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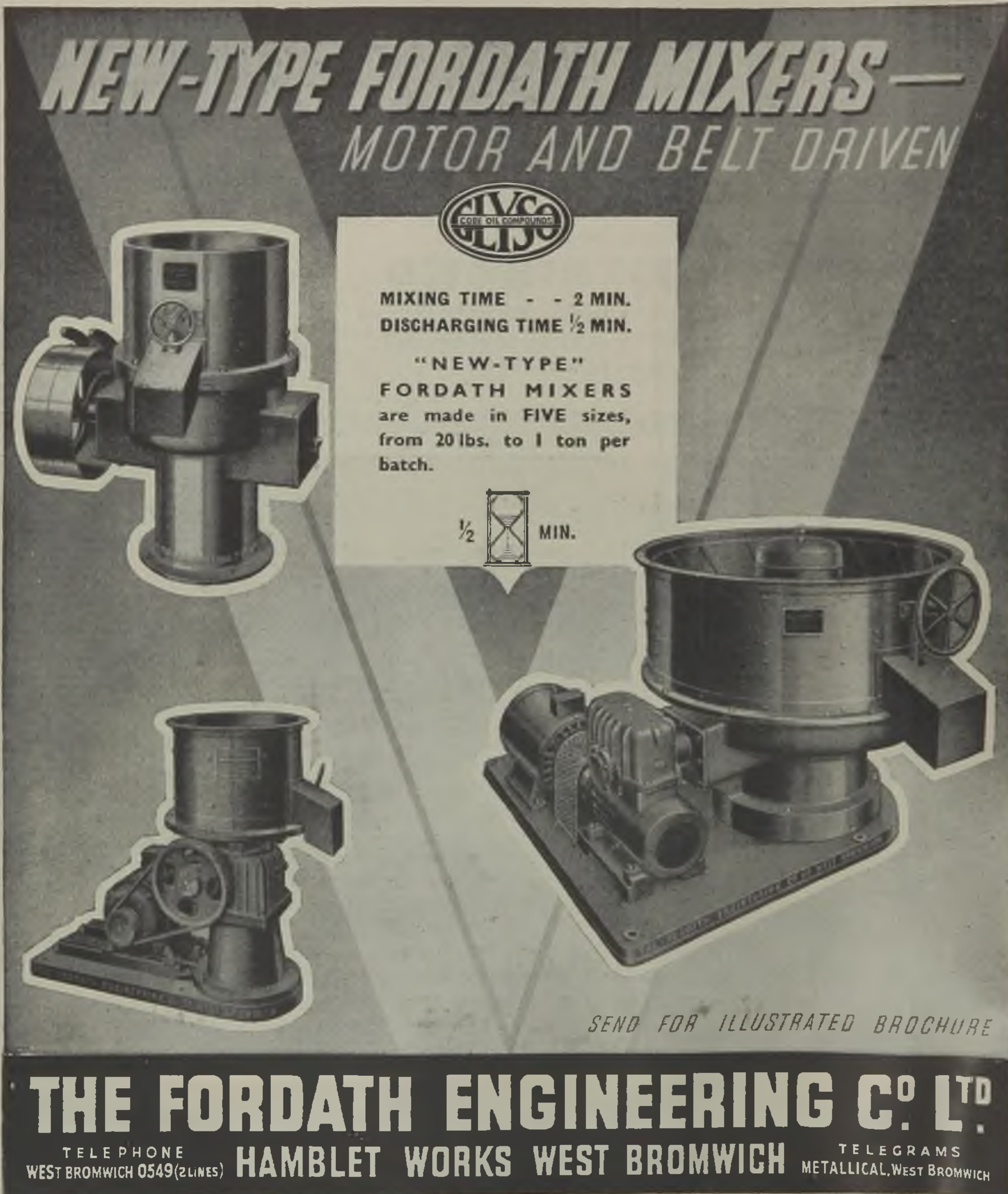
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Transom Business

Mr. J. H. Van Deventer, the Editor of the "Iron Age," has drawn attention to the dangers of what he calls "Transom Business." This phrase is new to us, but it leaves one with the impression that it is something extra. However, we are favoured with a definition which reads "Transom business is business you haven't sold." Because of controls, the foundry industry has not encountered much of this type of business during the war period, but they are cognisant of its implications in other lines, for who has not met the individual who glibly asserts that he is really spending very little of his own money when excess profit tax is taken into consideration? The time is rapidly arriving when the foundry industry will be offered much transom business, for this is a direct consequence of excessively high taxation. Its acceptance needs careful study.

Foundry owners should carefully scrutinise all transom business, especially where this needs the expenditure of large sums of money on a specialised plant for its execution. Worthwhile business is seldom there for the asking. It needs to be sought. We believe that at the moment industrial conditions are such that post-war orders should be sought. It is obvious there is much work to be done, and time spent examining pre-war order-books objectively will not be wasted. Systematic inquiry made now as to what old customers intend to do in the future will enable a skeleton plan to be established for future activities. Thus armed, a clear conception can be gained as to whether any transom business should be seriously entertained. Transom business typifies a seller's market, and calls for the display of the same degree of commercial acumen as when pressure is applied by the buyer in times of depression. The danger is specially pronounced when it impinges on the smaller concerns, as they may find themselves landed with "one big customer." There is one well known prosperous foundry which at one time in its career found itself operating as a subsidiary concern of a large firm in liquidation. That was the result of accepting transom business.

After the war there will be a lull of short duration before many of the foundries will be inundated with enquiries, and this lull is the crucial period, for it must be utilised for the establishment of a manufacturing policy of a manageable and progressive character. Some sections of the industry will not be in this happy position, and from the outset will have to launch a campaign to attract business to the foundries which would be claimed by competing industries. This is especially the case with the steel founders, because their activity is a veritable barometer of armament production. To replace munitions by orders from the mercantile marine, the railway, mining and engineering industries and still maintain production above that datum line, below which losses are certain, will need every ounce of initiative the industry can muster. To return to a 100,000 tons per annum production will place the whole industry in Carey Street. A target for at least 300,000 tons should be set, and action taken to see that it is achieved. The light alloy section also will have an uphill fight to maintain wartime production level. However, they are tackling the problem energetically and, in general, intelligently. The issue of booklets on such subjects as hints on machinery light alloys, is excellent propaganda, the need for expansion in both steel and light alloys being imperative. Transom business will be welcomed, and again to quote Mr. Van Deventer: "Transoms are not one-way openings, and business can float out of them as well as in through them." Initiative, however, will provide adjustable shutters for ensuring the retention of such business.

Contents

CORE BONDING

In a Paper, "The Bonding Properties of Mixtures of Petroleum Extracts and Linseed Oil and of the Extracts Themselves," which Mr. W. Davies, M.Sc., and Dr. W. J. Rees have prepared for presentation to the Iron and Steel Institute through the Steel Castings Research Committee (Moulding Materials Sub-Committee), the authors have drawn the following conclusions:—

(1) In sand mixes bonded with 2 per cent. of linseed oil up to 40 per cent. of the oil can be replaced by any of the petroleum extracts examined, except Group 1A(140) extract, without adversely affecting the tensile strength. If more than 50 per cent. of the oil is replaced by extract, the tensile strength falls off sharply. Mixtures containing up to 40 per cent. of extract require the same milling and drying conditions as those containing linseed oil alone to give the optimum tensile strength. Premixing of the linseed oil and extract before addition to the sand tends to give a more uniform mix.

(2) Up to 50 per cent. of the linseed oil in core compounds rich in starch can be replaced by extract; this replacement gives an increase in green strength, without altering the dry strength appreciably.

(3) Up to 40 per cent. of the linseed oil in core compounds rich in dextrin can be replaced by extract: this replacement increases the green strength, but is accompanied by a slight loss in dry strength.

(4) The replacement of 50 per cent. of the linseed oil in core compounds rich in molasses gives an increase in green strength, but reduces the dry compressive and tensile strengths; at the same time, the surface friability increases slightly.

(5) The replacement of 40 to 50 per cent. of the linseed oil in core compounds rich in sulphite lye reduces the dry compressive and tensile strengths.

(6) Sand mixes bonded with 2 or even 4 per cent. of extract give dry tensile strengths far below that of mixes containing 2 per cent. of linseed oil. Test-pieces of the extract mixes have extremely friable surfaces. Neither an increase in drying temperature from 200 to 250 deg. C. nor the use of driers at 200 deg. C. gives much improvement. From this, it appears unlikely that the extracts could wholly replace the linseed oil in mixes containing this bond alone.

(7) The replacement of linseed oil by an extract/linseed-oil mixture containing 40 to 50 per cent. of extract does not alter the stripping qualities of sand mixes.

(8) Of the extracts tested, Group 1(72) gives the best all-round results and its consistency is such that it can be easily handled.

(9) The above conclusions are based on work with Chelford sand, but tests on a number of mixtures with Arnold's 52 (Leighton Buzzard) sand lead to similar conclusions.

SAVE WASTE PAPER

IRONFOUNDRY FUEL NEWS—XVI

The experience of the Regional Panel members of the Ironfounding Industry Fuel Committee shows that one of the easiest and most profitable ways of saving fuel in mould and core-drying stoves which are used for batch working (generally one batch per night) is to keep the stove doors closed during the daytime as much as possible.

It is not perhaps realised as much as it might be that the amount of coke required to heat up the brickwork of a medium sized stove from air temperature to working temperature may amount to some two or three hundredweights, or even more. If the stove doors are left open from, say, the first thing in the morning until the stoves are loaded in the afternoon, most of this heat is lost, and a corresponding extra amount of coke must be used during the following night to compensate. Thus many tons of coke are wasted in a year.

It will be apparent that the maximum use should therefore be made of bogies which can be left outside the closed stove and loaded as convenient, and that the opening of the doors to admit men to load work on shelves should be minimised. Needless to say, stove doors should fit well (pay special attention to the tops of vertical sliding doors), and should be jammed tight, if necessary.

CUPOLA IRON IN OPEN-HEARTH FURNACES

Of interest to cupola manufacturers in this country is the fact that America has now three cupola premelting installations to supply hot metal to open-hearth furnaces. Mr. William C. Buell, jun., who addressed the 27th annual conference of the Open-Hearth Steel and Blast Furnace and Raw Materials Committees of the A.I.M.E. on this subject, stated he did not hold out much hope for the future of the process, as the cost of conversion in the cupola was too high, being of the order of 10 dollars a ton, although five dollars a ton was given by a member during the discussion. A second Paper by Mr. Hughe Barnes, consulting engineer to the Armco concern, reported a reduction in the operating time in the open-hearth through the use of molten cupola metal.

SAND FOR MAGNESIUM FOUNDRY PRACTICE

Mr. Oscar Blohm, writing in the "Iron Age," gives the following data in connection with the make-up of sand suitable for magnesium foundry practice. The A.F.A. grain size is to be of the order of 70 to 80.

Sand (washed and dried silica)	800 lbs.
Bentonite	10 lbs.
Ammonium silico fluoride	26 lbs.
Sulphur	7 lbs.
Boric acid	10 lbs.
Diethylene glycol	2 lbs.
Water	5 to 8 qts.

DEVELOPMENT OF A FLUX DEGASSING PROCESS FOR CHILL-CAST TIN BRONZES*

Experiments to meet the requirements for a successful oxidising flux process

By W. T. PELL-WALPOLE, B.Sc., Ph.D.

