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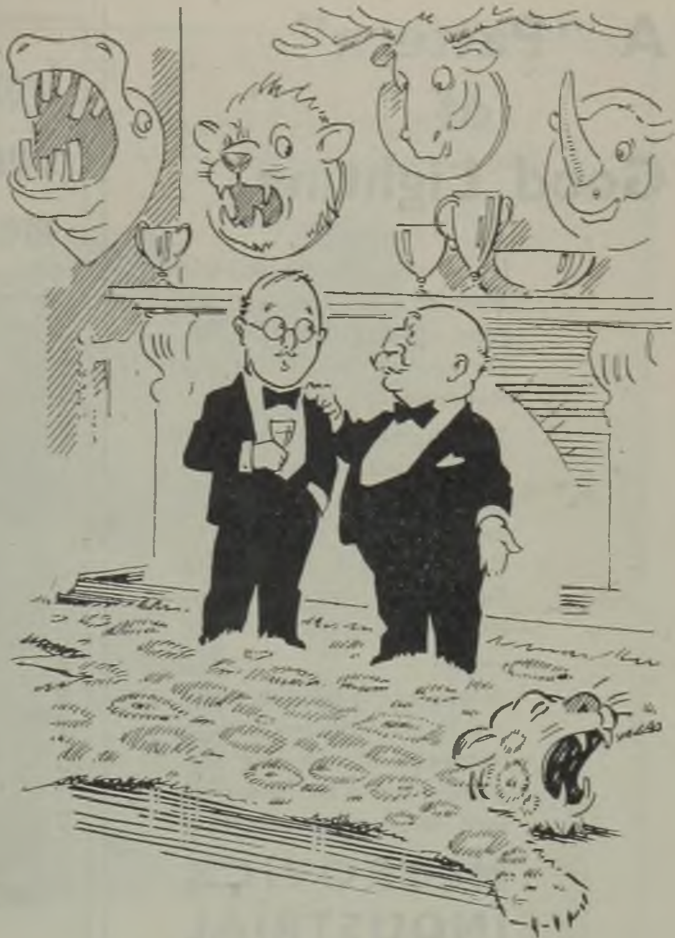

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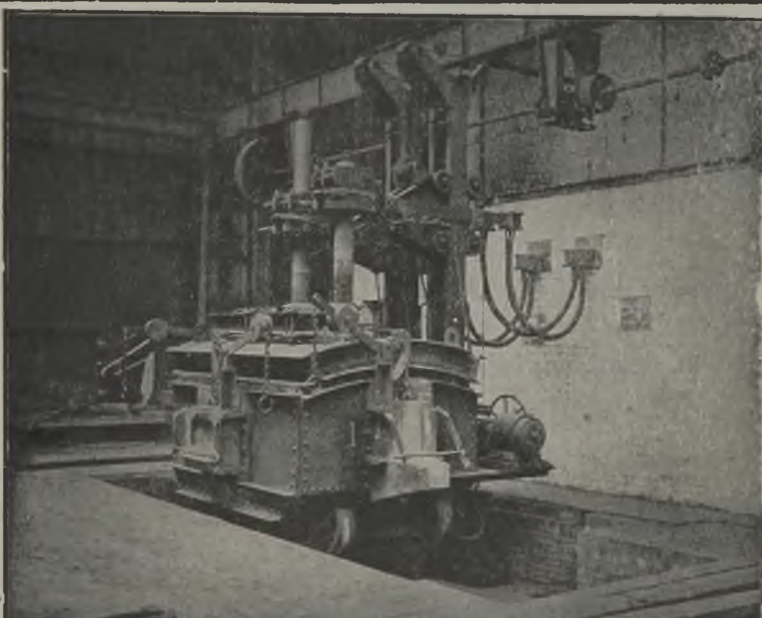

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The fact that goods made of raw materials in short supply owing to war conditions are advertised [illegible] should not be taken as an indication that they are necessarily available for export

FOUNDRY TRADE JOURNAL
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Rehabilitating an Industry

The victories in every theatre of war are causing all sections of the community to give thought as to what is going to happen after V-day. Especially is this true of those engaged in the vitreous enamelling industry, where for the last four years activity has been extremely limited. There is a general feeling abroad that orders will soon be plentiful, but aside from this there are many difficulties to be overcome. Much plant has been converted to war purposes and quite a few enamellers are now expert in the heat-treatment of armour plate. Then the skilled labour has been dispersed and will need to be remobilised. In the three fundamental requirements of the enameller, frit, iron castings and " steel " sheets or plates, changes may be looked for.

In the case of frit, some of the raw materials are, and will be, in short supply for some time. Fortunately, the suppliers of frit, in whose hands the bulk of the industry's research activities are centred, have overcome many of the difficulties as they arose. So far as iron castings are concerned, the great problem is for the foundry to supply a standardised article. To this end there must be co-operation with the pig-iron suppliers, the sand quarry owners, the metallurgist and the foundry plant designer. The fact that many foundries making castings for the enamelling shop are already, or will be, mechanised on the conclusion of hostilities, will tend towards the provision of standard articles. Foundrymen must never forget that they are often in competition with steel pressings, where a high level of standardisation has been achieved. Much enamelling work enters into the category of quantity production, and in this sphere progress can only be assured if all the components to be handled conform to predetermined standards. This is becoming more evident as those parties interested in the incorporation of enamelled goods into their productions are now seeking to impose acceptance specifications, an activity more likely to expand than decrease.

The Americans have been making surveys as to post-war prospects for their goods, and large increases over 1940 productions are confidently expected. Amongst those in which much extra business is promised are domestic dish-washing machines. As mere man has gained much experience in this gentle art during the last few years, he will not grudge the money for the purchase of this or, indeed, any other labour-saving kitchen equipment. We are not familiar with the " domestic " variety of dish washer, but to be acceptable it must of itself require a minimum of " washing-up."

We have just received a booklet* on " Heating, Cooking and Hot Water Supplies for the Post-war House," being a summary of views of the Women's Advisory Committee on Solid Fuel, and we were frankly disappointed. It might just as well have been compiled by the sterner sex. The type of information we expected to see is contained in a Report made by the People's Gas, Light-Coke Company, of Chicago, and comes to us through the May issue of " The Enamellist." This company asked 15,000 consumers for their opinions, with the result that it is now satisfied that the majority want a 36-in. high flat-topped cooker, 40 in. wide, half the surface of which is occupied by burners and half a plain enamelled sheet. A white finish is preferred, and the size of oven indicated as satisfactory is 14.9 in. high by 19.3 in. deep by 17 in. wide. There was a general preference for the four burners (all of the same size, be it noted), to be grouped at the left so as to give a plain table top at the right. Finally, nearly

(*Continued overleaf, column* 2.)

* Price 1s. 3d. post free, from 4, Rickett Street, Fulham, London, S.W.6.

Contents

FUTURE OF STEEL CASTINGS*

By JOHN HOWE HALL

In describing the progress that has been made in the steel castings industry, the use of the crucible, converter and open-hearth processes was brought out, the two former being used principally for small steel castings before the electric furnace was introduced. After the first world war the Bessemer process unjustifiably lost its importance as a melting unit for steel castings, and only in recent years has this error been corrected. The improvement in the melting process has been a decided one; also, the progress which has been made in removing risers which, before the use of cutting gases, had been knocked off or cold saw cut. As far back as 1914 the importance and significance of directional solidification were recognised.

Three definite steps play an important part in the improvement of steel castings; these are:—(1) Introduction of the acetylene cutting equipment which allowed the foundryman to place risers of the correct dimensions where they are needed; (2) introduction of radiographic and magnetic powder inspection; (3) improvement of welding apparatus and technique.

A survey of the history of heat-treating indicates that great progress has been made in this phase of the casting of steel. Formerly, the methods were very crude, but continuous improvement by the introduction of proper heat-treating equipment and control instruments has been outstanding. In 1913, the only method for heat-treating steel castings was by annealing. To-day, liquid quenching and tempering are applied to large tonnages of steel castings. After the first world war the alloy steels found great favour in the commercial field, but only after several years had passed were alloy steels heat-treated and not annealed.

Quenching of Steel Castings

It is predicted that within the coming five years the quenching of steel castings will come into its own, with the rational use of alloy elements. Moreover, greater importance than heretofore will be found in the future scrap. The so-called "needled" steels (addition of boron to other elements) promise a great future as, for instance, a combination of medium manganese plus boron for obtaining good machineability. Without doubt there will be a tendency towards sounder and lighter sections. In fact, the future part may be a combination of castings plus welded plate angles; but it is expedient to start with good castings before considering the weldment.

In order to accomplish these changes the designer must take cognisance of the fact that the mechanical conditions for making steel castings are different from those for making iron or other castings. The requirements for close dimensions on rough castings will become increasingly exacting, and the so-called "lost wax" process will come back into its own. Differential heat-treatment, as well as flame and high frequency induction hardening, will play a notable part in obtaining the desired physical properties in definite areas of steel castings. The hard surface alloys should greatly widen the market of steel castings. The centrifugal process, either horizontally or vertically centrifuging, will undoubtedly play an important role in the years to come.

