committee is glad to be able to say that after nearly two years' activity the Committee and its regional panels feel able quite adequately to assist the industry to maintain production and efficiency if a shortage of coke does arise.

In the report, referred to above, also appears the statement that several of the Ministry's Regional Controllers have had to reaffirm the seriousness of the fuel position to industrial consumers, in order to counteract any slackening of effort resulting from the feeling that the end of the war is in sight. Such feelings may have become less prevalent since September, but, in any case, any tendency towards relaxation must be strongly guarded against, as there is little doubt that the fuel position will not immediately become easier at the end of the European war.

To the small number of ironfounders who have not yet bothered seriously with fuel economy, in view of the good supplies of coke up to the present, may it be repeated that the first step in any campaign is to find out exactly how much feel is being used by each piece of plant?

TIN SMELTING CAPACITY

The Tin Producers' Association, in the latest issue of their bulletin, "Tin," discuss the need for new tin-smelting capacity after the war. There is every probability that the smelters in Malaya, the Dutch East Indies and Holland will be rendered useless, and it is not very likely that the smelter in Germany will get supplies at an early date. This means that the loss of pre-war smelting capacity may be approximately 106,000 long tons.

The bulletin points out that of the two smelters at Liverpool, that of Consolidated Tin Smelters, Limited, has an output of 50,000 tons, and that of the Straits Trading Company a capacity of 20.000 tons. The Belgian Congo smelter has an output of 20,000 tons and the new smelter in the United States is said to have a capacity of some 52,000 tons, so that together 140,000 tons may well be the maximum available. In a very few years this will not amount to half what is wanted. (The smelters of China, Japan, Australia and Africa have been omitted in this calculation.)

NEWS IN BRIEF

CLAYTON ENGINEERING COMPANY, LIMITED, is being wound up voluntarily. Mr. J. P. Shaw, Grand Buildings, Trafalgar Square, London, W.C.2, is the liquidator.

SHAREHOLDERS OF Harland & Wolff, Limited, have approved the board's proposals for changes in the capital structure. Dealings in the new shares have begun.

SERGT. CHARLES HARE, British Davis Cup team captain, 1937-38, and other well-known tennis players, attracted a large crowd to the Vulcan Foundry Tennis Club recently, when they gave a brilliant exhibition.

THE NUFFIELD ORGANISATION have taken over a factory in South Wales which they are at present running for the Government. The output includes the assembly from imported components of many types of war vehicles.

" SCREW STANDARDS V. LOGIC " is the title of a Paper to be given by Mr. H. F. Atkins, M.I.Mech.E., at a meeting of Manchester Association of Engineers, St. John Street Chambers, Deansgate, Manchester, 3, on October 27.

MR. FRANK HOLMES, A.R.C.S., B.Sc., A.M.I.E.E., will give a lecture on " Electronics " at a meeting of Keighley Association of Engineers at Devonshire Buildings, Devonshire Street, Keighley, at 7.30 p.m., on October 27.

THE MANAGEMENT and employees of the Teesside Bridge & Engineering Works have made presentations to Mr. W. H. Kirtley, of Thornaby, foreman template maker, in recognition of his receiving the British Empire Medal.

AN ADDRESS ON " The Influence of Engineering on Social Advancement " will be given by Mr. Edward Reeve, M.I.Mech.E., at an informal meeting of the Institution of Mechanical Engineers, Storey's Gate, St. James's Park, London, S.W.1, at 5.30 p.m., on October 27.

THE NORTH-EAST DEVELOPMENT ASSOCIATION, an organisation formed to attract new industries to the district, was inaugurated at a meeting at Newcastle-upon-Tyne on October 6. Lord Ridley was elected chairman. The Association's Council will comprise 71 members.

NORTH-EASTERN REFRACTORIES, LIMITED, Northern Refractories, Limited, Scottish Refractories, Limited, Sheffield Refractories Company, Limited, and Yorkshire Refractories, Limited, are being wound up voluntarily. Mr. W. A. Cutts, Genefax House, Sheffield, is the liquidator.