The requirements for a successful oxidising flux process are summarised as follows:—(1) The flux must carry an easily dissociated oxide, preferably an oxide of one of the metal constituents of the alloy, so that complete reduction does not seriously contaminate the bath; (2) the flux must be a solvent for any oxide skins present in the charge or formed during melting; (3) at melting temperature the flux must have a consistency such that it forms a continuous layer over the melt, and can be readily mixed with the latter to facilitate reactions and dissolution of oxides; (4) a suitable thickening agent must be selected which will mix with the flux to get it a pasty consistency so that it can be removed completely from the metal before deoxidation. The thickener must not contaminate the melt either directly or by reaction with the flux; (5) the necessary quantity of a suitable deoxidant must be added to the melt to remove excess of oxygen. The products of the deoxidation reactions must be readily removable from the metal, and residual deoxidant must not adversely affect the mechanical or working properties of the bronze, and (6) the flux should be of simple composition, easily prepared, cheap, not objectionably fuming, and should not attack the melting pot. The experiments described below were planned to develop a process which would meet these requirements.

Selection of Materials for an Alternative Oxidising-Flux Process

Cupric oxide was chosen as the oxidising agent, since it dissociates at the temperature of operation and even if completely reduced does not contaminate the melt. Technically pure oxide was used in preliminary experiments, but later copper mill scale was found satisfactory as a substitute. Materials to act as carriers for the copper oxide were selected from those which are relatively cheap and are not strongly basic in reaction, *viz.*, fused boric acid and borax, sodium chloride and sodium fluoride, all of commercial purity.

Stourbridge sand and commercial bone ash were used for thickening the flux, either alone or fritted with one-third part by weight of borax or sodium fluoride. All the materials were dried thoroughly and stored in air-tight containers.

Experiments on Fluxing Procedure

Before investigating the effects of different flux compositions, it was necessary to develop a satisfactory fluxing procedure. For this purpose a flux containing equal parts by weight of copper oxide, boric acid, sodium fluoride, and sodium chloride, was used at the rate of 1 oz. of flux per lb. of metal. This gave a cover $\frac{1}{2}$ to 1 in. deep with melts of 10 to 30 lbs., and an available oxygen content much greater than that required theoretically in the melt to ensure a minimum hydrogen content.

Melts of 9 to 14 per cent. tin bronze were prepared from virgin metals (cathode copper, Chempur tin) or from scrap, in salamander pots in a gas-fired pit furnace. The following factors were investigated:—(1) Adding the flux (*a*) as a dried mixture, or (*b*) prefused and re-ground; (2) adding the flux (*a*) all with the charge, or (*b*) half the quantity of low oxidising power (1 part by weight cupric oxide, 4 parts each other constituent) with the charge, and the remainder (3 parts cupric oxide, 4 parts each other constituent) during the superheating stage; (3) the time permitted for reactions to occur between the molten metal and flux, and (4) the effect of different thickeners.

All melts were deoxidised either with 0.05 per cent. phosphorus or with 0.1 per cent. aluminium. In each experiment the metal was poured at 1,150 deg. C. $\pm$ 20 deg. C., the temperature being measured with a Chromel/Alumel couple in a silica sheath protected with a wash of alundum cement or ganister. Three moulds were used, two of conventional design giving small strip ingots (12 $\times$ 4 $\times$ $\frac{1}{4}$ in. or 12 $\times$ 2 $\times$ $\frac{1}{2}$ in.), the other a small billet mould (Fig. 1) designed to give uni-directional cooling and thus minimise shrinkage defects. The strip moulds were pre-heated to 100 deg. C., dressed with French chalk and inclined at 30 deg. to the vertical for pouring down the inclined edge directly from the melting pot. With the billet mould, central-funnel pouring at a rate of $\frac{1}{2}$ lb. per second was used. The base was heated to 100 deg. C. and dressed with French chalk; the steel cylinder and the outer fireclay insulator were preheated to 700 to 800 deg. C.

Billets and ingots were annealed for 4 hrs. at 750 deg. C., then sectioned and tested as in Figs. 2-3. Some of the results of these experiments are summarised in Table I.

The flux fumed badly at operational temperatures and attacked the melting pot slightly, though much less than highly basic fluxes of the Lepp type. Difficulty was also encountered in thickening the flux for removal, a thin semi-transparent layer remaining on the metal surface and causing fine slag-traps in the billets. In spite of these disadvantages, the flux effected a definite degassing action on the metal, as shown by the very satisfactory mechanical properties of the

* Extracts from a Paper read before the Institute of Metals. The author is Chief Metallurgist, Tin Research Institute.

Development of a Flux Degassing Process

strip ingots, all of which were rolled hot or cold without cracking. The properties of the billets are particularly notable, being high and uniform across the section. Macrostructures and microstructures also showed marked freedom from porosity except at the top centre. Scrap charges gave results comparable with virgin metals. Analyses of these bronzes show a slight tin loss, which is discussed later.

Pre-fusing the flux was found to be preferable to using the "dried" mixture, since the latter on heating continued to evolve water vapour up to fusion temperature. Addition of the flux in two stages gave no advantage over adding all with the charge. The time which could be allowed for reaction between metal and flux was found to be restricted by the necessity of obtaining the correct casting temperature and avoiding over-oxidation (Table I).

Thickeners had little action on the properties of the metal except in the case of commercial bone ash. This caused a violent reaction and gave gassy metal with inferior properties, *e.g.*, tensile strength 15 to 17 tons per sq. in., with 15 to 30 per cent. elongation, compared with 22 to 24 tons per sq. in., with 50 to 60

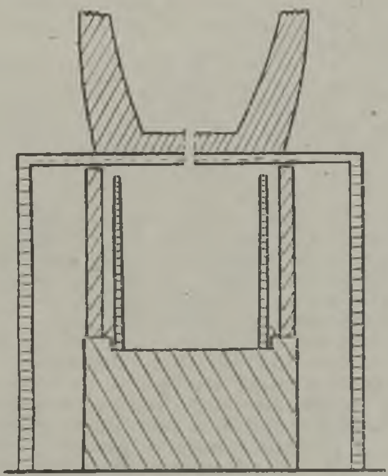


Fig. 1.—Metal is Poured Through a Salamander Funnel Into a Steel Cylinder, which is Surrounded by a Fireclay Insulator and Stands on an Aluminium Bronze Chill Base.

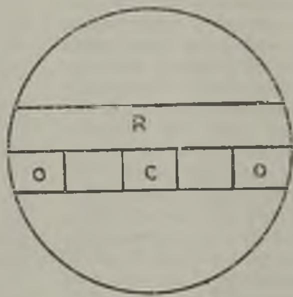


Fig. 2.—Plan of Billet, Showing Method of Sectioning for Tests. Key: R = Rolling Specimen; O = Outside Tensile Specimen; C = Central Tensile Specimen.

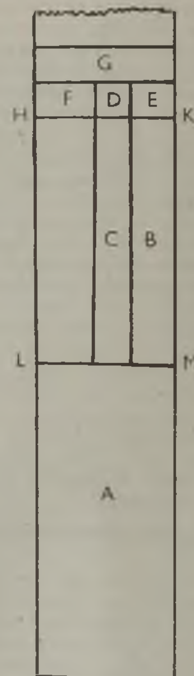


Fig. 3 (Right).—Method of Sectioning Strip Ingots. Key: A = Specimen for Rolling Test; B & C = Tensile Specimens; D-F = Microspecimens; G = Sample for Analysis; HK and LM = Nicked and Fractured for Visual Examination.

Table I.—*Effect of Reaction Time.*

Reaction time.	Appearance of melt after deoxidation.	Characteristics of ingot.	Rolling properties. Annealed 16 hrs. at 750 deg. C.
5 minutes	Too cold to pour.	—	—
10 minutes	Surface of metal cleared well. Temp. 1,250 deg. C.	Surface blowing. Slight pinhole porosity in microstructure.	Cold rolled 80 per cent. without cracks. Hot rolled with trace of edge cracking.
20 minutes	Surface did not clear; metal over-oxidised. Temp. above 1,300 deg. C.	Less surface blowing. More interdendritic porosity. Crystals of SnO_2 in microstructure.	Cracked badly in cold and hot rolling.

per cent. elongation, obtained with other thickeners. The gassing was attributed to residual organic matter in the bone ash, and was eliminated by re-calcination of the latter before use. The fritted mixtures thickened the flux more readily than the sand or bone ash alone, but otherwise gave no improvement.

From the results of these experiments, the following melting procedure was adopted for further investigations. The metal was charged with pre-fused flux (1 oz. per lb. of metal); when molten the flux was drawn aside and half the chosen deoxidant (0.05 per cent. phosphorus as 15 per cent. phosphor-copper, or 0.1 per cent. pure aluminium) was added, together with the required amount of tin. After 10 to 15 minutes' superheating, the flux was mixed with the metal, allowed to separate, thickened with dried sand, and removed completely from the surface of the metal. The remaining deoxidant was then added, stirred well in, and the metal skimmed again and allowed to cool to the casting temperature.

The Effect of Some Variations in Flux Composition

A number of fluxes (Table II) was prepared by modifying the original composition in order to eliminate the disadvantage of the latter and to study the effect of various carrier materials (boric acid, borax, sodium fluoride, etc.), each with two concentrations of copper oxide, on the properties of chill-cast tin bronzes. With each flux, strip ingots of 14 per cent. tin bronze from virgin metals and of 12 per cent. bronze from scrap were prepared by the melting and casting procedure given in the previous section. One comparative melt was made without flux. Ingots were annealed for 16 hrs. at 750 deg. C., and sectioned and tested as shown in Fig. 3.

Fluxes containing sodium chloride or boric acid were abandoned after preliminary examinations, since the former caused severe fuming and slag-traps in the metal, while substitution of borax for boric acid gave cleaner melts, especially with scrap charges.

The fluxes containing sand and borax are particularly notable; they are non-fuming, easy to thicken for removal, and have no attack on the salamander pot. Repeated use of this type of flux has confirmed that the pot gives as many heats as when no flux is used.

Analyses of the bronzes show a slight tin loss and a relatively high phosphorus loss with all fluxes, but appreciably greater in those of higher copper oxide content. This suggests that the latter reacts with the tin in the melt: $2CuO + Sn \rightleftharpoons SnO_2 + 2Cu$, and that the tin oxide formed is distributed between the metal and the flux. That absorbed by the metal prevents hydrogen absorption, and is eventually reduced by the deoxidant, thus accounting for the high phosphorus loss. The portion absorbed by the flux represents the observed loss in tin from the bronze.

The microstructures of flux-treated ingots all show less porosity than the untreated one, the sand-bearing fluxes being the best in this respect. The fluxes have no effect on the distribution or amount of the eutectoid, which in all ingots varies from isolated areas in the centre to intercrystalline films at the outside. The shallow surface layer of fine chill crystals has a higher

TABLE II.—*Compositions and Characteristics of Fluxes Used.*

Flux.	Composition, parts by weight.						Relative fluidity (amount of sand needed for thickening) in oz. per lb.	Attack on salamander pot.	Fuming.
	Cupric oxide.	Sodium chloride.	Sodium fluoride.	Boric acid glass.	Fused borax.	Red sand (dried).			
CFA*	3	4	4	4	—	—	Could not be thickened effectively (12)	Slight	Severe.
FA*	2	—	4	4	—	—	10	Slight	Less than CFA.
CF*	2	4	4	—	—	—	As CFA (10)	Slight	Severe.
B.1	4	—	—	—	8	—	6	Moderate	None.
F.1	4	—	8	—	—	—	8	Slight	Considerable. Less than CFA.
FB.1	4	—	4	—	4	—	6	Moderate	Slight.
SB.1	5	—	—	—	1	4	2	None	None.
SF.1	5	—	<1	—	—	4	2	Very slight	Very slight.
SFB.1	4	—	4	—	2	5	3	Negligible	Very slight.
B.2	2	—	—	—	10	—	8	Considerable	None.
F.2	2	—	10	—	—	—	10	Slight	Severe.
FB.2	2	—	5	—	5	—	8	Slight	Moderate.
SB.2	2	—	—	—	4	6	3	None	None.
SF.2	2	—	4	—	—	6	3	Negligible	Very slight.
SFB.2	2	—	2	—	2	6	3	Negligible	Very slight.