Where will the improved castings be used? The railways have always been the most extensive user of steel castings, and with the intention of reducing dead weight, lighter castings will be required. Many parts will undoubtedly be considered with the same thought in mind. Marine castings will also undergo a change in design, and the construction will be a combination of casting and rolled stock. In summarising, it can be said that the future castings must be sounder, lighter, stronger and more reliable.

* Paper presented at a meeting of the T. & O. Group, Division No. 1, of the Steel Founders' Society of America. The Author is Metallurgist, General Steel Castings Corporation, Eddystone, Penn.

IRONFOUNDRY FUEL NEWS—XIX

Last week's article in this series referred to the appreciable number of ironfounders who are being recommended by the Regional Panels of the Ironfounding Industry Fuel Committee to convert their natural draft drying stoves to forced draft. It was not meant to be implied, of course, that because a stove has a forced draft fire-box it is necessarily efficient. That this is not the case was shown by two members of the South Western Regional Panel when visiting a foundry in Somerset where dissatisfaction was felt with the fuel consumption in a newly-installed forced-draft stove. It was apparent to the visitors that no serious attempt was being made properly to control the air supply, and it also seemed that the grate area was too large. It was therefore suggested that three sides of the fire-box should be lined with $4\frac{1}{2}$-in. bricks and that the air supply should be more carefully controlled.

When visiting the firm again three weeks later, the Panel members were informed that their suggestions, which had been adopted, had resulted in an immediate reduction in coke consumption from 25 to 10 cwts. per day for the same output of moulds (70 tons per week). Even then enthusiasm did not wane, and by lining the fourth side of the fire-box with more firebricks, daily consumption was reduced to $8\frac{1}{2}$ cwts.

REHABILITATING AN INDUSTRY

(*Continued from previous page.*)

everybody wanted the corners inside the oven to be rounded. If those engaged in vitreous enamelling will make serious efforts to standardise all their raw materials, to ascertain just what are modern requirements, and satisfy them, then, granted good luck in getting the necessary labour, their prospects are indeed bright.

THE DEVELOPMENT AND PRODUCTION OF INOCULATED CAST IRON

Experiments to overcome some current difficulties of the ironfounder

By H. P. HUGHES and W. SPENCELEY

(*Continued from page* 354).

Improved Results Shown

Fig. 10 shows graphically the comparative physical properties of the two irons. Fifteen tests are included and the results are self-explanatory and plainly indicate the advantages gained by such developments. Table I gives in percentage value the increase in properties from the same tests. Attention is immediately drawn to the great increase in impact strength. Such a property is sure to give these irons many new fields of use.

TABLE I.—*Increase in Mechanical Properties of Inoculated Cupola Metal over Ordinary Cupola Metal as Derived from 15 Tests on Each Metal.*

Impact value	Increase 63	per cent.
Transverse strength	„ 30	„
Deflection	„ 28	„
Tensile strength	„ 23	„
Brinell hardness	„ 2	„

The first tests carried out were made on one of the band saw tables illustrated in Fig. 26, a casting very liable to distortion during machining. No alterations were made in the metal being used other than the fact that one was tapped direct from the cupola and cast and immediately after the other was tapped and an addition of 0.4 per cent. silicon was made. The structure of the first is shown in Fig. 11 and the second in Fig. 12. The beneficial results of the one over the other are well defined by the structure, the more desirable random graphite replacing the less desirable rosette graphite.

It may be worthy of note at this point that all the micro-photographs shown have been taken from actual castings so that more true and practical results could be obtained. The structure of a 5-in. section casting made in ordinary metal is illustrated in Figs. 5 and 13, the former at the edge of the casting and the latter in the centre. The undesirable rosette formation is evident in the one, and a very large flake characteristic of weakness is shown in the other, these large flakes no doubt being an indication of grain size, and borne out further in Fig. 14, showing the etched structure from the centre of this casting where the weakness around the grain boundaries can be plainly seen.

The corresponding structure in inoculated metal is illustrated in Figs. 14 to 18. The first shows

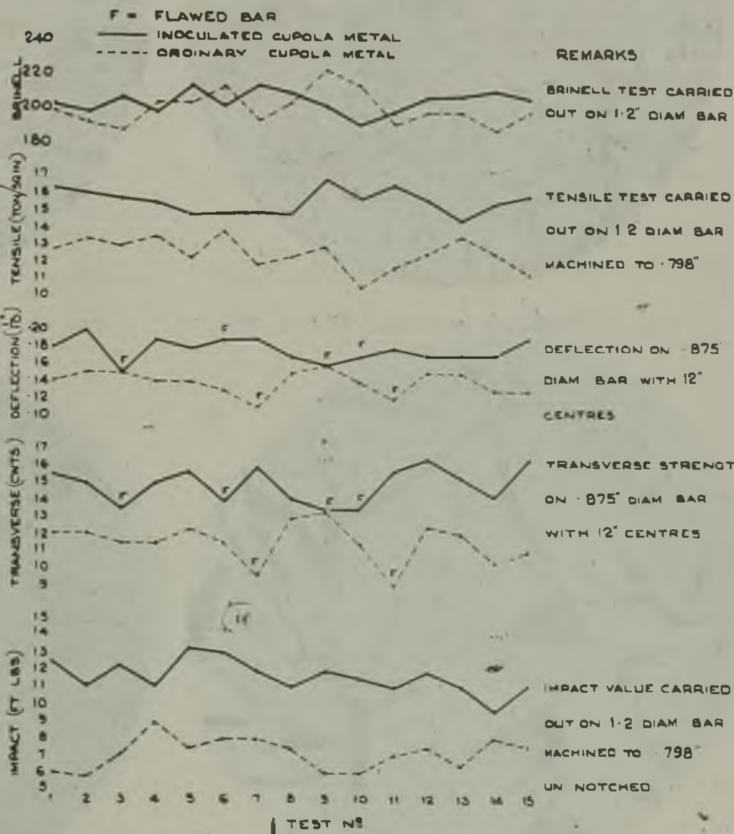

FIG. 10.—COMPARATIVE MECHANICAL PROPERTIES OF ORDINARY AND INOCULATED CUPOLA METAL. FIFTEEN REPRESENTATIVE TESTS ON EACH METAL.

Inoculated Cast Iron

the random graphite persisting at the edge of the casting and the second the random graphite of slightly larger formation in the centre. The third and fourth show the same portions etched; here again the structures would indicate much reduced variation in properties between the edge and the centre. These facts have since proved that inoculated metal is much less

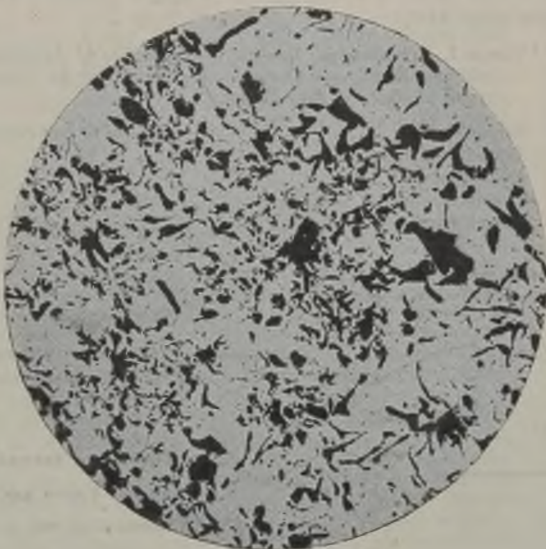

FIG. 11.—ORDINARY IRON FIRST TEST × 75.

FIG. 12.—INOCULATED IRON FIRST TEST × 75.

FIG. 13.—ORDINARY IRON CENTRE OF 5 IN. SECTION × 75.

FIG. 14.—ORDINARY IRON CENTRE OF 5 IN. SECTION ETCHED × 500.

affected through variations in structure by mass effect so that, if it goes no further, inoculated metal produces a more homogenous structure in heavy sections.

It was further realised that, if full advantage was to be taken of inoculation, it would be necessary to modify the metal mixtures somewhat to give an iron

FIG. 15.—INOCULATED IRON EDGE OF 5 IN. SECTION × 75.

FIG. 16.—INOCULATED IRON CENTRE OF 5 IN. SECTION × 75.

FIG. 17.—INOCULATED IRON EDGE OF 5 IN. SECTION ETCHED × 350.

FIG. 18.—INOCULATED IRON CENTRE OF 5-IN. SECTION ETCHED × 350.

Inoculated Cast Iron

more responsive to inoculation, as it was known that the effects produced by adding inoculants bore a relationship to the carbon content. This alteration was only slight, and it is to be understood that in no way could it be responsible for the outstanding differences associated with this metal.