SCOTTISH MEMBERS of the British Association for Industrial and Commercial Education are to hold a conference on the recruitment and training of young workers for industry and commerce in the Glasgow and West of Scotland Commercial College on October 27. The conference will be opened by the Secretary of State for Scotland, Mr. Thomas Johnston, M.P.

A GENERAL MEETING of the Institute of Welding will be held at the Institution of Civil Engineers, Great George Street, Westminster, London, S.W.1, on October 25, at 6 p.m., when a discussion on " Welding in British Industry after the War " will be opened by Mr. H. I. Hodgson (automobiles and general engineering), Mr. C. S. Lillicrap (shipbuilding), Mr. H. N. Pemberton (pressure vessels), and Mr. H. Sutton (aircraft).

THE CLYDE CONFEDERATION OF ENGINEERING AND SHIPBUILDING TRADES has sent notices to the district committees of the various unions asking them to discipline the shop stewards and not to place an embargo on overtime. Stressing that the question of overtime was a matter for discussion between the employers and the unions, and not the shop stewards, an official of the Confederation stated that there was an agreement between the employers and the unions allowing overtime to be worked on two nights each week and on alternate Sundays. While the Government now said that there should be no Sunday work unless during an emergency, the employers had a right to insist that employees work overtime where necessary. The Confederation alleges that the shop stewards have placed an embargo on overtime in retaliation for the ban on Sunday work.

OPPOSING the nationalisation of industry in an address to his constituents recently, Commander T. D. Galbraith, M.P. for the Pollok Division of Glasgow, said it had beeen " tried time and time again, and had proved itself a dismal failure." Commander Galbraith said that the Post Office in Britain was held up as the example of efficiency of a public service, but in America and Canada the telephones and telegraphs were run by free enterprise, and were incomparably superior to those in this country. In the last 30 years the number of telephone subscribers in Britain had increased sevenfold, but the telephone charges had remained much the same. In the same period the electricity industry, much criticised just now, and which some people wished to nationalise, had increased its sales fifteen times and reduced its cost to the consumer by 75 per cent.

GERMANY, between the two wars, deliberately engineered a campaign to weaken British shipbuilding economically, and almost succeeded, said Mr. A. Murray Stephen, re-elected president, addressing the Institution of Engineers and Shipbuilders in Scotland at Glasgow recently. Mr. Stephen, who is chairman and managing director of Linthouse Shipyard, said shipping indemnities played into the enemy's hands. That mistake should not be repeated. Mr. Stephen also made these points:—Conditions should be created to enable all British-owned ships to be built in British yards; the mercantile marine should be maintained at a higher level than in 1939; Naval work should be planned to maintain employment and keep the fleet up-to-date; trade routes from which the Axis countries ousted Britain before the war should be returned; building and owning of ocean-going ships by enemy countries should be prohibited as a measure against future war.

COMPANY RESULTS

(Figures for previous year in brackets)

Blakey's Boot Protectors—Final dividend on the ordinary shares of 10%, making 17½% (15%).

William Doxford & Sons—Second interim and final dividend of 10% on the ordinary shares, making 15% (same), and a participating dividend of 1% (same) on the 5% cumulative participating preference shares, making 6%.

Hammond Lane Foundry—Net profit for 1943, after tax, £13,830 (£15,050); preference dividend, £2,250 (same); final dividend of 7% and a bonus of 2½%, making 12½% (same); to general reserve, £4,000 (same); forward, £4,015 (£4,248).

Settle Limes—Profit, after charging depreciation, interest, etc., £17,668; contributions under War Damage Act, 1941, £336; E.P.T., £4,350; income-tax, £8,200; net profit, £4,782 (£4,218); dividend of 4% on the ordinary shares, £3,654 (same); forward, £4,693 (£3,565).

William Bayliss—Trading profit for the year to July 31 last, £7,986 (£7,374); rents, £1,617 (£1,475); mortgage interest, £1,000 (same); depreciation, £605 (£636); taxation, £4,050 (£3,400); net profit, £3,448 (£3,313); to general reserve, £1,000 (same); dividend of 7½%, £2,250 (same); forward, £3,473 (£3,275).