*Abandoned after preliminary experiments.

Development of a Flux Degassing Process

eutectoid content owing to the severe chilling action of the mould. All specimens were free from non-metallic inclusions.

The density of the chill-cast ingots does not vary with flux composition, but all fluxed samples have higher densities than the untreated one. After annealing, samples melted under siliceous fluxes are of rather higher density than the others. The copper oxide content of the flux has no effect on these, but with sand-free fluxes, those of higher copper oxide content give slightly higher densities.

The slight decrease in density which occurs during annealing is probably caused by completion of the reaction $2H_2 + SnO_2 \rightleftharpoons 2H_2O + Sn$ between residual hydrogen and oxygen in the metal. Scrap melts give slightly higher densities than the corresponding melts from virgin metals.

The results of tensile tests were not directly comparable, due to the slight variations in tin content. These variations were assessed by testing bronzes containing 10 to 14 per cent. tin, all prepared under the same flux (sand-borax-copper oxide): A graph of strength against tin content showed that an increase of 1 per cent. tin produced an increase in tensile strength of approximately 1 ton per sq. in., but there was appreciable change in extension over this range of composition. When this effect is taken into the account, there is no consistent variation in strength with the flux used, but elongation values are consistently higher with the siliceous fluxes. The scrap melts are not inferior to virgin melts when allowance is made for the difference in composition.

All the flux-treated ingots cold-rolled to 80 per cent. reduction without cracking, but in hot rolling from 750 deg. C. they developed slight edge cracking and, in some cases, fine cracks along the face-centre, probably caused by shrinkage cavities. The siliceous fluxes again gave the best results. The ingots prepared from scrap showed less cracking in all cases, but this is probably attributable to their lower tin content. The untreated ingots, both virgin and scrap, were markedly inferior to the flux-treated ones.

The variations in mechanical properties of rolled strip with the flux used (when allowance is made for variations in tin content) are in the same order as the freedom from cracking during hot rolling, *i.e.*, the siliceous fluxes again give the best results.

The results of these investigations show that the fluxes containing only sand, borax, and copper oxide are the most satisfactory. They are cheap, non-fuming, easy to thicken for removal, and give the greatest improvement in soundness and mechanical and working properties of the bronze. Further investigation of the effect of copper oxide content of the flux in relation to deoxidation procedure is in progress.

TABLE III.—*Effect of deoxidant.*

Property tested.	Deoxidised with phosphorus.	Deoxidised with aluminium.
Molten metal characteristics.	Surface clear. Metal fluid.	Surface covered with oxide skin. Metal pours very sluggishly.
Surface of strip ingots.	" Blowing " on pouring edge.	No " blowing."
Tensile test on 10 per cent. tin billet, as cast.	23–24 tons per sq. in. 45–65 per cent. extension.	21–23 tons per sq. in. 30–50 per cent. extension.
Tensile test on annealed specimen of 14 per cent. tin strip ingot	27–29 tons per sq. in. 60–70 per cent. extension.	23–27 tons per sq. in. 25–50 per cent. extension.
Average density of 10 per cent. tin billet	Cast .. 8.91 grm. per c.c. Annealed .. 8.89 grm. per c.c.	Cast .. 8.92 grm. per c.c. Annealed .. 8.92 grm. per c.c.
Microstructure of 9 per cent. or 10 per cent. tin billet (flux FB), annealed.	Uniform α. No inclusions.	Occasional trapped oxides. Brown inclusion.
Cold rolling; 9–14 per cent. tin strip ingot, annealed.	No cracking to 90 per cent. reduction.	No cracking to 90 per cent. reduction.
Hot rolling; strip ingots 9–14 per cent. tin.	Traces of edge cracking, increasing with tin content.	No cracking in any composition.

Comparative Effect of Phosphorus and Aluminium as Deoxidants

A number of experiments reported in the preceding sections were repeated with aluminium as deoxidant instead of phosphorus. The chief difference between the two are summarised in Table III.

The higher density and absence of any change in density on annealing, together with the lower tin loss in bronzes deoxidised with aluminium, suggest that it removes the oxygen from the melt more efficiently than does phosphorus, so that no oxygen is available to react with the residual hydrogen during solidification and subsequent annealing. From the metallurgical viewpoint, however, aluminium is not a satisfactory substitute for phosphorus, owing to the formation of oxide skins which become entrapped in the metal and impair the mechanical properties. In addition to these trapped oxides, a hard, brown inclusion, probably some

(*Continued on page* 312, *column* 1.)

A MAZDA FOUNDRY LIGHTING INSTALLATION

Our photograph illustrates a Mazda lighting installation in the main foundry of the Wycliffe Foundry & Engineering Company, Limited. The installation consists of 16 Mazdalux roof lay-lights, each housing six Mazda 80-watt, 5-ft. fluorescent lamps, and was carried out by the Electric Equipment Company, Limited.

The average intensity obtained is approximately 6 ft. candles, and the spacing 20-ft. centres laterally and 28 ft. longitudinally.

GREY IRON AT ELEVATED TEMPERATURES

Sub-committee XXII of the American Society for Testing Materials which has been developing data on the use of grey iron at elevated temperatures, has held several interesting discussions on this problem. In Cincinnati it considered details of proposed specification requirements for grey iron for service up to 340 deg. C., as pressure containing parts. Improvements were agreed on in defining the requirements and in eliminating intermediate temperature levels below 340 deg. C. As drafted, the proposal avoids conflict with other A.S.T.M. specifications, for example, with requirements for Grey Iron Castings for Valves, Flanges and Pipe Fittings (A 126 — 42) which are now used up to 230 deg. C. in accordance with existing codes.

A new limitation on the composition of the cast iron for elevated temperature work was proposed by defining the carbon equivalent, namely, C + 0.3 (Si + P) shall equal not more than 3.8. Cast irons above the grade of No. 40 (18 tons per sq. in. tensile) were to be eligible for this service, and existing cast irons up to the grade of No. 40 are at present eligible for service up to 230 deg. C. in existing pressure vessel codes. A further requirement proposes that all castings must be stress relief annealed by heating above 430 deg. and not more than 565 deg. C. Plans are in motion to redraft the proposed specification, support its contents with references and explanatory paragraphs, and present it for approval.

Mr. William M. Caldwell has been appointed assistant to the executive vice-president of the Grey Iron Founders' Society, national association of manufacturers of engineering grey irons, Mr. Walter L. Seelbach, of Cleveland, president, has announced. Mr. Caldwell, until recently senior business specialist in the grey iron and malleable castings section of the Office of Price Administration and formerly instructor in economics, management and structural engineering at the Pratt Institute, Brooklyn, N.Y., will devote a major part of his time to the association's expanding foundry cost programme.

TEN RULES FOR THE BRASSFOUNDER

(Reproduced from a poster recently issued by the Ministry of Fuel and Power on behalf of the National Brass Foundry Association. Copies obtainable from the Ministry, 2, Little Smith Street, London, S.W.1.)

A. The Furnace.—1. Keep the flue clean. 2. Keep the cover airtight on the furnace. 3. Use the right size pots and keep them clean

B. The Metal.—4. Melt as fast as possible. 5. Don't stew the metal. Put the empty pot back while still hot. Add the metal in time to be only just ready for pouring by the time the moulds are ready.

C. The Coke.—6. Use a single charge of coke for each heat. When the pot is taken out you should see the fire bars here and there through the hot coke. 7. Keep the coke heap tidy, and don't break the coke more than you can help. 8. Use smalls and slack from the coke heap and from the riddled ashes for the core stove or the boiler.

D. The Foundry.—9. Keep the foundry neat and tidy. 10. Turn off lights, fans, gas and water when not in use. Be ready always to make or receive suggestions for saving fuel.

Remember, the saving we ought to make from 20 80-lb. furnaces in a year will release enough coal to make one tank or one Spitfire.

By courtesy of the American Office of War Information, the American and British-Commonwealth Association is able to offer the loan of a series of documentary (some technical) sound films portraying American life. Application for the free use of any of these films should be addressed to the Hon. Director, American and British-Commonwealth Association, 18, South Street, London, W.1.

DEVELOPMENT OF A FLUX DEGASSING PROCESS FOR CHILL-CAST TIN BRONZES

(*Continued from page* 310.)

form of Al_2O_3, associated with the eutectoid, occurs in metal containing even a trace of aluminium.

The absence of blowing porosity in strip ingots deoxidised with aluminium suggests that the reaction normally responsible for this defect occurs between oxide on the surface of the molten metal and carbon of the cast-iron mould, and that the extent of the blowing depends on the ease with which this oxide reacts with carbon at the temperature reached on the mould face during pouring. Thus, with melts deoxidised with phosphorus, blowing is most severe, while with melts containing excess of tin oxide it is much less, and in metal deoxidised with aluminium it has not been observed. The superior hot-rolling properties of bronze deoxidised with aluminium are probably due to the decrease of intergranular porosity, indicated by the higher density.

The residual phosphorus content averages 0.02 per cent. from an addition of 0.05 per cent., while of the 0.1 per cent. aluminium used for deoxidation only 0.01 per cent. remains on average. It is improbable that these residual amounts of deoxidant imply complete removal of oxygen from the melt, and further work on the quantitative aspect of deoxidation is in progress.

Melting tin bronzes under oxidising fluxes improves their soundness and the working and mechanical properties. Bronzes containing 9 to 10 per cent. tin thus treated and cast so as to be free from shrinkage defects can be extruded and subsequently cold-rolled and cold-drawn. The wrought products have very high mechanical properties. The properties of metal prepared entirely from scrap are equal to those produced from the purest virgin metals, provided the melting and casting techniques are suitable.

Variations in flux composition, time of reaction between flux and metal, the composition of the thickener used for removing the flux, and deoxidation technique are all interdependent variables which may influence the properties of the metal.

Common salt was found to be an objectionable constituent in the flux; borax was found to be preferable to boric acid. The most suitable flux in the present work contained borax 34, sand 50, and cupric oxide 20 per cent. by weight. This flux does not attack the melting pots severely, is only slightly fuming at 1,200 to 1,300 deg. C., and can easily be thickened for removal from the melt so that slag inclusions are rarely found in the metal. The improved soundness and mechanical properties of the metal indicate that it has a considerable degassing action on the melt.

Dried sand or fritted mixtures of 3 sand : 1 borax or 3 sand : 1 sodium fluoride were the most satisfactory thickeners for the flux. Aluminium, used as an alternative deoxidant to phosphorus, gives the bronzes higher densities and better hot-rolling properties, but seriously impairs their mechanical properties, particularly in the cast state, owing to entrapped oxide skins.

AMERICAN CERAMIC SOCIETY

Amongst the Papers presented to the annual meeting of the Enamel Division of the American Ceramic Society were:—

1. *Mechanics of Enamel Adherence: XVI, Influence of Manganese Oxide on Metal Precipitation at Ground-Coat Interfaces.* By R. M. King: Department of Ceramic Engineering, Ohio State University, Columbus 10, Ohio.

2. *Abrasion Resistance of Porcelain Enamels.* By Clark Hutchison: Ingram-Richardson Manufacturing Company of Indiana, Inc., Frankfort, Ind.

3. *Chemical Durability of Porcelain Enamels.* By Ralph L. Cook and Andrew I. Andrews: Department of Ceramic Engineering, University of Illinois, Urbana, Ill.

4. *Properties of Enamel Slips, I.* By Burnham W. King, Jr., Herbert D. Carter, and Harry C. Draker: Harshaw Chemical Company, Cleveland, Ohio.