The materials used previous to inoculation were a high phosphorus iron, two grades of low phosphorus iron (about 0.3 to 0.4 per cent phosphorus), good-quality machinery scrap and return scrap. Similar irons were used after conversion to the inoculated metal, with the machinery scrap displaced by steel scrap, so that a carbon content between 3.2 and 3.3 per cent. was available No special pig-irons were used throughout this investigation. The corresponding analysis is shown in Table II, where the comparative figures of 15 tests are given The reduced silicon content previous to inoculation was found necessary to obtain maximum benefits from inoculation. The incorporation of steel scrap has also tended to reduce the phosphorus content somewhat.

TABLE II.—*Chemical Properties of Inoculated Cupola Metal Compared with Ordinary Cupola Metal Derived from 15 Tests on Each Metal.*

	Ordinary cupola metal.	Inoculated cupola metal.
T.C.	3.51	3.24
Gr.	2.90	2.66
C.C.	0.61	0.58
Si	1.80	2.05
S	0.085	0.091
P	0.71	0.54
Mn	0.80	0.75
Si (*without inoculant*)	—	1.63

FIG. 19.—WEDGED TEST. READING FROM LEFT TO RIGHT: (1) NOT INOCULATED $\frac{1}{2}$ IN. CHILL. (2) INOCULATED NIL. (3) NOT INOCULATED $\frac{7}{8}$ IN. CHILL. (4) INOCULATED NIL.

Simpler Melting Practice

It was further believed that by means of inoculation, much simpler cupola practice could be adopted. This is understood by the fact that in this foundry where a wide range of section size was handled and castings produced with other special properties, it was necessary to adopt several mixtures to suit the requirements. This has proved to be so, and it has been found that this metal is suitable for a much larger range of castings than any one of the past grades. It is able to produce a strong grey structure in thin sections and a satisfactory close grain structure in heavy sections.

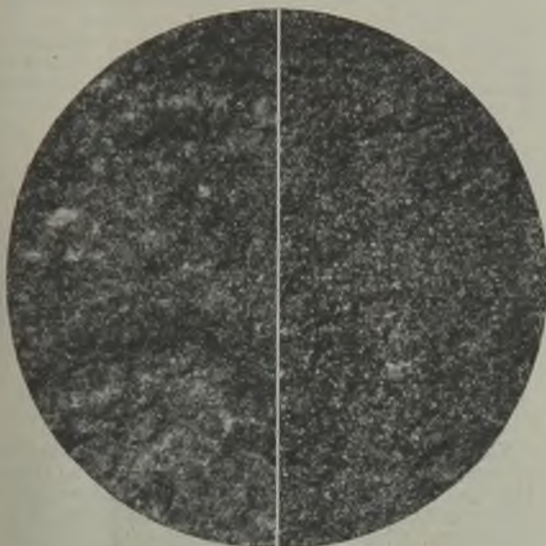

FIG. 20.—FRACTURE SECTION OF 4 IN. DIA. BAR. LEFT: NOT INOCULATED. RIGHT: INOCULATED.

Later experience has shown that by the use of various quantities of inoculant, the metal can further extend its field of usefulness. Although one mixture has not yet been found capable of dealing with the complete range, it has been reduced to only two, and it is hoped after some further experimental work to obtain a mixture to suit every range of casting and make any necessary modifications at the spout. The full advantage of this can be realised, as it has always been the contention of foundrymen that considerable difficulty is produced when a variety of mixtures are going through, at any rate it would relieve any doubt in the mind of the operator running a cupola on different irons as to where one grade ends and the other begins.

To obtain full advantage from inoculated metal it is essential that close control be instituted. The older foundrymen may say it is another controlling factor in a section of foundrywork that is already overburdened with them, and so the possibility of error is increasingly greater, which is correct, but on the other hand some contact with this metal will convince the most bigoted that it is well worth the additional attention.

There is certain outstanding and practical evidence from the metal that inoculation is effective. The characteristic effect on the top of a ladle of metal, although unexplainable by the Authors, is a definite proof to the eye as to whether or not the inoculation has been successful.

The well-known wedge test (Fig. 19) is another method of readily and conveniently obtaining this information. Another test is the examination of a fractured section, particularly in thin sections, where the network is apparent to the naked eye in the non-treated iron, and is found to disappear in the treated metal. Fig. 20 shows two bars of 0.4 in. dia., where this network is plainly seen. It was necessary to reduce this bar to such a diameter to make the effect easily noticeable.

The technique leading to an understanding of the process of inoculation may yet be somewhat vaguely understood, although the practical advantages are well recognised. Much work has been done lately to try and explain away some of the theories, and though they may not have given us a complete and accurate basis, they have undoubtedly opened up the field of investigation. Such names as Eash, Flynn and Reese, Norbury and Morgan, Massari, Boyle and Lorig remind us of workers who have made much information available. It is well known that inoculated metal has properties diversant from ordinary metal, those dealing with it have been quick to realise this, and have found in many instances that an alteration in practice had to be adopted.

(To be continued.)

A NON-FERROUS ETCHANT

In a letter to "Metal Progress," Mr. Louis A. Carapella, of the Mellon Institute, recommends the following material as a really versatile etching medium for nearly all non-ferrous alloys:—

Ferric chloride, 5 grs.;
Ethyl alcohol, 96 ml.;
Hydrochloric acid, 2 ml.

The ferric chloride is first dissolved in alcohol and then the solution is acidified by the concentrated HCl. The author also recommends its use for etching tempered manganese steel.

Production of malleable iron castings in America in May was reported at 70,123 short tons, as against 67,402 in April. Order-books show increased business.

A note in "Steel" claims that dolomite consumption is lower when open-hearth furnaces are fired with mixed gases instead of straight producer gas, and, generally speaking, less bottom trouble is experienced.

NATIONAL HEALTH INSURANCE

VOLUNTARY AND EMPLOYED CONTRIBUTORS' BENEFITS

With the new scheme of social insurance now in the offing, it behoves every insured person, particularly voluntary contributors insured for health insurance, to note the contribution total registered in the contribution year which ended July 2, 1944, as to be fully insured. This will doubtless have a bearing in the new scheme; moreover, sickness and disablement benefits in 1945 will be determined by the contribution total just mentioned. But this total can be rectified between now and November 30, 1944, if a person has an "under 50" total by paying the necessary contributions as arrears to bring up to any number desired by the person concerned, a point to remember being that the higher the number the better the benefit.

For full benefits there must be a contribution total of 50 finally recorded; on the other hand, no sickness or disablement benefit will be available throughout 1944 unless the total is at least 35. Where the total is between 36 and 50, deductions are made from full rates (these being: Men, 18s. weekly; married women, 13s.; other women, 15s.), at certain contribution total steps, that is, at 36, 39, 42, 44, 46 and 48, the deductions for men being 11s., 9s., 7s., 5s. 6d., 3s. 6d. and 2s. respectively; for married women, 7s., 6s., 5s., 4s., 3s. and 1s. 6d.; for other women, 9s., 7s. 6d., 6s., 4s. 6d., 3s. and 1s. 6d. For disablement benefit, the deductions range from 6s. 6d. to 1s. Sickness weeks count the same as actual payments for voluntary contributors, this applying also to unemployment weeks for employed contributors.

The arrears stamps for voluntary contributors (insured for both health insurance and pensions under the combined scheme) cost 2s. for men, 1s. 7d. for women; if only insured for health insurance (voluntary insurance) the stamps cost 11d. for men, 10½d. for women. For elderly contributors (health insurance and pensions together), these being men who at 60 (women at 55) had then registered at least ten years' insurance, the rate is 11d. for men, 10½d. for women, for bringing up a total from 26 to a higher number; for completing a total of 26 the 2s. and 1s. 7d. rates must be paid. A voluntary contributor should note that a total of 45 must be recorded (26 elderly contributors), or right to continue in voluntary insurance may be lost.

NEW CATALOGUE

Soft Solders, Fluxes, Flux-cored Solders. British Insulated Cables, Limited, Prescot, Lancs, have prepared a particularly useful 12-page catalogue covering the supply and economic utilisation of solders, soldering pastes, fluxes and flux-cored solders. The range is quite wide, and the notes on choice and use should prove of real benefit to users.

THE WET METHOD OF FOUNDRY SAND RECLAMATION

The Cincinnati Milling Machine Company decided in 1939 to instal a system of reclamation for its new foundry. It decided upon the wet system for the following reasons:—

(1) Wet scrubbing and classification produced reclaimed sand with properties nearest those of the sand when new.

(2) Handling sand wet permitted pumping instead of using long belts and vertical elevators for conveying from one point to another.

(3) The wet method eliminated need for dust suppression equipment.

(4) Based on a study of the equipment already in use for pumping core sand, maintenance costs for maintaining wet reclamation equipment was calculated to be lower than for that of a dry system.

(5) Process water reclamation was feasible, and would produce a further economy.

A full description of the process used is given in the "Iron Age" for July 6. It is interesting to note that 13,500 tons of sand have been reclaimed over a period of 12 months, associated with the saving of about 65,000,000 galls. of water.

According to the "Iron Age," if commercial aviation increases ten times its pre-war volume, it would operate present aircraft producing capacity at about a 4 per cent. rate.