Bennis Combustion—Profit for the year to April 30, after depreciation, £12,184 (£25,570); E.P.T. recoverable, £6,000 (nil); taxation, £8,000 (£10,500); war damage premiums, £155 (£210); preference dividend, £3,000 (same); ordinary dividend of 10% (same); to general reserve, £3,000 (£1,000); forward, £2,647 (£2,368).

Cochran & Company, Annan—Trading profit to June 30 last, £78,193 (£58,397); maintenance, £30,832 (£22,556); depreciation, £9,291 (£8,340); overdraft and other interest, £1,995 (£1,385); workers' bonus, £5,862 (£5,361); fees, etc., £876 (£750); taxation, £18,882 (£12,985); net profit, £10,455 (£7,020); deferred repairs, £2,500 (nil); war damage payments, £846 (£936); dividend of 4%, tax free, £6,000 (same); forward, £2,070 (£961).

RESEARCH ADVISERS

The Lord President of the Council has appointed Mr. W. J. Drummond, Dr. H. L. Guy, F.R.S., Sir William Halcrow and Mr. W. F. Lutyens to be members of the Advisory Council to the Committee of the Privy Council for Scientific and Industrial Research.

Sir Joseph Barcroft, Sir Harold Hartley and Sir Frank Smith retired from the Council on completion of their terms of office on September 30.

THE FIFTH HINCHLEY MEMORIAL LECTURE will be delivered to the Institution of Chemical Engineers (Chemical Engineering Group) on October 27, at 3 p.m., in the Institution of Civil Engineers, Great George Street, Westminster, London, S.W.1, by Sir Alexander Gibb. His subject will be "Hydro-Electric Development in Great Britain and its Influence on Chemical and Allied Industries."

OBITUARY

MR. ROBERT SMITH, who was assistant general secretary of the National Union of Foundry Workers in Manchester and Glasgow for 28 years, died recently at Glasgow. He was 84 years of age.

MR. EUGENE CURRAN, managing director of Edward Curran & Company, Limited, enamelled steel hollowware manufacturers, of Cardiff, and of the Cardiff Foundry & Engineering Company, Limited, died recently, aged 66, following a short illness. He was a member of the Wales and Monmouth Branch of the Institute of British Foundrymen, of which his two sons are also members.

MR. T. EDGAR FELLOWS, of Tettenhall, Wolverhampton, has died in his 67th year. For about 40 years he had been associated as director and chairman with S. J. & E. Fellows, Limited, stampers and pressers, of Wolverhampton, and was also chairman of Fellows, Chamberlin, Limited, Barry, the Crane Foundry Company, Limited, and J. A. & A. Bratt & Sons, Limited, and a director of Midland Tar Distillers, Limited.

CAPT. N. B. THOMAS, R.E., Parachute Regiment, was killed in action at Arnhem last month while serving with the 1st Airborne Division. He was the second son of the late Col. Lionel Beaumont Thomas, formerly M.P. for King's Norton, and of Mrs. B. Thomas, Cedar Grange, Hethersett, Norfolk. Col. Lionel Beaumont Thomas, who was for more than 25 years a director of Richard Thomas & Company, Limited, was also killed in action during the present war. Capt. N. B. Thomas, who was aged 28, was formerly attached to the Bombay Sappers and Miners, 4th Indian Division. He was a great-grandson of the founder of Richard Thomas & Company, Limited.

PERSONAL

MR. E. RANSOM HARRISON has joined the board of Walter Spencer & Company, Limited, Crescent Steelworks, Sheffield.

MR. S. BATES, secretary of the Consett Iron Company, Limited, has been elected a member of Consett (Durham) Urban Council.

MR. ARTHUR DUNCOMBE, proprietor of Fred Duncombe, Limited, lock manufacturers, Willenhall, has been appointed a Justice of the Peace for Staffordshire.

MR. W. HOLBECHE, who has retired from Guest, Keen & Nettlefolds, Limited, Birmingham, after 53 years' continuous service, has received a presentation from the staff and employees.