5. *Enamelled Utensil Manufacturers Council Standard Thermal-Shock Test for Porcelain Enamelled Cooking Utensils.* By F. A. Petersen and A. I. Andrews: Department of Ceramic Engineering, University of Illinois, Urbana, Ill.

6. *Relation of Metal Gauges and Enamel Thickness to Impact Resistance of Porcelain Enamelled Utensils.* By F. A. Petersen and A. I. Andrews: Department of Ceramic Engineering, University of Illinois, Urbana, Ill.

7. *Relation of Bottom Radius to Impact Resistance of Porcelain Enamelled Utensils.* By F. A. Petersen and A. I. Andrews.

8. *The Ceramic Engineer in Porcelain Enamelling Plants.* By Charles S. Pearce: Porcelain Enamel Institute, 1010 Vermont Avenue, Washington 5, D.C.

9. *Uverite, Mill-Addition Opacifier for Porcelain Enamels.* By C. J. Harbert and John W. Iliff: Harshaw Chemical Company, Cleveland, Ohio.

10. *Observations Indicating Absence of Plastic Flow in Sheet Iron Ground Coat.* By W. G. Martin and S. W. Lauck: A. O. Smith Corporation, Milwaukee, Wis.

11. *Tests for Hot-Water Resistance of Tank Enamels.* By W. N. Harrison and D. G. Moore: National Bureau of Standards, Washington, D.C.

12. *Effect of Ground-Coat Enamels on Reflectance of Cover-Coat Enamels.* By P. C. Stufft: Pemco Corporation, Baltimore, Md.

13. *Use of Potassium Dichromate Method in Determining Iron Content of Pickle Acids.* By E. G. Porst: Pemco Corporation, Baltimore, Md.

THE FUTURE OF PATENTS

There is to be held in the near future a Governmental inquiry on the industrial implications of the Patent Law. If any of our readers wish to give evidence in this vitally important matter, affecting as it does the very basis of some concerns, they should ascertain the steps to be taken from the Comptroller of the Patent Office, Southampton Buildings, Chancery Lane, London, W.C.2.

STEEL MIXES AND INOCULANTS IN GREY CAST IRON

Assumption that melting of steel in cupolas is a difficult practice is entirely false

By W. BARNES and C. W. HICKS

(*Continued from page* 292.)

Fixed Steel Content with Varying Amounts of Inoculant

As nickel is an alloying element it was omitted from this series. The main series of tests were carried out with 60 per cent. steel in the charge.

Ferro-Silicon.—Fig. 23 shows the effect on tensile strength of increasing additions of ferro-silicon. The strength of the untreated metal varied from 17.0 to 18.0 tons. After treatment the maximum increase in strength was reached with 40 ozs. of addition per ton of metal, after which there was a rapid decrease until, at 120 ozs. per ton, the strength fell to 1.3 tons below the strength of the untreated metal. This is explained by Figs. 24 to 27, which clearly illustrate

FIG. 21.—INCREASING PERCENTAGES FROM 0, THROUGH 10, 20, 30, 40, 50, 60 AND 70% OF STEEL, WITH NO ADDITIONS. × 1,000.

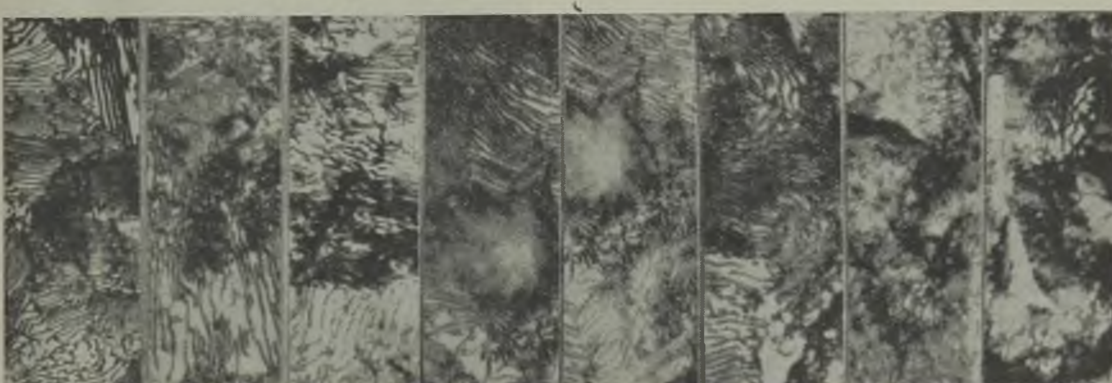


FIG. 22.—INCREASING PERCENTAGES FROM 0 THROUGH 10, 20, 30, 40, 50, 60 AND 70% OF STEEL, WITH ADDITIONS OF 60 OZS. OF ALUMINIUM/FERRO/SILICON MIXTURE. × 1.000.

Steel Mixes and Inoculants

the increasing quantities of graphite as the ferro-silicon addition increases, until in Fig. 27 the graphite is in massive lakes and almost continuous.

Calcium Silicide.—This inoculant was used on 60 per cent. steel mixes and also on 30 per cent. steel mixes. It is seen in Fig. 28 that the increase in tensile strength is greater in the higher steel mix, confirming the results in Figs. 1, 6, 11 and 16. Here, again, as with ferro-silicon, the optimum effect is reached with the comparatively small addition of 40 ozs. per ton of metal, but, although there is a definite falling off with increasing additions, the strength does not drop below that of the untreated iron. The explanation of this can be found in Figs. 29 to 36, which do not show the pronounced increase of graphite found in the previous group.

Aluminium-Silicon.—As in Fig. 28, the results shown in Fig. 37 again confirm that the increase in strength after the addition of the inoculant is greater with the higher steel mix, the maximum increase on 60 per cent. steel being 1.5 tons, and with 30 per cent. steel 1.10 tons. After obtaining these increases with 40 ozs. of inoculant per ton of metal, there is

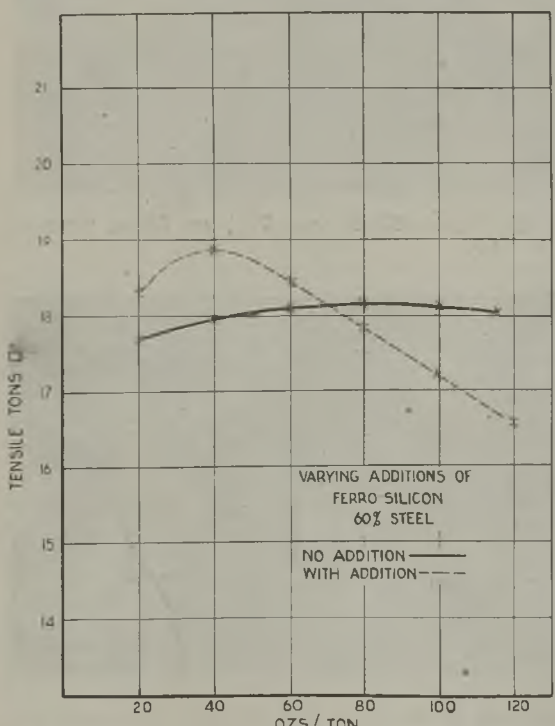
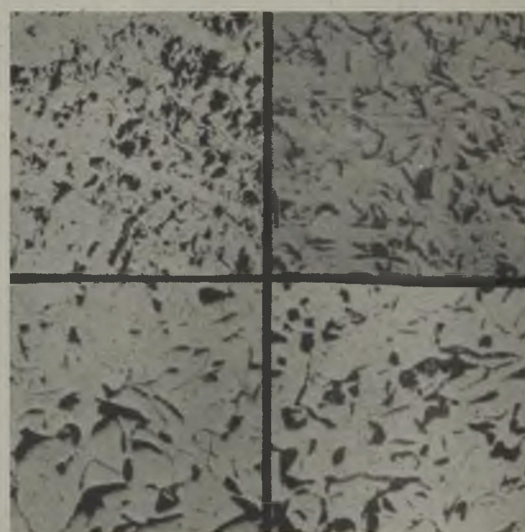


FIG. 23.—INFLUENCE OF FERRO-SILICON ON TENSILE STRENGTH.

FIGS. 24-27.—ADDITIONS OF FERRO-SILICON. 60% STEEL. FIG. 24, TOP LEFT: NO ADDITION. FIG. 25, TOP RIGHT: NO ADDITION. FIG. 26, BOTTOM LEFT: WITH ADDITION; 4 OZS. PER TON. FIG. 27, BOTTOM RIGHT: WITH ADDITIONS; 120 OZS. PER TON. ALL × 100.



FIGS. 29-32.—VARYING ADDITIONS OF CALCIUM SILICIDE. 60% STEEL. FIG. 29, TOP LEFT: NO ADDITION. FIG. 30, TOP LEFT: NO ADDITION. FIG. 31, BOTTOM LEFT: WITH ADDITION; 40 OZS. PER TON. FIG 32, BOTTOM RIGHT: WITH ADDITIONS; 120 OZS. PER TON. ALL × 100.

the now familiar fall in strength as the addition of inoculant is increased. Figs. 38 to 45 show that there is a refining of the graphite after additions, although the strength of the treated iron eventually falls below the untreated strength.

Aluminium.—Because of the Authors' use of aluminium-silicon, and the tests carried out on ferro-silicon alone, a short series of tests were carried out with additions of aluminium swarf, the results of which are shown in Fig. 46. The added amounts of 6, 12 and 18 ozs. are equivalent to the production of

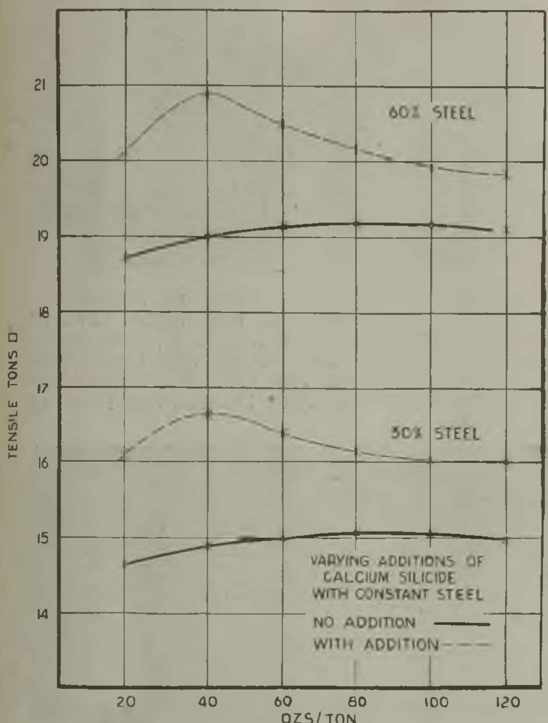


FIG. 28.—INFLUENCE OF CALCIUM SILICIDE ON TENSILE STRENGTH.

aluminium in 20, 40 and 60 ozs. of aluminium/silicon. The optimum increase in tensile with a 12-oz. addition is 1.3 tons, and it will be seen from Figs. 47 to 50 that above this amount there is a pronounced coarsening of the graphite.

General Observations.—When ferro-silicon is added at the spout there is an endothermic reaction, and the iron becomes more sluggish as the addition increases. With calcium silicide there is a slight exothermic reaction, and increasing additions do not make much difference to the tapping temperature. There is also a definite formations of slag particles, which take time to rise and clear. Because of this it is advisable to hold the ladle for two or three minutes to allow the slag to coagulate.

The addition of aluminium-silicon has approximately the same degree of exothermic action as calcium silicide, but the slag formation is much less. Aluminium alone has a pronounced exothermic action, and the iron appears to be hotter, livelier, and much cleaner than with any other addition.