UNITED NATIONS STANDARDS COMMITTEE

The British Standards Institution has announced the setting up, as a temporary measure, of a United Nations Standards Co-ordinating Committee, with offices in London and New York. The object of the Committee, whose membership will consist of representatives of the national standards bodies in any of the United Nations, will be to provide a centre for the immediate co-ordination of standards relating to communications and the development of standards for raw materials and partly and wholly manufactured articles which have to be transferred across borders. The standards will provide methods of expressing and testing properties of materials and appliances; and include symbols, terms and definitions, and dimensional standards to secure interchangeability. The promulgation of the standards will be the responsibility of the various individual standards organisations.

Approval of the scheme has already been received from Australia, Canada, South Africa, and the U.S.A. The London office, at 19-21, Palace Street, London, S.W.1, is in charge of Mr. C. le Maistre, C.B.E., who recently retired from the British Standards Institution.

Two Indian foundries, Jessops & Company Limited, of Calcutta, and Binny & Company, Limited, of Madras, are now producing Meehanite metal castings.

METALLURGICAL EXAMINATION OF LIGHT ALLOY CYLINDER HEADS FROM GERMAN AIRCRAFT

Carried out by the Metallography Department (under the direction of Dr. C. Wilson, Ph.D., A.R.S.M., D.I.C.), of the Research Laboratories of High Duty Alloys, Limited

This report, published under arrangements made by the Ministry of Aircraft Production, contains a summary of the metallurgical data obtained by investigation of three light alloy cylinder heads from various German aircraft, as follows:—(1) Dornier 17 aircraft, Bramo-Fafnir 323 engine; (2) Dornier 17 aircraft, B.M.W. 132 engine; and (3) Dornier 217 aircraft, B.M.W. 801 engine. The cylinder head from the B.M.W. 132 engine had suffered considerable damage, but the other two items were in good condition.

TABLE I.—*Fin Spacing of German Aero Engines.*

	B.M.W. 801 engine from DO 217.	Bramo-Fafnir 323 engine.
	mm.	mm.
Fin spacing at tip	3.0	5.0
Fin thickness root	2.5	2.5
Fin thickness tip	2.0	2.0
Fin depth (max.)	35.6	35.0

The components had clearly been manufactured as castings, with the rocker box castings and inlet and exhaust connections as integral parts. The main parting line of the moulding boxes had run transversely across the fins and rocker boxes. The fins were close pitched in each case, and details of the two undamaged components are given in Table I. The manifold connections and rocker box studs were attached to the castings by means of screw threads, but the valve stem bushes and valve seatings had apparently been shrunk into position. The general appearance of the castings was good, and no obvious evidence of porosity or drawing was seen on the undamaged samples. In spite of the close spacing of the fins, no signs of "failure to make" were observed in any part of the casting examined.

Chemical Composition

The results of chemical analyses are given in Table II. It is interesting to note that the castings had been manufactured in three entirely different alloys. The cylinder head of the B.M.W.132 engine had been produced in an alloy of unusual composition, but in the case of the B.M.W.801 engine, the manufacturers had found it necessary, for some reason, to use an alloy of the Hydronalium type, in which the important alloying element consists of magnesium. The Bramo-Fafnir casting had been produced in a material resembling Y-alloy.

TABLE II.—*Composition of the Cylinders.*

Engine type.	Cu. Per cent.	Ni. Per cent.	Mg. Per cent.	Fe. Per cent.	Si. Per cent.	Ti. Per cent.	Mn. Per cent.
B.M.W. 132 from DO 17	10.10	—	0.27	0.96	0.14	0.04	0.02
B.M.W. 801 from DO 217	—	—	4.88	0.37	1.27	0.11	0.15
Bramo-Fafnir 323	4.12	2.03	1.19	0.24	0.27	0.12	0.02

Macrostructure

The general structure of the castings has been observed in etched sections passing through a rocker box, valve guide and adjacent wall. The three samples examined varied greatly, as regards general quality and condition. The B.M.W. 132 casting (Fig. 1) showed unusually coarse grain size, and the etched sections were characterised by the long columnar crystals extending from the inner surface. The material was also seen to be severely affected by gas porosity in the external areas of the wall. The inner zone of columnar crystals, although slightly porous, was not seriously affected by this defect, and it would seem that precautions had been taken during casting to obtain improved soundness adjacent to the inside surface of the cylinder head. The casting from the B.M.W. 801 engine showed a marked contrast as regards grain size, which was seen to be fine and uniform in character throughout the section. An obvious feature in this sample was the occurrence of fine shrinkage cavities in the wall section, but apparently complete soundness in the fins. The section was carefully examined, but at no position was evidence observed of visible shrinkage cracks. The section of the cylinder head from the Bramo-Fafnir engine showed considerable variations in grain

Cylinder Heads from German Aircraft

size, varying from finely crystalline at the centre of the crown to a coarse crystal structure in the wall. The most striking feature of the casting, however, was the occurrence of severe porosity throughout each section examined. One of the sections is illustrated in Fig. 2. The porosity extended to the fins, many of which contained severe cracks.

Fig. 1 (left).—Macrostructure in Section of B.M.W. 132 Cylinder Head.
Fig. 2 (right).—Macrostructure in Section of Bramo-Fafnir Cylinder Head.

Microstructure

A number of specimens from each component have been examined microscopically, and certain features seemed to be common to the three samples. The general particle size of the visible constituents was relatively coarse, thus providing further evidence that components had been produced as sand castings. In the case of the cylinder head from the B.M.W. 132 engine, the constituent network seemed to be abnormally coarse. The casting from the B.M.W. 801 engine showed a more favourable structure in which the visible constituents consisted mainly of the magnesium-silicon compound, together with a complex aluminium-iron-silicon compound, but the soluble magnesium-aluminium compound was not seen in the as-polished condition. The network of visible constituents in the Bramo-Fafnir cylinder head casting seemed to be characteristic of the type of alloy.

In the case of the B.M.W. 132 and Bramo-Fafnir components, porosity of a fairly severe character was observed in almost every field examined, except in specimens prepared near the inner wall. In these areas, it would seem that the porosity had been controlled to a large extent, probably by the use of drastic chilling methods. The casting from the B.M.W. 801 engine also showed a similar contrast in soundness between areas near the inner wall and areas at the centre of the wall, but generally the casting seemed to have been manufactured to a much higher standard of quality. The material at the external surface, including the fins, was seen to be reasonably sound.

Comments

The samples examined had clearly been manufactured as castings, and the features seen in the microstructure and macrostructure provided fairly conclusively that sand moulds had been used. The junction of the two halves of the sand mould occurred along a line through the rocker boxes, normal to the fins, and it would appear that the castings had been fed by risers at the open end. An interesting feature of these castings was the close fin spacing, of which details are given in Table 1. The samples from the B.M.W. 132 engine and from the Bramo-Fafnir engine would not be regarded as good quality castings, but neither sample showed evidence of any tendency to failure in service, and the components seem to have been sufficiently sound for the duty required. The casting from the B.M.W. 801 engine showed a higher degree of soundness, but would not conform with the highest standards of quality.

The three samples examined have supplied insufficient data fully to assess the standards adopted, but it would seem that the German manufacturers do not aim at high general quality and only insist on soundness in those parts of the component where freedom from porosity is essential. It is interesting to note also that an improved standard of quality seems to have

(*Continued on page* 14, *col.* 2.)

MACHINE SHOP PRACTICE AND FOUNDRY TECHNIQUE*

Fostering co-operation to meet exacting post-war requirements

By C. W. MARSHALL

In recent years the extended use of automatic or specialised machine tools resulted in many foundry problems, and the wartime necessity for employing all available resources has produced many complications. Unsuitable machines have often been used, in a number of cases for jobs beyond their capacity, and also automatic machining attempted on details previously considered too complicated, that is, requiring a special machine setting. With the co-operation of founders, however, production has reached high levels and has shown the diversity of ways a particular component can be machined, with special attention to general accuracy in the foundry.

Economic considerations will in the post-war period no doubt further develop already increasing production methods, and thus requirements from repetition foundries in particular will be more exacting, competition also demanding an improved product. With this in view, further co-operation between foundry and machine shop is very desirable, particularly as foundrymen should definitely consider finishing operations when planning layouts and deciding foundry technique. The writer, therefore, intends to follow an outline of production machining practice with comments on some features which affect the successful finishing of the foundry product.

Production Machining Practice

An essential feature is multi-tool operation on all types of automatic chucking machines, turret lathes and borers in order rapidly to carry out most standard machining operations. This necessitates casting accuracy at all points being machined, as interference with any tool can affect the whole set-up, particularly when one tool may be cutting intermittently.

Tools are balanced as far as possible to give equal amounts of travel during cutting, and the complete cycle of operations also divided to equalise the times of each machine operation. Usually, equipment is planned to capacity and excess material added by the foundry often necessitates a special operation, as extra tools cannot be included or mean lengthy turret travel during which time main turret and cross slide tools would be idle.