MR. A. L. MCCOLL has been elected chairman of the Superheater Company, Limited, in place of the late Mr. H. W. Lee. MR. HAROLD MELHUISH has been appointed a director of the company.

MR. A. T. J. PARKES, of Wolverhampton, has been appointed a Justice of the Peace for Staffordshire. Mr. Parkes is a director of Josiah Parkes & Sons, Limited, hardware manufacturers, Willenhall, and is Deputy-Lieutenant of the County of Stafford.

Raw Material Markets

IRON AND STEEL

Relaxation of the control of the iron and steel industry is not an immediate probability, and the prospect of a period of restricted activity is accepted as an unavoidable consequence of the military situation. The steelworks have had a good run; they have been operating to capacity for nearly five years, and a slight easement of the pressure preceding the change-over to the production of the enormous tonnages which it is expected will be required for post-war reconstruction, is not altogether unwelcome.

Activities in the foundries are still on a reduced scale, but the position has not undergone further deterioration. If only to a limited extent, permits have been released for the production of light castings for house building and repairs, and hopes are entertained that this trade will rapidly develop. At the general engineering and allied foundries, the amount of work in hand is shrinking, and new orders are needed to maintain full employment. In these circumstances the provision of the necessary supplies of pig-iron is well within the capacity of the blast furnaces, and the only grade still scarce is hematite, which can only be supplied in small parcels to authorised consumers.

The easy trend of the scrap market continues. Considerable tonnages of cast-iron and steel scrap are still being called for by the engineering foundries, however. The strongest demand at the moment is for heavy machinery metal. In many cases, the lighter grades of scrap are proving difficult to dispose of.

Sufficient supplies of coke are available to meet present needs. Most foundries continue to take in stocks, for although there is not the demand for coke that was experienced at this time last year, it is expected that the supply problem will become more difficult during the winter.

British steelmakers have made a most satisfactory response to the call for increased tonnages of billets, blooms, sheet bars, etc. Execution of the large volume of orders for light sections, rounds, squares, flats, etc., which has been placed by the Government, involves a high consumption of semis, and as the import of Lease-Lend material is on a smaller scale, re-rollers are largely dependent on home sources of supply. Both prime and defective billets are in constant request, small billets being specially called for. On the other hand, sheet makers are well supplied with bars, and are turning out good tonnages of flats and corrugated sheets. There has been no lack of work at the sheet mills and a further spate of orders is likely now that the restrictions on galvanising have been withdrawn.

The announcement of a gradual reversion to the building of certain types of ships for post-war purposes promises to give a new impetus to the shipbuilding industry, with favourable repercussions on the demand for steel plates. Some of the mills are also rolling limited tonnages for shipment to the U.S.A., and the position has undergone some improvement. It is noticeable, however, that specifications for the lighter sizes still predominate, and this tendency is still more pronounced in the orders for sectional material. Producers of colliery requirements are provided with regular employment, and similar conditions prevail at the rail mills, while wire drawers are working to the limit of their capacity.

NON-FERROUS METALS

Consumption of the non-ferrous metals is steadily diminishing as war requirements fall off. Although there have been several small concessions, such as in the use of zinc for galvanising, and copper and lead in plumbing work, there has been no general lifting of the restrictions on civilian work. Until this takes place there is no likelihood of any increase in the demand. Copper is in particularly good supply, but there has been no indication of any further release. The chief reason is probably the continued shortage of labour.

There is the possibility that tin, in contrast, may show a slight increase in consumption over the next few months. Requirements on the Continent will probably call for a fair tonnage.

As home consumption shows no sign of increasing, it should be possible to meet these demands without any undue strain on reserves. No official statistics are available regarding our stocks, but with the strict economy enforced in the use of the metal, they should be quite substantial. At the same time, there is no likelihood of civilian release of tin in this country until supplies are again available from the Far East.

Limited amounts of lead have been released for use in the repair of houses. Although the supply situation is quite comfortable, shipments to this country continue to be regulated by the question of restricted cargo space rather than by the tonnage available at the producing areas.

NEW COMPANIES

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

Scottish Aluminium Ware, Larkhall, Lanarkshire—£25,000.