With all the inoculants tried there appears to be a fairly small optimum amount, after which the

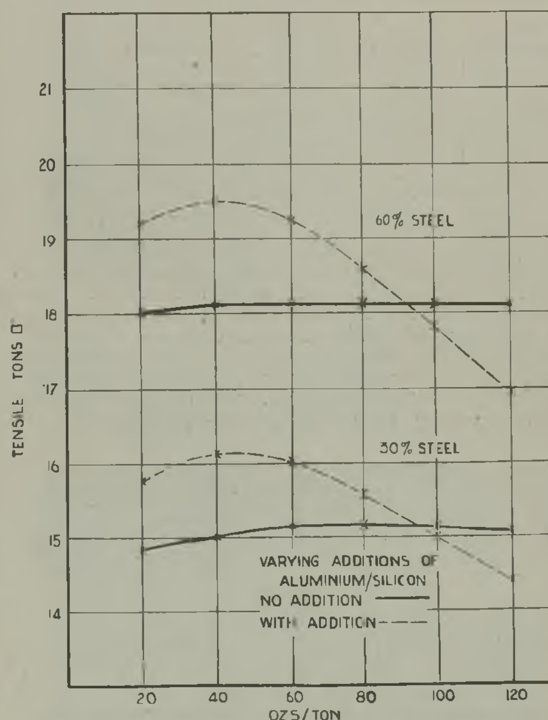


FIG. 37.—INFLUENCE OF ALUMINIUM/SILICON ON TENSILE STRENGTH.

graphitising effect of the addition adversely affects the physical properties of the metal in irons which are initially devoid of free cementite. It would appear from this that the greatest effect of such additions up to the optimum amount is in deoxidising the metal, the resultant propagation of nuclei causing a finer graphite formation in the same way that regulated additions of aluminium are used to control the grain formation in steel.

The graphitising effects of inoculants have their proper value in the inoculation of initially white irons, which are outside the scope of this Paper.

Steel Mixes and Inoculants

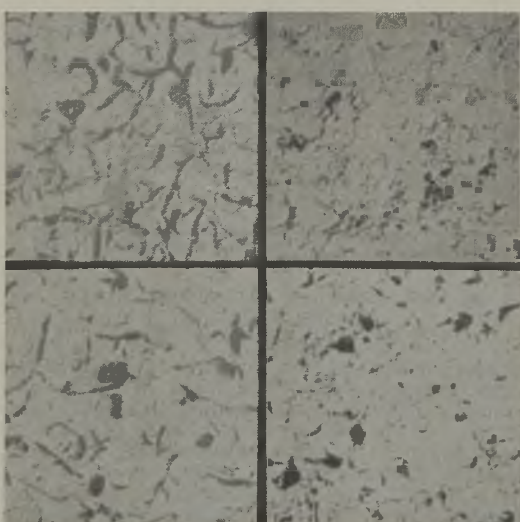
Heat-Treatment

Oil Quenching and Tempering.—In this series of tests the same groups of 0, 30 and 60 per cent. steel mixtures, with the analyses shown in Table IV, were used.

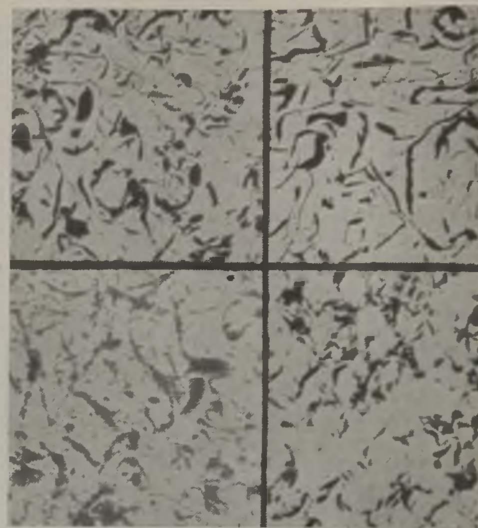
TABLE IV.—*Percentage Composition Analyses of Irons Used for Heat-Treatment Experiments.*

Steel content.	T.C.	Si	P	Mn	C. Equivalent.
Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
0	3.20	2.43	0.78	0.52	4.27
30	3.36	2.12	0.47	0.58	4.22
60	3.11	1.92	0.30	0.55	3.85

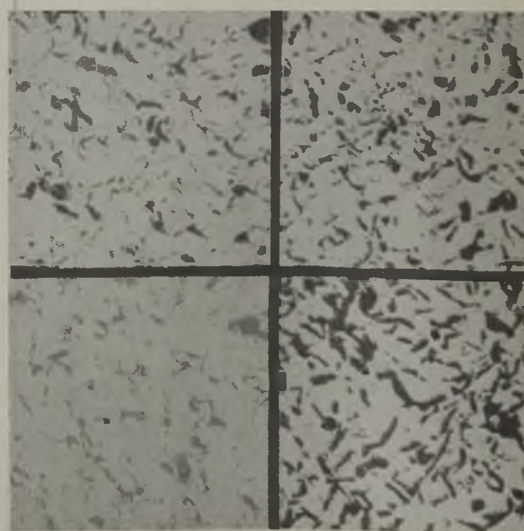
0 *per cent. Steel.*—Fig. 51 illustrates the effect of oil quenching at 800 deg. C., and subsequent tempering at various temperatures up to 650 deg. C. On quenching there is a sharp drop in tensile, and also in hardness, and this decrease continues gradually throughout the tempering range. The photomicrographs from these tests show a fully lamellar pearlitic matrix in the "as cast" condition (Fig. 52), which, after quenching, changes to granular pearlite, with an



FIGS. 33 TO 36.—VARYING ADDITIONS OF CALCIUM SILICIDE. 30% STEEL. FIG. 33, TOP LEFT: NO ADDITION. FIG. 34, TOP RIGHT: NO ADDITION. FIG. 35, BOTTOM LEFT: WITH ADDITION; 40 OZS. PER TON. FIG. 36, BOTTOM RIGHT: WITH ADDITION; 120 OZS. PER TON. ALL × 100.



FIGS. 38-41.—VARYING ADDITIONS OF ALUMINIUM/FERRO-SILICON MIXTURE. 60% STEEL. FIG. 38, TOP LEFT; NO ADDITION. FIG. 39, TOP RIGHT: NO ADDITION. FIG. 40, BOTTOM LEFT: WITH ADDITION; 40 OZS. PER TON. FIG. 41, BOTTOM RIGHT: WITH ADDITION; 120 OZS. PER TON. ALL × 100.



FIGS. 42-45.—VARYING ADDITIONS OF ALUMINIUM/FERRO-SILICON MIXTURE. 30% STEEL. FIG. 42, TOP LEFT: NO ADDITION. FIG. 43, TOP RIGHT: NO ADDITION. FIG. 44, BOTTOM LEFT: WITH ADDITION; 40 OZS. PER TON. FIG. 45, BOTTOM RIGHT: WITH ADDITIONS; 120 OZS. PER TON. ALL × 100.

increase in graphite, the plates being edged with ferrite (Fig. 53). During tempering, as the temperature rises, the graphite growth continues, until at 650 deg. C. the structure is composed of large areas of ferrite with some coarse globular cementite and extremely coarse graphite (Figs. 54 to 57). It would appear from the results that the carbide is unstable, and begins to break down immediately at high temperatures.

30 *per cent. Steel.*—The physical properties after quenching and tempering are shown in Fig. 58, and the microstructures in Figs. 59 to 64. On quenching from 800 deg. C., there is a drop in tensile strength from 10.7 to 8.6 tons per sq. in., but an increase in hardness from 217 to 255. On tempering, the tensile increases to a peak of 12.5 tons per sq. in. at 400 deg. C., falling to 10.5 tons at 600 deg. C., while the Brinell hardness falls to 217 at 400 and 163 at 600 deg. C.

On quenching the matrix shows a structure of well-tempered martensite, which in increasing tempering becomes irresolute at 350 to 450 deg., but at 650 deg. C. resolves into large areas of ferrite with globular cementite, very similar to the structure of the 0 per cent. steel mix at the same temper.

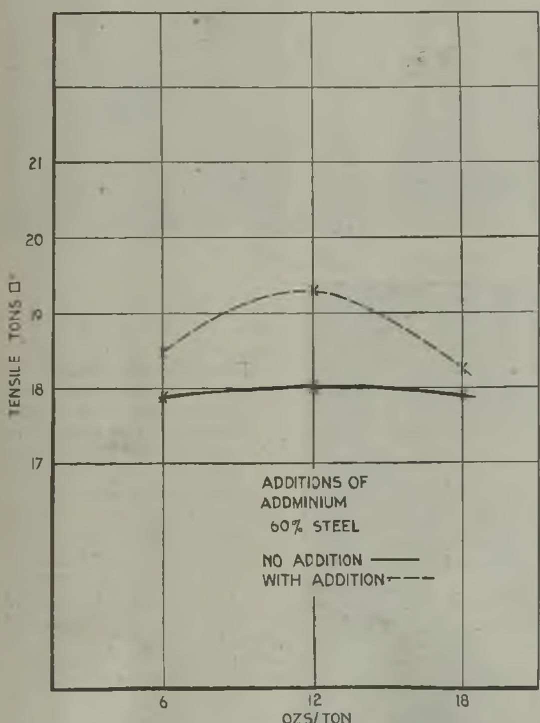
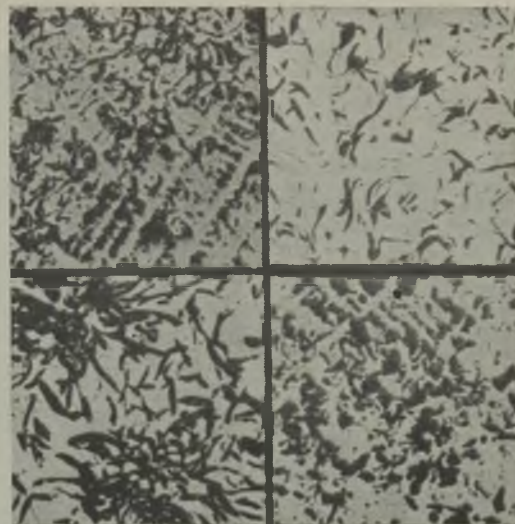


Fig. 46.—Influence of Aluminium on Tensile Strength.

As the analysis of this iron is almost identical with the 0 per cent. steel mix, the results appear to prove that the use of steel as a raw material tends to retard the breakdown of the carbides at high temperatures, but that 30 per cent. steel is not sufficient to prevent breakdown at a second heating above 450 deg. C. after an initial heating to 800 deg. C.

60 *per cent. Steel.*—On oil quenching from 800 deg.



Figs. 47-50.—Additions of Aluminium. 60% Steel. Fig. 47, Top Left: no addition. Fig. 48, Top Right: no addition. Fig. 49, Bottom Left: with addition; 6 ozs. per Ton. Fig. 50, Bottom Right: with additions; 18 ozs. per Ton. All × 100.