Multi-tool operation results in definite reduction of the area available for clamping or location, and in many cases circular castings are held in small cored bores to permit the simultaneous machining of several diameters. Production milling also often restricts permissible location area, particularly where indexing is carried out in order to machine several points with one machine setting. The machining of the long bores is often accomplished on vertical boring machines and, as these usually follow roughing operations by floating core drills, eccentric coring results in finished bores failing to machine, although rough machined at all points. With regard to the actual tools themselves, tungsten carbide or similar tipped tools are now almost universally used and, while permitting maximum feeds and speeds, these tools require casting accuracy in that variations in cutting pressure due to depressions or excess material will quickly cause tool failure.

The planning of machine operations is largely governed by the type of machines available, but where this question does not arise operations are planned to accommodate design requirements as interpreted by the inspection methods. Opinion as to the best method of achieving the desired result differs greatly amongst production engineers, particularly where great accuracy is required, and one thus finds similar parts given an entirely different sequence of operations by different machinists.

Design Assistance

To a great extent designers can assure ease of machining by co-operation with foundry executive and production engineer. Simplicity of moulding to the elimination of cores will give many points from which positive location can be taken, but if design is such as to necessitate difficult coring, then special location bosses or pads should be added where mouldable in relation to core position. Even with simply moulded details provision for location can greatly facilitate machining and allow multi-tool operation, together with a satisfactory machine grip and location base. This can be illustrated by considering one type of a commercial vehicle wheel hub casting which is simply described as a main flange or circular plate portion having a cored tapered boss on either side.

To accommodate maximum casting variation, the best set-up for the first operation boring and facing is undoubtedly from one edge and the outside diameter of the main flange, but in order to permit multi-tool operation on both faces and edge of the flange, it is necessary to hold in one cored bore which, apart from transmitting any error in core position to all casting diameters, gives a small location base in the vertical plane. With a very similar part the designer has added three chucking pads to the outside diameter of one boss, and this immediately takes away location from a cored portion and also widens the location base. A final point worthy of note under this heading is that the designer often has a certain

* An entry for a Short Paper Competition organised by the East Midlands Branch of the Institute of British Foundrymen.

Machine Shop Practice

amount of control over the extent of the machining, and in some cases restriction may facilitate feeding or location.

Location and Jig Construction

The theoretical "six-point principle" of location can be successfully applied to all castings, and foundries should press for correct application, avoiding cored portions and points liable to variation wherever possible. Apart from this, correct application means obtaining a comparatively large area within the three points in the first plane and using the points in the other planes to the best advantage with regard to the machining position in these planes. With castings expected to give trouble during machining, one finds jig designers adding more than the number of points permissible in any particular direction, and usually these extra locations only further complicate the first operation machining. In some instances, with modern jig construction, these extra locations are of the compensating type to accommodate casting variation and, although very desirable for some details, require judicious use.

Usually, the first operation machining locations are the most vital from the foundry point of view, particularly with turning and boring operations, as these provide the main registration for further machining. Large circular castings, however, often require careful location for correct angular disposition to the first operation machining, and here again special pads are desirable if their purpose is emphasised. Also, milling or planing operations seldom produce a complete location position, and second operation registration to the machined face needs further careful consideration.

As with operation planning, variation in location methods often depends on design requirements of finished products. Thus with a simple casting like a brake shoe first operation location can be from the fulcrum boss and pad, or the inside of the rim, whichever is required to minimum tolerance. One complication sometimes met is that machinists prefer to use the same jig for several slightly different castings, and so a location vee on a boss may contact at different points in relation to face or mould joint.

Pattern Plant and Foundry Technique

From the preceding comments on correctness of design and location perhaps it will be assumed that those responsible for these two functions are also to be held entirely responsible for the success of the machining, but the writer would, however, qualify this by pointing out that experience has often proved machine-shop troubles to be entirely due to foundry shortcomings. However, if probable or agreed machine locations are known, there are numerous ways in which the foundryman can assure a machinable casting, and it is hoped that discussion will either make these more obvious or prove that many are fully aware of their application.

When laying out pattern plant, the first decision is with regard to the joint line position, and often with small repetition castings this can be varied considerably if necessary to ensure machine locations mouldable in relation to a complicated boss or facing. Although for machine moulding straight joints are usually preferred, it may be policy to joint down to a small boss or facing in order to guarantee its relation to the half-mould carrying the locations.

With the simple hub already discussed, jointing can take place at either face of, or through the centre of the main flange. While the central method shows up any casting off-set, the edge is preferred from a locational point of view, and it is found that jointing at the flange face away from the boss with the minimum wall thickness gives the best result, as this boss is then in direct relation to the flange outside diameter from which location may be taken.

During pattern construction, location points should receive attention both as to correctness and carrying minimum taper. This is a point where the chucking pads quoted under design assistance can be of great help; a boss may be given liberal taper on the major portions and the three comparatively small chucking faces will easily mould with minimum draft. One method sometimes applicable to eliminate machine setting from a cored portion is to relieve the core-print locally, and so to provide a mouldable area sufficient to carry one location point.

Casting Head

With green-sand practice, the question of casting gain often arises, particularly with relatively heavy details, and it may be found necessary locally to reduce patterns or provide means of withstanding metal pressure. Core assembly methods often affect the machine shop (in some cases dependent on the efficiency of the fettling department) and to again revert to the hub casting; this part gave trouble due to the core assembly producing flash, which, although difficult to fettle, fouled the boring bar. When castings having several cored bores are machined on multi-spindle type machines, it is necessary to maintain pitch centres, and a method of barrel cores located accurately by jig cores was described in a Paper on core production read to the Branch earlier this session.

Lastly, under this heading of foundry technique, the old question of feeder and runner disposition must appear. These necessary evils have always caused trouble in the machine shop, and presumably always will; however, the writer would instance a simple case where a slight modification can assist machining. With a circular-type casting requiring two feeders, the moulder will invariably place these diametrically opposite, but it should be noted that a slight angular movement away from the centre line will assist in avoiding these areas with a 3-point location, such as a self-centring chuck.

In conclusion, both foundrymen and engineers will agree that many variables can affect the finished pro-

(*Continued on page* 14, *col.* 2.)

INDUSTRIAL RADIOGRAPHY *

By V. E. PULLIN, C.B.E.

Wide variations exist in the quality of the radiography found in different works. This lack of uniformity is a very serious matter, because it so enhances the difficulty of assessing the reliability of the radiographic technique; also, of course, it adds very considerably to the difficulty of proper interpretation. Variations in radiographic technique should to a large extent be easy of elimination. They are due for the most part to carelessness and lack of precision in the various processes common to all radiography. Such matters as careful alignment of the radiation, accurate measurement of focus film distances, design of cassettes, support of the cassettes when in position, standardisation in dark-room technique, all demand most careful attention. They all contribute to bad or good radiographic technique.

Where possible, the fundamentals of the art should be standardised for any particular type of radiography. Not only should the apparatus itself be of uniform design, but there should be a standardised method of drill for the operator which should be followed with precision.

With regard to the dark-room, standardisation is imperative, not only in the processing apparatus itself, but in its arrangement and use. A not infrequent fault, and one that may cause considerable trouble, is due to splash marks on negatives or on intensifying screens, and even now it is not uncommon to find a dark-room where there is no rigid demarcation between the dry and wet portions.

All the things mentioned are commonplace, and it would be generally conceded that every experienced X-ray operator knew all about their importance. That may be true; nevertheless, the observance of such elementary points is very often conspicuous by its absence.

Radiography has separate values in two important directions; first, in development work, and, secondly, in inspection. This differentiation applies not only in the foundry, but also in the welding art.

Photographic

With the advent of high-voltage X-rays the selection of suitable film becomes more difficult, and the necessity for research in this field becomes more and more apparent. Of course, for the proper radiography of high-grade welding a high-contrast small-grain film is *sine qua non*. It is desirable that such radiographs should be produced, if possible, without the use of salt intensifying screens. On the other hand, economy of time very often, one might almost say usually, renders their use necessary. However, with voltages of the order of 1,000,000, it will be possible to eliminate the use of such screens altogether and and use either a "no-screen" film or lead intensifying screens.

In the meantime it should be remembered that wherever it is possible economically to obtain weld radiographs without the use of salt screens this technique should be followed. Several of the big photographic film manufacturers are engaged at the present time in research to produce better X-ray films specially designed for high-grade engineering radiography. There can be no doubt that in recent years photographic films have improved very considerably, but there is still plenty of room for improvement.

It is now possible to obtain automatic or semi-automatic units for processing X-ray films, and it is to be hoped that every radiographic laboratory in the country will soon be equipped with this apparatus. There can be no doubt that the processing part of the radiographic art is second in importance to none, a fact that has only recently been accepted in practice.

The design of suitable cassettes is an aspect of this work that has been sadly neglected. It is by no means an infrequent thing for the author to be puzzled by obscure adventitious marks on films which he has ultimately traced either to bad cassette design or improper support of cassettes, and he recommends this question in its entirety to the appropriate body for investigation with the hope of improvement. A very great deal might be done towards improvement in this direction by more critical attention to this aspect of the work by the X-ray operator himself.