Cuex, 272, Corporation Street, Birmingham, 4—Engineers, etc. £5,250.

H. Case (Hardware), 12, High Street, Cradley Heath, Staffs—£5,000. F. A., M. and R. C. Case.

A. Wigley (Belper), Queen Street, Belper, Derby—Engineers, etc. £5,000. S. W. and H. H. Wigley.

J. Grantham & Sons, 104, High Holborn, London, W.C.1—Engineers, etc. £10,000. J. and R. Grantham.

Smith Bros. & Webb, 261, Stratford Road, Birmingham, 11—Engineers, etc. £10,000. C. D. and P. C. Smith.

H. L. Homer & Company, 38, Faraday Avenue, Sidcup, Kent. Engineers, etc. £2,000. H. L., L. P. and E. Homer.

CURRENT PRICES OF IRON, STEEL AND NON-FERROUS METALS

(Delivered, unless otherwise stated)

Wednesday, October 18, 1944

PIG-IRON

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

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

Hematite.—Si up to 3.00 per cent., S & P 0.03 to 0.05 per cent.; Scotland, N.-E.Coast and West Coast of England, 138s. 6d.; Sheffield, 144s.; Birmingham, 150s.; Wales (Welsh iron), 134s. East Coast No. 3 at Birmingham, 149s.

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

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

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

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

Cold Blast.—South Staffs, 227s. 6d.

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

FERRO-ALLOYS

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

Ferro-silicon (5-ton lots).—25 per cent., £21 5s.; 45 per cent., £25 10s.; 75 per cent., £39 10s. Briquettes, £30 per ton.

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

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

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

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

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

Ferro-chrome.—4/8 per cent. C, £46 10s.; max. 2 per cent. C, 1s. 3½d. lb.; max. 1 per cent. C, 1s. 4¼d. lb.; max. 0.5 per cent. C, 1s. 6d. lb.

Cobalt.—98/99 per cent., 8s. 9d. lb.

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

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

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

SEMI-FINISHED STEEL

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

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

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

FINISHED STEEL

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

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

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

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

NON-FERROUS METALS

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

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

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

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

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

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

Brass.—Solid-drawn tubes, 14d. per lb.; brazed tubes, 16s.; rods, drawn, 11⅜d.; rods, extruded or rolled, 9d.; sheets to 10 w.g., 11⅛d.; wire, 10⅞d.; rolled metal, 10½d.; yellow metal rods, 9d.

Copper Tubes, etc.—Solid-drawn tubes, 15¼d. per lb.; brazed tubes, 15¼d.; wire, 10d.

Phosphor Bronze.—Strip, 14¼d. per lb.; sheets to 10 w.g.; 15¼d.; wire, 16½d.; rods, 16½d.; tubes, 21⅛d.; castings, 20d., delivery 3 cwt. free. 10 per cent. phos. cop. £35 above B.S.; 15 per cent. phos. cop. £43 above B.S.; phosphor tin (5 per cent.) £40 above price of English ingots. (C. CLIFFORD & SON, LIMITED.)

Nickel Silver, etc.—Ingots for raising, 10d. to 1s. 4d. per lb.; rolled to 9 in. wide, 1s. 4d. to 1s. 10d.; to 12 in. wide, 1s. 4¼d. to 1s. 10¼d.; to 15 in. wide, 1s. 4½d. to 1s. 10½d.; to 18 in. wide, 1s. 5d. to 1s. 11d.; to 21 in. wide, 1s. 5½d. to 1s. 11½d.; to 25 in. wide, 1s. 6d. to 2s. Ingots for spoons and forks, 10d. to 1s. 6½d. Ingots rolled to spoon size, 1s. 1d. to 1s. 9½d. Wire, round, to 10g., 1s. 7½d. to 2s. 2½d., with extras according to gauge. Special 5ths quality turning rods in straight lengths, 1s. 6½d. upwards.