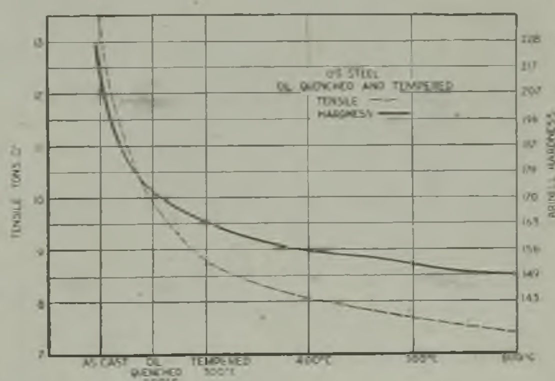
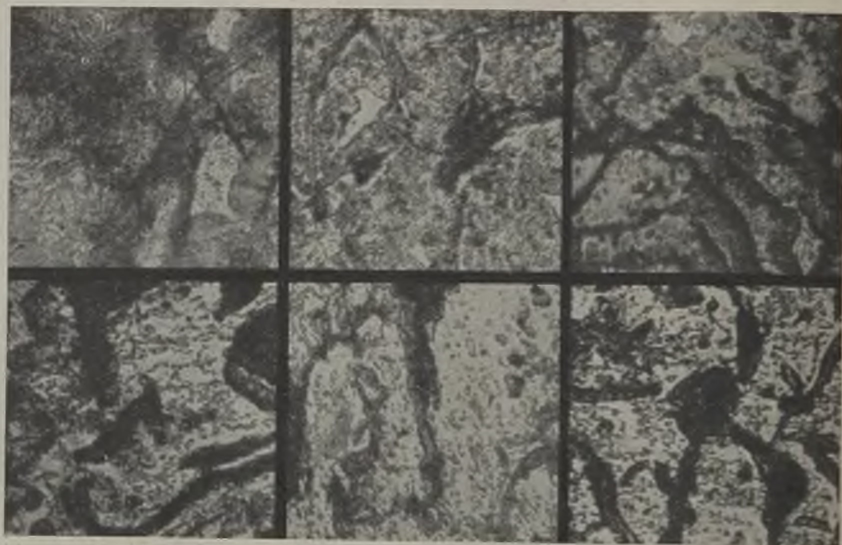


Fig. 51.—Influence of Oil Quenching and Tempering on Tensile Strength.

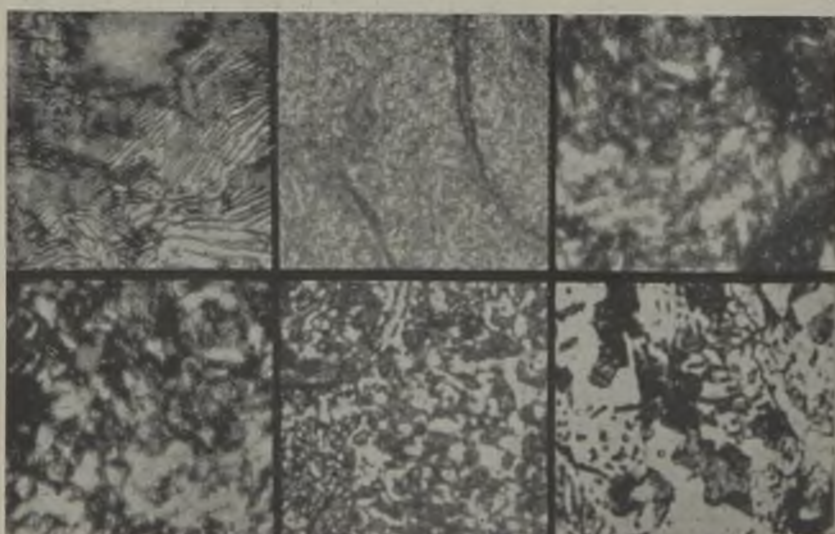
Steel Mixes and Inoculants

C., the matrix shows a slightly tempered martensite, which on tempering passes through sorbitic phases until at 650 deg. C. there is a structure consisting mainly of sorbitic pearlite, with a small amount of fine pearlite.

Fig. 65 reveals on quenching a sharp increase in Brinell hardness from 228 to 418, and a drop in tensile strength from 16 to 14 tons per sq. in. On tempering, the Brinell value falls evenly, but there is a rapid increase in tensile strength until an optimum combination of 364 Brinell with a tensile of 22.6 tons per sq. in. is obtained at a tempering temperature of 370 deg. C. It will be seen that at 650 deg. C. the Brinell hardness has fallen to 241, and the tensile to 18 tons, well above the pre-treatment values.



FIGS. 52/57.—EFFECT OF OIL QUENCHING AND TEMPERING. 0% STEEL. FIG. 52, TOP LEFT: AS CAST. FIG. 53, OIL QUENCHED, 800 DEG. C. FIG. 54, TOP RIGHT: OIL QUENCHED, 800 DEG. C.; TEMPERED, 350 DEG. C. FIG. 55, BOTTOM LEFT: OIL QUENCHED, 800 DEG. C.; TEMPERED, 450 DEG. C. FIG. 56, BOTTOM CENTRE: OIL QUENCHED, 800 DEG. C.; TEMPERED, 550 DEG. C. FIG. 57, OIL QUENCHED, 800 DEG. C.; TEMPERED, 650 DEG. C. ALL × 300.



FIGS. 59-64.—EFFECT OF OIL QUENCHING AND TEMPERING ON 30% STEEL. FIG. 59, TOP LEFT: AS CAST. FIG. 60, TOP CENTRE: OIL QUENCHED, 800 DEG. C. FIG. 61, TOP RIGHT: OIL QUENCHED, 800 DEG. C.; TEMPERED, 350 DEG. C. FIG. 62, BOTTOM LEFT: OIL QUENCHED, 800 DEG C.; TEMPERED, 450 DEG. C. FIG. 63, BOTTOM CENTRE: OIL QUENCHED, 800 DEG. C.; TEMPERED, 550 DEG. C. FIG. 64, BOTTOM RIGHT: OIL QUENCHED, 800 DEG. C.; TEMPERED, 650 DEG. C. ALL × 1,000.

The evidence of the graph and the photomicrographs (Figs. 66 to 71) indicate that with this steel content the carbides are completely stable during quenching and tempering heats, and react in the same way as a plain carbon steel, although, because of graphite distribution, the initial and final strengths are much lower than with steel of the same matrix structure.

(To be continued.)

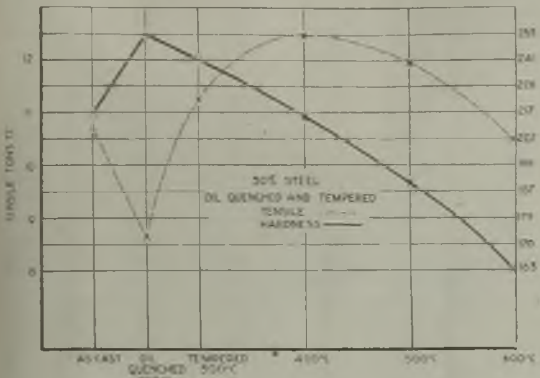


FIG. 58.—INFLUENCE OF OIL QUENCHING AND TEMPERING ON 30% STEEL CAST IRON.

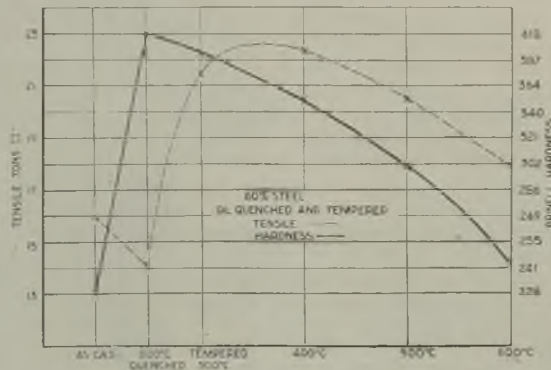
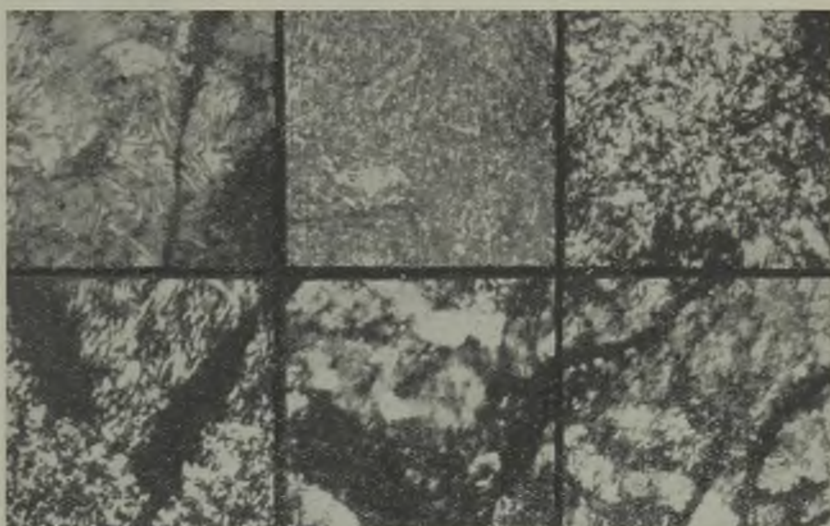


FIG. 65.—INFLUENCE OF OIL QUENCHING AND TEMPERING.



FIGS. 66-71.—EFFECT OF OIL QUENCHING AND TEMPERING, 60% STEEL. FIG. 66, TOP LEFT: AS CAST. FIG. 67, TOP CENTRE: OIL QUENCHED, 800 DEG. C. FIG. 68, TOP RIGHT: OIL QUENCHED, 800 DEG. C.; TEMPERED, 350 DEG. C. FIG. 69, BOTTOM RIGHT: OIL QUENCHED, 800 DEG. C.; TEMPERED, 450 DEG. C. FIG. 70, BOTTOM CENTRE. OIL QUENCHED, 800 DEG. C.; TEMPERED, 550 DEG. C. FIG. 71, BOTTOM RIGHT: OIL QUENCHED, 800 DEG. C.; TEMPERED, 650 DEG. C. ALL × 1,000.

The July issue of the "Nickel Bulletin" contains abstracts dealing with powder metallurgy, bonding in electroplated metals, sand casting of non-ferrous alloys, testing of brake magnets, centrifugal casting methods and creep strength of nickel-containing alloys. Copies may be obtained, free of charge, from the Mond Nickel Company, Limited, Grosvenor House, Park Lane, London, W.1.

Mr. R. H. Turk, managing director of the Pemco Corporation, Baltimore, has been elected President of the Porcelain Enamel Institute.

Mr. Charles E. Sorensen, formerly managing director of the Ford Motor Company, Detroit, has been appointed chief executive officer of the Willeys Overland Motors, Inc., and is to be elected president of that company.

PERSONAL

Lieut.-Col. Lord Dudley Gladstone Gordon, chairman of J. & E. Hall, Limited, has been appointed a director of Barclays Bank.

Viscount Davidson has been elected president of the Engineering Industries Association. He is a director of Dorman, Long & Company, Limited.

Mr. L. Measures, manager of the construction department of the Consett Iron Company, Limited, has received a presentation on leaving to take up an appointment in the South of England.

Mr. T. Campbell Finlayson has been appointed technical director of the Woodall-Duckham Vertical Retort & Oven Construction Company (1920), Limited, in succession to Dr. E. W. Smith.

Mr. H. R. Holmes, managing director of the Central Provinces Manganese Ore Company, Limited, has also been appointed chairman in place of the late Mr. D. J. C. Glass. Mr. Alexander Linton, secretary, has been elected a director.

Sir Duncan Watson has been appointed a member of the North of Scotland Hydro-Electric Board, representing the Central Electricity Board, in the place of Mr. W. K. Whigham, who has resigned on the grounds of ill-health. Sir Duncan Watson founded, in 1896, the firm of Duncan Watson & Company, and is now chairman of Duncan Watson (Electrical Engineers), Limited, the Trussed Concrete Steel Company, Limited, and other concerns. He was knighted in 1927.