Uniformity of negative density should be aimed at in every works. It is impossible to recommend any particular background density for engineering radiography that shall be universally applicable. It is a desirable thing, however, that in any one laboratory uniformity of density should be achieved. What this density should be depends very largely upon the idiosyncrasy of the person who is going to interpret the radiographs. The author prefers a very high density of the order of $2h$ and d, but such films postulate the availability of very intense illumination for viewing. The maintenance of constant film density in any particular type of radiography is a very good practical check on the general technique employed, and any departure from the standard should be a hint of importance to the operator to revise and check his methods. This uniformity also cannot fail to be of great assistance in interpretation, particularly where large numbers of pictures are concerned.

Technique

It is said very often that one of the chief difficulties involved in the radiography of engineering materials is concerned with interpretation. This is only partly true. Radiographic interpretation, particularly in specialised spheres, is relatively simple. What does constitute the main difficulty is radiographic technique. The first thing to ensure is that a radiograph is obtained under the best possible conditions combined with absolute precision. It is useless to try to interpret a radiograph that is the product of bad or faulty technique; hence the importance of standardisation and of accurate and comprehensive record keeping.

The author prefers long focus film distances, especially in high-grade weld radiography, even where

* From a Paper entitled "Remarks on Radiography and in particular Weld Radiography," presented to the North-East Coast Institution of Engineers and Shipbuilders

slightly longer exposures are involved. The importance of accurate alignment cannot be over-emphasised. The alignment of the rays should be achieved by the use of some device which is automatic or nearly automatic in operation. In other words the subjective or personal element should be eliminated as far as possible.

The use of accurate penetrometers, again particularly in weld radiography, is a *sine qua non*. Penetrometers of one form or another should be so designed as to indicate roughly a percentage variation in thickness which will be apparent on the radiograph, and this image will afford a very sound guide as to penetration and the adequacy of the radiographic method. On the other hand, the greatest care should be observed in attempting to assess the size or depth of flaws in the material by an penetrometer indication. It should be remembered that the radiographic appearance both of a penetrometer image, and also of a flaw, is dependent not only upon the depth of such an image or flaw, but also to some extent upon its area.

Interpretation

Interpretation, the author pointed out, must be regarded as a matter of secondary importance when compared with technique. Assuming that a radiograph has been properly obtained, interpretation should present little difficulty, especially to the experienced viewer. It should be remarked at the outset that all radiographers should be taught to account for every shadow that appears on the film. The surface of the radiographed section should be carefully inspected for surface irregularities, and these should be checked with shadows on the radiograph and corresponding shadows should be recorded. There is nothing more irritating to one than to be told that such and such a shadow is probably due to a surface irregularity. All shadows should be explainable and directly referable to their cause. Such inspection and records should be a matter of routine.

NEW PATENTS

The following list of Patent Specifications accepted has been taken from the "Official Journal (Patents)." Printed copies of the full Specifications are obtainable from the Patent Office, 25, Southampton Buildings, London, W.C.2, price 1s. each.

562,596 SWINDIN, N. Methods and apparatus for pickling iron and steel.

562,597 and 562,636 MAGNESIUM ELEKTRON, LIMITED, and EMLEY, E. F. Fluxes for use in the treatment of light metals.

562,642 EVERY, C. E. (Titanium Alloy Manufacturing Company). Methods of deoxidising steel, and iron, and alloys therefor.

562,660 POTTS, H. E. (Haynes Stellite Company). Method of manufacturing improved nickel-molybdenum-iron alloys.

562,708 PARSONS MARINE STEAM TURBINE COMPANY, LIMITED, DOUGLAS, L. M., and SMITH, J. H. Gear-cutting machines.

562,738 UNITED STATES PIPE & FOUNDRY COMPANY. Centrifugal apparatus for casting metal pipes.

MACHINE SHOP PRACTICE AND FOUNDRY TECHNIQUE

(*Continued from page* 12.)

duct, and that, to eliminate these, the greatest co-operation is needed. Even with the simple hub casting previously quoted, such a variable can occur in at least eleven ways, summed up as follows:—(1) The designer may provide chucking pads or leave the operation planning to locate from points finally machined away; (2) location can be planned from the cored bores or from the main flange diameter on either side; (3) mould can be jointed at either edge or centre of main flange; (4) core can be made by using loose pieces or jointed at two different points, which later results in flash in opposite planes; and (5) disposition of the feeders can be such as to give varying wall thicknesses to the boss or can alternatively affect flange thickness.

While foundry experience with similar parts would definitely eliminate a number of these points, others are not so obvious and depend on co-operation with the production engineer to achieve a satisfactory result after machining. With large engineering concerns producing their own castings, this co-operation often means very specialised methods in the foundry to assure machinability, and this leads machinists to expect similar treatment from outside suppliers of castings. Finally, attention to machine-shop problems in the foundry will have definite repercussions on scrap, and it is felt that much can be done to educate both foundrymen and machinists in their relationship to each other, and that such action will be necessary for economic handling of cast products in post-war days.

METALLURGICAL EXAMINATION OF LIGHT ALLOY CYLINDER HEADS FROM GERMAN AIRCRAFT

(*Continued from page* 10.)

been necessary for the cylinder head of the later engine. The alloys used for the B.M.W. cylinder head castings are also interesting. The early casting 132 had been manufactured in a material corresponding to the American 122 alloy which has found application in automobile pistons, but which has no counterpart in British aero-engine manufacture. The B.M.W. casting of later manufacture (801) consisted of an alloy of the Hydronalium type, which would not normally be regarded as suitable for applications involving elevated temperatures.

To meet the heavy lorry programme, the American War Programme Board has granted special priority assistance to the foundry industry manufacturing certain castings which are in short supply and which are retarding production.

RELATIONSHIP OF BRINELL HARDNESS AND YIELD STRESS IN CERTAIN CAST STEELS

By T. W. RUFFLE

Discussion on a Paper presented at the Annual Conference of the Institute of British Foundrymen. Mr. D. Sharpe, the retiring president, occupied the chair. Mr. Ruffle's Paper was printed in our issue of July 20 last.

MR. H. T. ANGUS, Ph.D., M.Sc. (Member), referring to the use of the Brinell test as a method of checking standards of heat treatment, said that it was undoubtedly useful and indicative, in some cases, of incorrect heat treatment or segregation, but as with all mechanical tests, it must be used with the greatest discretion particularly when dealing with castings of varying section which were to be heat-treated. Among other things, for control purposes with repetition castings one must make quite certain that the section which was Brinelled was at the same point in each casting, because if the section varied, the Brinell varied partly because of the different effects of the heat treatment upon the different sections and also because of decarburisation which had more effect in thin than in thick sections. The Brinell test would serve to indicate the differences of hardness in different parts of the casting, but would not differentiate between incorrect heat treatment, material out of specification, or deep decarburisation of a thin section, unless the history of the casting were accurately known. There was also the well-known case of 12 per cent. manganese steel in which the Brinell figure was practically the same in the as-cast state as in the final heat-treated state.

THE AUTHOR agreed that it was necessary to be very careful in the application of the Brinell test, and it was also probably quite accurate to say that in a number of cases it did not give much help, especially with 12 per cent. manganese steel. His own practice had been, with castings, to test in various places on the first few of a routine job and to decide on a standard position for all future castings. The most important point in connection with decarburisation was to have thorough grinding and a conscientious man on the job if consistent work was to be produced. In his own case he had been fortunate in having such a good man who carried out thorough grinding and obtained extremely useful results. He did not dream of claiming that useful results could be obtained on every steel in every case, but there were a large number of cases in which the Brinell test was a useful tool to have.

Correlation with Yield Point

MR. W. H. SALMON, Assoc. Met. (Member) was interested in the way the Author had related the Brinell hardness to the yield point of these castings, but thought that more emphasis should be put on Mr. Ruffle's conclusion No. 4, which said that the conversion factor should be applied only to the type of steel and the heat treatment given in the Paper. When his castings gave an ultimate stress of 40 tons per sq. in., and a yield ratio of 0.669, Mr. Ruffle showed a Brinell of 17. Now suppose that by varying the heat treatment given to the steel, the ultimate stress was maintained at exactly 40 tons per sq. in., but the yield ratio was varied from 0.500 (annealed), 0.625 (cooled more quickly), to 0.750 (oil or water quenched and tempered). Would the Author expect to find a higher Brinell than 178 with a 30 tons per sq. in. yield point, and a lower Brinell with a 20 tons per sq. in. yield point, if the ultimate stress was constant at 40 tons per sq. in.?