NON-FERROUS SCRAP

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

Returned Process Scrap.—(Issued by the N.F.M.C. as the basis of settlement for returned process scrap, week ended Oct. 14, where buyer and seller have not mutually agreed a price; net, per ton, ex-sellers' works, suitably packed):—

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

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

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

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

IRON AND STEEL SCRAP

(*Delivered free to consumers' works. Plus 3¾ per cent. dealers' remuneration. 50 tons and upwards over three months, 2s. 6d. extra.*)

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

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

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

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

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

SITUATIONS

FOUNDRY SUPERINTENDENT.—A vacancy caused by retirement will shortly occur in the Foundry of a well-known old-established Engineering Works in Leicestershire, with a weekly output of 60 tons grey iron, light and medium castings, of a semi-repetition nature, and 3 tons non-ferrous; a permanent post for a thoroughly qualified man between 35 and 45 years of age, competent to take full control; preference would be given to a man capable of introducing the production of malleable iron (blackheart) castings on a repetition basis; all applications will be treated with the strictest confidence.—Box 708, FOUNDRY TRADE JOURNAL, 3, Amersham Road, High Wycombe.

FOUNDRY SUPERINTENDENT required for Iron Foundry in the Midlands, producing castings of all sizes; must be energetic and with technical foundry and metallurgical qualifications; please state qualifications, previous appointments, and age; excellent prospects in a wide field.—Reply Box 722, FOUNDRY TRADE JOURNAL, 3, Amersham Road, High Wycombe.

MACHINERY

WANTED. — Modern drop-bottom Cupola, from 3 ft. to 4 ft. dia. inside casing.—Send full particulars to Box 720, FOUNDRY TRADE JOURNAL, 3, Amersham Road, High Wycombe.

WANTED.—One 2½ in. capacity Forging Machine; "Ajax" or similar type. One 2 in. capacity Forging Machine; "Ajax" or similar type. One Hot Upsetting Machine; suitable for dealing with stock 2 in. dia. maximum. Direct Electrically-driven Machine; preferred suitable for 400 volts, 3-phase, 50 cycles, a.c. supply.—Reply Box 718, FOUNDRY TRADE JOURNAL, 3, Amersham Road, High Wycombe.

FOR SALE.—Three "Morgan" Patent Tilting Furnaces, type "S" (400 lbs. capacity); complete with motor-driven Fan. Two "Pickles" Patent Turnover Moulding Machines, to take 14 in. by 16 in. boxes and fitted with pneumatic vibrators, control valves, flex, etc.—Apply to NEWMAN, HENDER & Co., LTD., Woodchester, Glos.

FOR SALE.

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ONE GAS-FIRED STOVE, by Bullard; sheet steel construction; suitably insulated; internal measurements 4 ft. 6 in. high, 7 ft. 6 in. wide, 7 ft. 6 in. deep; swing doors.

TWO GAS-FIRED STOVES, by Controlled Heat & Air, Ltd.; 6 ft. high, 3 ft. wide, and 7 ft. deep; swing doors.

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4 GAS-HEATED Core-Drying Stove Units; each fitted with four drawers, 3 ft. square; complete with burners and fume cowls; makers, Bilston Stove Co.—Box 724, FOUNDRY TRADE JOURNAL, 3, Amersham Road, High Wycombe.

ELECTRIC Conveyor Furnace; suitable for vitreous enamelling, annealing or stoving; length 75 ft.; firing space 8 in. high, 6 in. wide; three automatically controlled heating zones; accuracy ± 5 deg.; temperatures 0 to 900 deg. C.; five speeds between 6 and 15 hours, but easily adaptable for other speeds; may be seen working; London area.—Box 712, FOUNDRY TRADE JOURNAL, 3, Amersham Road, High Wycombe.

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

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Standard Size Adaptable Moulding Machines, etc.
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PATTERNS for Hand or Machine Moulding; sound construction; accuracy; keen quotations; good delivery.—L. E. SLATER, Patternmaker, near 267, Coggeshall Road, Braintree, Essex.

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

STEEL CHIMNEY, 42 ft. high, 21 in. dia., for Sale.—Seen at LANDSEER-BAILEY, 385, Garratt Lane, London, S.W.18. Battersea 3018.

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

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