Mr. Thomas W. F. Brown, D.Sc., has been appointed director of research of the Parsons and Marine Engineering Turbine Research and Development Association. He will take up his duties on September 1 next. Dr. Brown graduated B.Sc. in Engineering (including Naval Architecture) at Glasgow University in 1921, and D.Sc. in 1927. He was also awarded the Associateship of the Royal Technical College, Glasgow. In 1926 he obtained the Robert Blair Fellowship and went to Harvard University to carry out research work and received the Degree of S.M. (Harvard.) Dr. Brown's practical training was obtained in the marine engine works of Alexander Stephen & Sons, Limited, Glasgow, and at sea in vessels of the British India and other companies. Subsequently he was assistant general manager of the marine engine department of Alexander Stephen & Sons, Limited, and from 1935 to date has held the position of technical manager at the marine engine works of R. & W. Hawthorn, Leslie & Company, Limited, Newcastle-upon-Tyne.

Wills

Elmore, A. S., of Boxmoor, metallurgist £101,932

McHattie, Joseph, of Ardrossan, founder of the Carntyre Steel Castings Company, Limited ... £47,111

Walker, R. W., of Sheffield, late managing director of Atkinson Bros., Limited, steel and tool manufacturers £6,337

STEEL PRICE SCHEDULES

The Iron and Steel Control have had under consideration the desirability of publishing copies of the price schedules in force for the various sections of the industry. This course has presented difficulty owing to the the complicated nature and length of many of the schedules and the difficulties of reproducing them on a wide scale under war conditions. The essential features of certain of the related schedules have, however, now been summarised in a form which appears manageable for general circulation, and copies of such summaries relating to alloy steel, stainless steel, bright carbon steel bars and flats, bright mild-steel wire (in straight lengths), and wire products (wire netting and second-hand barbed wire), can be obtained on application to the Control. It is hoped shortly to make available similar summaries of the schedules relating to other iron and steel products in wide general use.

The full schedules are, of course, available for inspection at the Control offices, but it is thought that these summaries, which cover the main points in the pricing of the steel products concerned, will be of general convenience for reference purposes.

AFRICAN ORE EXPORTS TO BRITAIN

The Director-General of Supplies at Johannesburg has disclosed that about 540,000 tons of high-grade iron ore from the South African Iron & Steel Corporation's mine deposit at Thabazimbi, Northern Transvaal, was exported to Britain during a critical period of the war. The ore was sent when the military situation in the Scandinavian and Mediterranean areas forced Britain to seek alternative sources for iron ore. The first call for assistance came from the British Government to the Union Government shortly before the fall of France. The first shipment of ore was loaded and at sea within a few weeks of arrangements being completed. The rate of despatch increased steadily to about 40,000 tons monthly. The shipments continued for two years until they were discontinued owing to the acute shortage of shipping.

NATIONAL CERTIFICATES IN METALLURGY

It had been expected that the scheme for national certificates in metallurgy in which the Iron and Steel Institute, the Institution of Mining and Metallurgy, and the Institute of Metals are co-operating with the Board of Education would be launched in time to allow colleges and schools to start their courses in the academic year beginning September, 1944. This has, unfortunately, proved impracticable. The scheme will now come into operation so that courses will begin in September, 1945, and the first examinations will be held in 1946 for the ordinary certificate. Colleges and schools are being advised to this effect by the Board of Education, so that as much progress as possible can be made in anticipation.


The High-Quality Iron for High-Duty Castings.
DALE
DALE
Made in seven standard grades or to individual requirements, this iron has a close grain structure and fine graphitic carbon content. It replaces Hematite, and tones up high phosphorus irons.
We also make Dale Refined Malleable Iron to any required specification.
STANTON
DALE Refined PIG IRON
THE STANTON IRONWORKS COMPANY LIMITED
NEAR NOTTINGHAM

NEWS IN BRIEF

GREY-IRON FOUNDRIES in the U.S.A. produced 9,217,800 net tons of castings in 1943.

DE LA RUE PLASTICS, LIMITED, have acquired the whole of the issued share capital of Thomas Potterton (Heating Engineers), Limited.

METAL TRIM, LIMITED, is being wound up voluntarily. Mr. V. G. H. Medley, 62, New Broad Street, London, E.C.2, is the liquidator.

THE INDUSTRIAL COURT has decided against a claim for increased wages made on behalf of coppersmiths and founders in H.M. dockyards.

HEMERDON WOLFRAM, LIMITED, is being wound up voluntarily. Mr. S. R. Hogg, River Plate House, Finsbury Circus, London, E.C.2, is the liquidator.

IT HAS BEEN STATED by a War Production Board representative that U.S. stocks of tin would last until mid-1945, even if no new shipments were received.

BOLIVIAN EXPORTS OF TIN during the first three months of 1944 amounted to 8,692 metric tons, as compared with 10,308 tons during the same period of last year.

CANADIAN FIVE-CENT PIECES are now being made of nickelled, chromium-plated cold-rolled strip steel. The new coins are stated to be of excellent appearance and good durability.

THE HEARTH FURNITURE AND ART METALWARE MANUFACTURERS' ASSOCIATION has been formed at Birmingham. The Birmingham Chamber of Commerce provides the secretariat.

THE FIRM of R. White & Sons, which has been established in Widnes as engineers for over 75 years, has now been transferred to a limited liability company, under the name of R. White & Sons (Engineers), Limited.

THE COUNCIL of the City and Guilds of London Institute has conferred the fellowship of the Institute on the following:—Mr. Julian L. Baker, Mr. E. Bate, Sir George H. Nelson, Sir James Scott Pringle, and Mr. F. S. Whalley.

SOUTH AFRICA is making arrangements to establish a large-scale bath-making industry. Shortage of baths is one of the main factors retarding the building of houses. Existing factories being inadequate and oversea supplies having ceased, a new factory to mass produce baths will be erected.

DORMAN, LONG & COMPANY, LIMITED, are dismantling their Carlin How ironstone mine in Cleveland, the whole of the mineral strata having been exhausted. The workmen are being transferred to the Brotton mine. The Carlin How mine, originally the property of Bell Bros., was first opened in 1870.

TYNEMOUTH COUNCIL is negotiating for two new industries. The firms concerned have approached the council and terms relating to the sale of sites have been agreed to. Tynemouth has already acquired one post-war industry, De La Rue Plastics, Limited, having bought a site on the West Chirton Trading Estate.

FOLLSAIN SYNDICATE, LIMITED, is paying a first and final dividend of 20s. in the £, in cash and/or shares of Follsain Metals, Limited, pursuant to the scheme of arrangement approved by the Court on July 26, 1943. The dividend is payable at the offices of Edward Moore & Sons, Thames House, Queen Street Place, London, E.C.4.

SOME 220 certificates and gifts, including three for 50 years' service to Messrs. A. E. Dallman, F. Hewitt and D. Slater, were distributed to employees of the group companies of the John Thompson Engineering Company, Limited, at Ettingshall, Wolverhampton, recently. The certificates issued covered approximately 3,400 years, and the total number of medals and certificates issued since the inception of the scheme is 2,200.

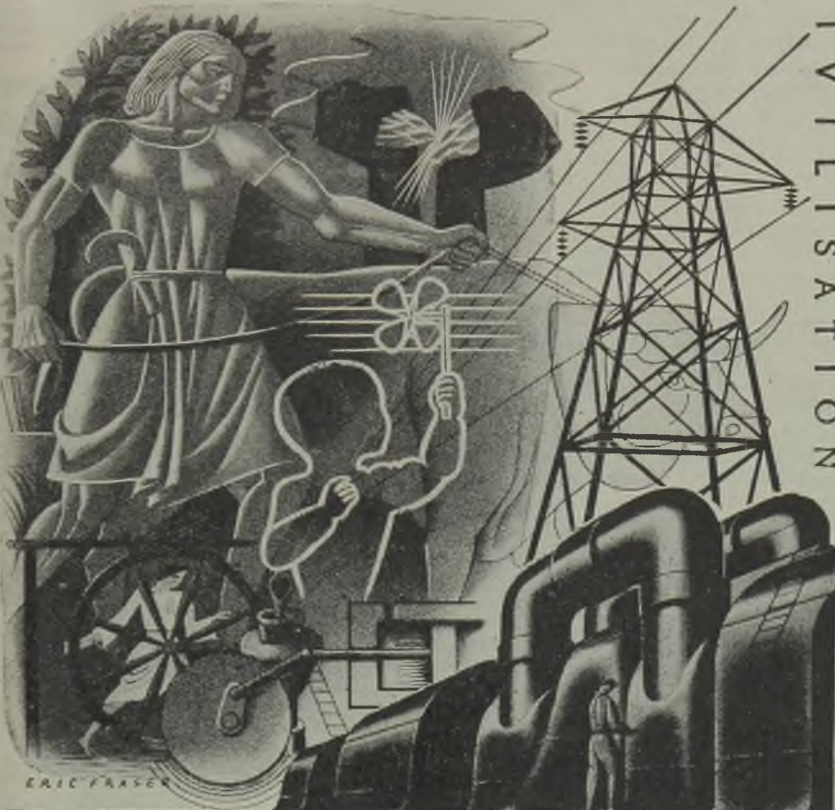
REPORTS reaching Stockholm say that a 72-hour week will be adopted in all German war factories in Goebbels's four-month plan for all-out mobilisation of German industry for the war effort. Bomb damage will no longer be cleared up. No private travelling will be permitted. The use of gas and electricity will be curtailed, a number of shops will be closed, and all women, including those in the 45-60 age groups, must work in the factories.

THE NUFFIELD ORGANISATION announce the award of the first three University scholarships in a scheme which allows a boy of fourteen from an elementary school to go through to the University of Birmingham for three years at £250 a year. The scheme is open to all Nuffield apprentices with not less than three years' service. The first winners of the scholarships are Hedley Thomas Hunnisett (20), Morris Motors Limited, Robert Stanley Slatcher (19), Morris Motors, Limited, and Peter John Gosling (20), Morris Commercial Cars, Limited.

WARNER & COMPANY, LIMITED, pig-iron manufacturers, of Middlesbrough, return a trading profit of £6,137 for the year ended June 30 last, compared with £18,035 in the previous year. The reduction is attributed by Mr. H. W. F. Bolckow, the chairman, to increased costs of fuel, labour and maintenance, and to the increase in the price of certain controlled raw materials in August, 1943. Selling prices have remained unaltered since 1941. Mr. Bolckow states that the question of controlled selling prices in relation to costs has been the subject of repeated representations, and is in active negotiation at the present time.

DALBEATTIE TOWN COUNCIL has voiced its annoyance at the Government's disinterestedness in a revival of the former Dalbeattie iron-ore industry. Claiming that the ore has an iron content of over 65 per cent., and that it is extremely low in phosphorus, the Council has received an assurance from Sir Steven Bilsland that the Scottish Council on Industry will investigate the position. The Council has meantime agreed to the sinking of a shaft at its own expense, and is asking the Stewartry County Council to support the venture financially on the grounds that a revival of iron-ore mining at Dalbeattie would materially assist county rates and provide much needed local employment.

FUNDAMENTALS OF CIVILISATION



No. 5. POWER

THE UNITED STEEL COMPANIES LTD

Since the dawn of time man has endeavoured to utilise power to provide for his needs. In early times power was wrested from the muscles of slaves or from the patient ox. Medieval man harnessed the wind and water to turn his mills and grind his corn.

To-day the engineer makes use of a third element—fire and, with air and water, generates many thousands of horsepower in one place, whence it is distributed to do useful work at many distant points.

These modern miracles have been made possible by the special and alloy steels evolved to suit the complex conditions in the operation of high temperature water tube boilers, in the turbines and electrical generators. Electric pylons of steel stride across the countryside carrying the invisible current for conversion into power at the bidding of man.