THE AUTHOR replied that the Brinell ratio would vary as the yield ratio went up. There would be a smaller Brinell impression suggesting a higher tensile as the yield ratio increased. If anyone had Brinelled, as he had done, straight normalised and water quenched steel at the same time, they would have found that the figures were definitely not interchangeable. There was a different ratio of Brinell hardness number to ultimate stress. It was only possible to standardise figures for one type of material and one type of heat-treatment. The difference might not be very great, but it was often quite appreciable, and it was not possible to take the figures from the Paper and apply them either to a quenched job or a fully annealed job. To get the full value from hardness testing, a study should be made of results from the steel and heat treatment in each case.

MR. C. J. DADSWELL, Ph.D., B.Sc. (Member), said that possibly few people who heard Sir Charles Darwin at the morning meeting of the Institute realised at the time that among the Papers presented at this conference was one which showed in an excellent manner the application of statistical recording in a foundry. This Paper showed there was an opportunity for doing it in foundries where the test results were recorded in such an intelligent manner as was done in the Author's case. That was an extraordinarily healthy thing to see, and he considered that the Author had done a very creditable thing.

THE CHAIRMAN remarked that many engineers had developed the dangerous habit of using the Brinell test for purposes which were scientifically not correct, and Dr. Angus had indicated clearly where that danger was. Before looking into the further use of the Brinell test they ought to be looking after yield points, and it was worth while stressing the danger of the use of Brinell tests for any other purpose than definitely known statistics. The translation of Brinell hardness figures for any other purpose should be very thoroughly investigated before they were passed on to the engineer to make another trouble for the poor foundryman!

A hearty vote of thanks was accorded Mr. Rufile for his Paper.

The American Press is constantly carrying references to the relaxation of regulations in favour of the production of materials other than munitions of war. For instance, in the last quarter of this year, permission has been given for the manufacture of 128,175 domestic refrigerators spread over 21 firms.

EXPORTS OF MACHINERY

POST-WAR NEEDS OF EUROPEAN COUNTRIES

Sir Eugene Ramsden, M.P., in view of the probability that, after the war, "there will come from devastated Europe very large and urgent demands for machinery and machine tools of all descriptions," has written to Mr. Hugh Dalton, President of the Board of Trade, suggesting that home manufacturers should first be re-equipped and that their old equipment should then be exported, provided it was in workable condition. If the mills of France, Belgium and other countries are destroyed, it will be desirable, taking the long view, to help them to get going again at the earliest possible moment, but if this is done at the expense of British industry, we should lose business and unemployment would result, says Sir Eugene Ramsden. If the foreigners were re-equipped with the most up-to-date machinery while our own people had to continue using their old equipment, the position would be an impossible one and we should not be able to compete in British and foreign markets.

Mr. Dalton, in his reply, wrote that, while he certainly did not wish our industries to be handicapped by foreign firms being newly equipped at their expense, it was desirable that plants which might be destroyed in Europe should be got back into production as soon as possible, and obviously a certain amount of new machinery would be required. "It must be remembered, moreover, that our export markets for machinery will be most important to us after the war, and if we do not export any new machines, they will be lost to other countries; we must therefore try to hold a reasonable balance in the allocation of machinery between home and export. The suggestion that we should retain the greater part of our new machinery and export the second-hand plant that firms would surrender on obtaining renewals, is an interesting one. Personally, I would doubt how far European countries will want to buy second-hand machinery. They might well prefer to get new machinery from other sources. However, when this time comes, we would certainly consider applications for export licences from individual firms wishing to dispose of second-hand machinery for which they had offers from customers overseas."

EXPORT TRADE POLICY

Members of Walsall Chamber of Commerce complained at a meeting held recently that British manufacturers were getting no lead from the Government regarding their post-war policy for export trade.

Mr. F. Willmot said that in America personnel and materials had already been released to manufacturers.

Mr. J. A. Webster said that he had received information that United States firms were showing samples and quoting firm prices in South American markets, whereas manufacturers in this country did not know what labour or materials would be available nor which markets would be open to them.

HEAVY ENGINEERING INDUSTRY

CO-OPERATION WITH IRON AND STEEL MAKERS

In his statement accompanying the report and accounts of Davy & United Engineering Company, Limited, Mr. D. F. Campbell, the chairman, says it cannot be too strongly emphasised that British manufacturers must have every opportunity of maintaining their works in modern and efficient condition, especially in view of the large volume of heavy engineering work that will be required in the post-war period for reconstruction and deferred maintenance and repairs. As efficient tools are useless without experienced engineers and skilled craftsmen, the directors are developing a long-term scheme to assist young entrants into the industry to increase their knowledge under the guidance of men experienced in teaching and engineering technique.

Post-war developments are receiving a great deal of attention, not only in connection with the extension and improvement of the company's works, but also in connection with their arrangements with their American associates and their future co-operation with the iron and steel industry of this country. Government officials and the iron and steel trade have co-operated with the makers of heavy engineering equipment in establishing a liaison which should prove most valuable in maintaining a high technical standard to the great benefit of all concerned. The immediate transition period after the war will doubtlessly be one of some difficulty, but the prospects for full employment in the company's heavy engineering works for several years are excellent, says Mr. Campbell.

WORLD MINERAL CONTROL

A recent scheme proposed by G. B. Langford, Professor of Mining Geology at the University of Toronto, for international control of mineral production is interesting though not thoroughly in line with Article Four of the Atlantic Charter. The plan calls for a giant international mineral cartel, to fix prices, allocate production and control flow to markets. Buffer stockpiles and preventing belligerently-inclined nations from securing excess mineral supplies would be incidental to the scheme. Prof. Langford urges the prevention of mineral waste by avoiding depressions in the mineral industry, to be accomplished by fixing mineral prices at comfortably high levels, such as has been customary for gold. Economic producers, who would enjoy handsome profits under such an umbrella, are to be relieved of their surplus gains through excess profit taxation. A comprehensive study of productive capacities and world consumer requirements is to be made, in the light of which production is to be controlled and supplies delivered to the consumers.

Mr. Harcourt Johnstone, Secretary for Overseas Trade, stated in Birmingham recently that consideration was being given to the revival of the British Industries Fair.

NEWS IN BRIEF

THE AMERICAN IRON AND STEEL INSTITUTE reports that national emergency (NE) steel specifications have been altered so as to permit greater consumption of triple-alloy (nickel, chromium, molybdenum) steel scrap which has been accumulating in scrap yards and factories.

OWING TO A typographical error, our note in our issue of August 24 on the recent presentation to Mrs. Daniel Sharpe, wife of the immediate Past-President of the Institute of British Foundrymen, did not make it clear that the presentation was made on behalf of the Past-Presidents of the Institute.

WEARDALE RURAL COUNCIL'S suggestions for developing the industries of the area are to be supported by the Executive Committee of South-West Durham Development Board. Meeting at Bishop Auckland, the board agreed to ask the Government to send a representative to investigate the possibilities of increasing work in the limestone and other quarries, fluorspar mines and works, and to report on the possible erection of calcium carbide plant.

REPRESENTATIVES OF THE Engineering and Allied Employers' Federation, at a conference in London recently with delegates of the Amalgamated Engineering Union, accepted the principle that, where it is necessary to reduce works' staffs, the names of dilutees should first be submitted to the National Service Officer for removal. The union leaders are understood to have expressed concern recently about the suspension and temporary employment of skilled workers while dilutees were being retained.

MEMBERS of the General Iron Fitters' Association employed by Smith & Wellstood, Limited, of Bonnybridge, claimed that fitters should be paid overtime for time worked outside the normal working hours. The National Arbitration Tribunal has found it established that the normal working hours of fitters are 8 a.m. to 5.30 p.m. Monday to Friday, with a midday break of one hour, and 7.30 a.m. to 12 noon on Saturday, and that it is the custom to pay overtime on a daily basis irrespective of the total time worked during the week. They award accordingly from the first full pay period following August 18.

CHANGES IN THE representation of the Staveley Coal & Iron Company, Limited, Staveley, near Chesterfield, and the Park Gate Iron & Steel Company, Limited, Rotherham, for the North-western area come into operation on October 1. Mr. G. P. Raundrup, pig-iron sales manager for the Staveley Company for the Lancashire, Cheshire and West Riding of Yorkshire areas and Lancashire and Cheshire representative of the Park Gate Company, is retiring at the end of September after 44 years with the Staveley Company and 20 years with the Park Gate Company. Mr. Raundrup has been a member of the Manchester Royal Exchange for 47 years. Mr. W. W. Dale, his assistant, whose experience of the iron and steel trades runs closely parallel with that of Mr. Raundrup, is also retiring at the end of the month. Both, however, will continue to act in a consultative capacity on behalf of the Staveley Company until the end of the year. From October 1, the pig-iron interests of the Staveley Company for the Lancashire, Cheshire and West Riding areas will be looked after by Thos. W. Ward, Limited, who will also take charge of the Lancashire and Cheshire areas for the Park Gate Company. A Manchester office has been opened by Thos. W. Ward, Limited, at Lord's Chambers, 26, Corporation Street. Mr. B. H. Webster, a member of Mr. Raundrup's staff concerned with the Park Gate products, will join the Manchester office of Thos. W. Ward, Limited, from October 1.