THE UNITED STEEL COMPANIES LIMITED

STEEL, PEECH & TOZER, SHEFFIELD
SAMUEL FOX & CO. LTD., SHEFFIELD
UNITED STRIP & BAR MILLS, SHEFFIELD
APPLEBY-FRODINGHAM STEEL CO. LTD., SCUNTHORPE
WORKINGTON IRON & STEEL CO., WORKINGTON
THE SHEFFIELD COAL CO. LTD.
THE ROTHERVALE COLLIERIES, TREETON
UNITED COKE & CHEMICALS CO. LTD.
THOS. BUTLIN & CO., WELLINGBOROUGH

(RB) U.S.P. 29

COMPANY RESULTS

(Figures for previous year in brackets)

Range Boilers—Interim dividend of 5% (same).

Sidney Flavel & Company—Interim dividend of 10% on the 4s. ordinary shares.

Newton Bros. (Derby)—Net profit for the year ended March 31, after providing for depreciation and taxation, £13,431 (£14,300); to reserve, £5,000; dividend of 17½% (same); forward, £9,214 (£8,694).

Warner & Company—Trading profit for the year to June 30 last, £6,137 (£18,035); income from investments, etc., £907; taxation, £1,200 (£13,000); depreciation, £1,850 (same); ordinary dividend of 7½% (same); forward, £3,657 (£3,603).

Charles Churchill & Company—Profit for year to March 31, 1944, £48,198 (£46,290); to general reserve, £7,000 (£15,000); contingencies, £25,000 (£15,000); preference dividend, £3,600; ordinary dividend of 35% (same); forward, £31,049 (£31,576).

Greenwood & Batley—Trading profit to March 31, after E.P.T., £155,105 (£152,167); net profit, after depreciation and income-tax, £44,992 (£49,455); contingencies, £10,000 (£19,000); ordinary dividend of 15% (same); forward, £38,614 (£33,266).

Dawnays—Profit for the year to March 31 last, £88,553 (£81,559); depreciation, £11,011 (£11,035); A.R.P. and war insurances, £3,613 (£6,865); taxation, £37,000 (£28,000); net profit, £36,311 (£35,659); dividend on the ordinary shares of 20% (same); forward, £185,866 (£174,945).

Crossley-Premier Engines—Profit for the year ended April 30, 1944, after charging £8,500 for depreciation, £35,450 (£49,612); N.D.C., £1,646; net profit, £14,304 (£18,264); to general reserve, £3,000; dividend on the 5½% cumulative preference shares, less tax, £4,125 (same); dividend of 10%, less tax, on the ordinary shares, £6,250 (same); forward, £9,447 (£9,018).

Fairbairn Lawson Combe Barbour—Trading profit, including dividend from a subsidiary company, for the year to March 31, £195,013 (£282,972); depreciation, debenture and bank overdraft interest, war damage contribution, etc., £62,624; net profit, subject to taxation, £133,128 (£226,345); taxation and contingencies, £83,000 (£180,000); dividend, less tax, £8,861; dividend on the preferred ordinary shares of 1s. per share, less tax, £7,500 (same); ordinary dividend of 25%, £6,241 (same); forward, £147,584 (£120,058).

The trend in the production of electric steel in the United States is upward. Using as a basis the data for the first quarter of this year as computed by the American Iron and Steel Institute, the total output of ingots and steel for castings to April 1 was 1,138,601 net tons. This is 43,455 tons in excess of the same period in 1943. The production for the first quarter was at the rate of 379,534 tons per month. In the same period a year ago it was 365,048 tons each month.

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.)

R. White & Sons (Engineers), Ditton Road, Widnes—£70,000. J. W. White and G. M. W. West.

T. Siddle & Sons (Engineers)—£2,500. T. Siddle, 12, Burley Wood View, Leeds, 4, and E. Little.

C. C. Mathews Engineering Company, 167, London, Road, Kingston, Surrey—£2,000. C. C. Mathews.

Ernest Walton (Bradford), Ludlam Street, Mill Lane, Bradford—Engineers. £3,000. E. and A. Walton.

Hayward Forge—Engineers, etc. £500. A. H. D. Fairbairns, 11, Sheffield Street, London, W.C.2, subscriber.

Tolerance Welding & Engineering Company—£3,000. L. Tobias, 58, Margaret Street, London, W.1, subscriber.

Multimetals (Holdings), 20, Essex Street, London, W.C.2—£12,000. J. Caldwell, J. C. Hart, and P. S. E. Seth-Smith.

Walsall Pattern Company—Patternmakers, etc. £1,000. — Weatherall, 172, Bristol Road, Edgbaston, Birmingham.

James Brandon & Sons, Clifford's Inn, London, E.C.4—Engineers, etc. £1,000. J. H. Brandon and T. J. Turnell.

Gerrards Cross Engineering Company, Phœnix Works, Oxford Road, Gerrards Cross, Bucks—£1,000. M. K. Horne.

Compressors & Equipment (Chobham)—£1,000. J. B. Stiles, Trespassers Cottage, Chobham, Surrey, and H. H. E. Georgel.

BOLT AND NUT ORDER REVISED

The Control of Bolts, Nuts, Screws, Studs, Washers and Rivets (No. 5) Order, 1944, came into force on August 15. It amends the Control of Bolts, Nuts, etc. (Nos. 1, 3 and 4) Orders, 1943. The principal alterations are:—

(1) Reductions in the maximum prices for certain aircraft bolts, nuts and screws;

(2) increases in the maximum price of certain black steel bolts and nuts;

(3) increases in the maximum prices for steel wood screws and reductions in the maximum prices for brass wood screws;

(4) the introduction of maximum prices for certain bolts, studs and screws of specifications not hitherto included; and

(5) the introduction of maximum prices for sales of black bolts and nuts by merchants.

The Second Schedule to the existing Order and the Related Schedules are revoked and are replaced by a new Second Schedule and new Related Schedules.

Copies of the Order may be obtained from H.M. Stationery Office, or through any bookseller, price 1d. (S.R. & O. 1944, No. 910.)


LININGS
for all Types of
FURNACES
GR

Raw Material Markets

IRON AND STEEL

Quiet conditions at the foundries are reflected in the meagre flow of orders for No. 3 foundry iron. Licensing restrictions, however, are still imposed, the chief purposes of the Control in limiting supplies being to enforce economy, both in the use of fuel and also of rail transport. For low-phosphorus grades there is still a fairly steady demand, and much bigger tonnages of hematite could be absorbed if supplies were available. Most foundries would welcome much larger tonnages of scrap, especially heavy machinery metal, but supplies are better than they were.

The position of coke supplies is now more satisfactory. In most cases, deliveries are being made regularly, in tonnages sufficient to meet current needs and to allow fuel to be put into stock.

Makers of finished iron have a fair amount of work in hand. Good outputs of crown-quality material and best bars are passing steadily into consumption, but it is still possible to satisfy urgent orders at short notice.

Production of the special high-grade steels required for the aircraft and other armament industries now keeps well abreast of imminent needs, but maximum outputs of steel semis are still wanted to keep the re-rolling mills in full operation. These establishments are pledged to deliver substantial quantities of small bars, light sections, strip, etc., over the next three months, and although new orders for sheets are not at the moment flowing quite so freely, the sheet mills also have heavy commitments. Indeed, the popular impression seems to be that the production of prefabricated steel houses will ensure for the sheet mills, in peace as in war, conditions of stabilised activity.

In other departments of the finished steel trade, conditions are unchanged. The call for plates is much less urgent ,and heavy structural products figure less conspicuously in rolling programmes than the lighter sizes. Miscellaneous material such as colliery arches, props and bars, heavy steel rails, etc., is well specified, and large tonnages are still being taken up by the electrical and general engineering trades.

NON-FERROUS METALS

While the copper position in this country now seems to be satisfactory, the situation in the United States is still somewhat involved. Consumption is on a very large scale, and all attempts are being made to maintain supplies from outside producers, as the domestic copper output of the U.S. has been steadily falling. At the same time, production of copper in Rhodesia is being carried on at an admittedly lower level than formerly, even though the originally-planned reduction has not fully been effected. Factors to be taken into account in this respect are the shortage of labour at the mines and the heavy pressure now being exerted on transport facilities.

Consumption of tin has not varied much over recent weeks. The demand is now within the supplies available, and there are certainly no serious problems in meeting current needs for essential purposes. In other directions, however, the use of tin remains severely restricted.

The zinc position has remained virtually unchanged for a long time. If anything, consumption in this country has registered a slight decline, and all demands are fully satisfied.

Demand for lead is steady, and while adequate supplies are forthcoming to meet war requirements, there are no indications of any releases for civilian orders. There is now the prospect of a spurt in activity with the necessity for constructional work following the Allied armies' progress on the Continent.

CONTROL OF IRON AND STEEL

INCREASED PERCENTAGE ON IRON CASTINGS

The Minister of Supply has made the Control of Iron and Steel (No. 35) Order, 1944, which came into force on August 15. This Order alters the existing Control of Iron and Steel Orders, the principal alterations being:—

(1) The Distribution Scheme has been amended.

(*a*) in regard to springs, to control only the iron and steel for their manufacture, and not the acquisition and disposal of finished springs; and

(b) to free the acquisition and disposal of used wire netting, in any quantity, from licence or authorisation,

(2) the maximum prices for iron castings and for manufactured iron (wrought iron) are increased;

(3) maximum prices are imposed for the first time on certain types of cold drawn tubes; and

(4) the control of merchants' (including stockholding merchants') selling prices is extended to include a number of products not hitherto price controlled for sales by merchants, and by fixing margins which may be added by merchants other than stockholding merchants.

A number of related price schedules are revoked, and replaced by new schedules. Schedules Nos. 91-95, Iron Castings, Rainwater and Soil Goods, are now subject to the addition of 41 per cent., in lieu of 32½ per cent. previously operating. New schedules for hematite pig-iron effect a revision of the basis quality to the previous level.

Copies of the Order may be obtained from H.M. Stationery Office, or through any bookseller, price 1d. (S.R. & O. 1944, No. 909.)

MR. C. HOEY, foreman of the jobbing section of the Hammond Lane Foundry Company, Limited, Dublin, died recently.

CURRENT PRICES OF IRON, STEEL AND NON-FERROUS METALS

(Delivered, unless otherwise stated)

Wednesday, August 16, 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 2.25 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.; 45/50 per cent., £27 10s.; 75/80 per cent., £43. 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.—4/6 per cent. C, £59; max. 2 per cent. C, 1s. 6d. lb.; max. 1 per cent. C, 1s. 6½d. lb.; max. 0.5 per cent. C, 1s. 6¾d. 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, 11⅝d.; rods, extruded or rolled, 9d.; sheets to 10 w.g., 11¼d.; 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, 21½d.; 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. 5¼d. to 1s. 11¼d.; 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 Aug. 12, 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

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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*)

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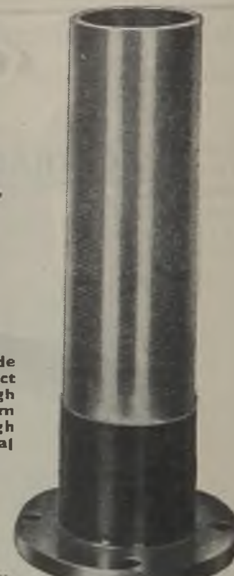

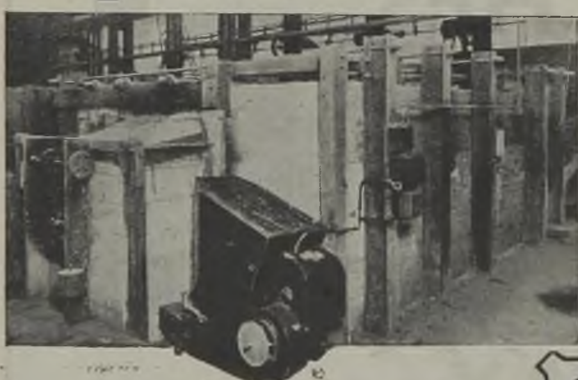

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