PERSONAL

MR. V. ELKINGTON, managing director of the Dover Engineering Works, Limited, is this year's Master of the Coopers' Company.

MR. J. F. STANIER has been appointed managing director of the Renishaw Iron Company, Limited, Renishaw Ironworks, near Sheffield.

MR. E. G. TAYLOR, formerly general sales manager of Tecalemit, Limited, has now been appointed sales director after long service extending over 20 years. MR. C. S. LECLAIR has now been made technical director, after having been with the company for nearly ten years in the capacity of chief engineer.

SIR GEOFFREY BURTON has resigned the position of managing director of the Birmingham Small Arms Company, Limited. He is at present engaged in a voluntary capacity as Director-General of Mechanical Equipment in the Ministry of Supply. He has occupied this and similar positions in the Ministry for the last four years.

MR. E. J. FOX retired from the chairmanship of Davy & United Engineering Company, Limited, on reaching the age of 70, while retaining his seat on the board. Tribute is paid to his services to the company in a statement by Mr. D. F. Campbell, the present chairman, which accompanies the report and accounts for the year to March 31 last. The success of the company since its reconstruction some nine years ago has been largely due to Mr. Fox's untiring and diligent efforts in the direction of its affairs, says Mr. Campbell. Under his guidance the precarious position of 1935 has been changed into one of strength, and much progress has been made, including the association with United Engineering & Foundry Company of Pittsburgh, Pa., and the acquisition of Davy & United Roll Foundry, Limited, and Duncan Stewart & Company, Limited. Works extensions and improvements have also been carried out. Not the least of Mr. Fox's achievements were the negotiations for co-operation with the iron and steel industry.

Wills

ROBERTS, WILLIAM, of Scarborough, formerly of Cleckheaton, brassfounder	£4,433
MEYNELL, HERBERT, of Wolverhampton, chairman of Meynell & Sons, Limited, brassfounders	£26,396
CROSSLAND, G. A., of Sheffield, of the foundry sales staff of the English Steel Corporation, Limited, Sheffield	£1,494

COMPANY RESULTS

(Figures for previous year in brackets)

A. & J. Main—Dividend of 10% (same).

Quirk Barton—Interim dividend of 2½% (same).

Halesowen Steel—Interim dividend of 7½% (same).

John C. Parkes & Sons—Interim dividend of 3½% (same).

Modern Machine Tools—Final dividend of 7½% (10%), making 15% (17½%).

British Oxygen Company—Interim dividend on the ordinary stock of 8% (7%), less tax at 9s. 8d.

Scoffin & Willmott—Net profit for eight months to March 31 last, £2,965 (£3,086 for year); brought in, £8,014 (£4,928); assets written down, £82,564; debit forward, £71,585.

Zinc Corporation—Participating dividend of 1s. (same) per share for 1943 on the preference and ordinary shares, making 6s. per share, or 30%, on the preference, and 2s. per share, or 20%, on the ordinary shares (same).

Hartley & Sugden—Net profit for the year ended June 30 last, £11,597 (£12,467); preference dividend, £1,661; taxation, £5,000; to general reserve, £2,000; dividend of 6% on the ordinary shares, £3,060 (same); forward, £1,879 (£2,003).

Geevor Tin Mines—Net profit for year to March 31, 1944, £19,551 (£24,019); tax, £3,450 (£4,500); written off shaft sinking and permanent development, £3,037 (£3,632); final dividend of 4½d. per 5s. share, making 7½d. (9d.); forward, £8,187 (£8,152).

James Howden—Profit for the year to April 30 last, £234,499 (£138,937); interest, £6,269 (£8,460); depreciation, £21,000 (same); war damage insurance, £2,341 (£3,547); taxation, £139,000 (£73,000); net profit, £64,389 (£31,530); deferred repairs, £31,000 (nil); to general reserve, £10,000; ordinary dividend of 15% (same); forward, £28,414 (£22,874).

Hallamshire Steel & File—Trading profit for year to March 31, 1944, after depreciation and E.P.T., £40,690 (£46,610); income-tax, £17,775 (£17,768); war damage insurance, £704 (£864); net profit, £19,986 (£19,953); to contingencies reserve, £7,500 (same); interim dividend of 9d. per 10s. share, tax free (same), final dividend of 1s. 9d. per share, tax free (same), £7,875; forward, £11,431 (£10,195).

Davy & United Engineering—Profit for the year ended March 31, including dividends from subsidiary companies, £124,172; taxation, £71,387; net profit, £52,785 (£45,745); to general reserve, £100,000; dividend of 7½% (same); applied in the reduction of the value of the consideration for trading and manufacturing agreement with United Engineering & Foundry Company, £5,000 (same); forward, £80,729 (£156,475).

The Westinghouse Electric International Company, of Pittsburg, which for more than 25 years has operated in the international field as an exporter, has now decided to enter the import business.

T.U.C. PLANS FOR CONTROL OF INDUSTRY

A plan for post-war reconstruction of industry, drafted by the T.U.C. and considered by the general council at a meeting last week, will be submitted to the full congress in October. Nationalisation is proposed of fuel and power (including coal, gas and electricity), transport (including railways, canals, road transport, shipping and internal airways), and the iron and steel industry. It is suggested that a public corporation be established to take over all the undertakings in the particular industry or group of related industries. Compensation would be paid based on the actual earnings over a period of years.

Control of the following industries, among others, is urged: Heavy chemicals, cement, non-ferrous metals, rubber, heavy sections of mechanical and electrical engineering; manufacture of motor-cars, aircraft, railway locomotives and rolling stock; shipbuilding; domestic utensils and electrical and mechanical appliances for the home.

OBITUARY

MR. C. A. JENKINS, director and secretary of Elmore's Metal Company, Limited, died recently.

MR. HENRY SLOANE LESTER, of Wm. Lester & Sons and the Pennycock Patent Glazing & Engineering Company, Limited, Glasgow, died on August 24.

MR. JAMES WILLIAM SPONG, chairman of Spong & Company, Limited, hardware manufacturers, of Tottenham, London, N., died suddenly on August 22.

MR. FREDERICK MOUNTFORD, chairman and founder of Frederick Mountford (Birmingham), Limited, manufacturing engineers, died recently, aged 74. He was for some years a member of the Birmingham City Council.

MR. JOHN GEORGE CROZIER, managing director of Richard Johnson & Nephew, Limited, wire manufacturers, died on August 27, in Manchester. He was also on the boards of the Johnson & Nephew Fence Company, Limited, and Strappings, Limited.

NEW TECHNICAL COLLEGE FOR DERBY AND NOTTS

A joint committee of the Derbyshire and Nottinghamshire County Councils and the Nottingham City Council has drawn up a scheme whereby there will be transferred to those bodies the technical education functions hitherto exercised by Nottingham University College at buildings belonging to the city council. This step will involve the establishment of a new technical college, the capital expenditure on which will be met by the three authorities in the proportion of five for Nottingham, four for Nottinghamshire, and one for Derbyshire. The governing body will consist of 10 representatives of Nottingham, eight of Nottinghamshire, and two of Derbyshire, together with representatives of University College.

Raw Material Markets

IRON AND STEEL

The foundry industry has emerged from the holiday atmosphere without any reliable indication of recovery from the recent lethargic conditions. There may have been no further shrinkage in pig-iron production, but outputs appear to be somewhat in excess of immediate needs, and although licences are being more freely issued, buyers generally are restricting their purchases to relatively small tonnages. To this broad generalisation hematite still provides a notable exception, supplies of this grade being released only in very meagre tonnages by the Control. In place of hematite, engineering and speciality foundries are using largely low- and medium-phosphorus iron and refined iron. A limited amount of high-phosphorus iron is also being taken in. There is little activity in the light foundry trade.

There is a strong demand for most grades of scrap. Heavy cast iron and machinery scrap are eagerly taken up, while the demand for short heavy steel, suitable for foundry work, is greater than the supply. All supplies of wrought-iron scrap offered find a ready outlet. Heavy mild-steel scrap is more plentiful than of late, and the pressure for delivery has relaxed somewhat.

Coke is now in good supply, both foundry and blast-furnace grades being available in sufficient quantities to meet current needs and also to lay in stocks. There are prospects of supplies being short again during the winter, and users may find their stocks serving them in good stead.

Buyers of special alloy steels are showing a little more restraint, probably inspired by the expectation of further dramatic changes on the war fronts. There is, however, no abatement of the steady demand for semi-finished steels for the re-rolling industry. Both prime-quality billets and defectives are called for in undiminished quantities, and regular deliveries are an essential condition of the fulfilment of substantial Government contracts, according to the time schedule.

Bookings for small bars, light sections, etc., extend for several months ahead, but, on the other hand, there is no difficulty about prompt rolling of heavy joists, and except perhaps for boiler plates, the pressure on the plate mills is markedly reduced. Colliery and railway materials are substantially specified. Sheet mills, too, are well employed, and these departments are not likely to experience a less active demand, when the steel industry is once more permitted to cater for civilian requirements.

NON-FERROUS METALS

In this country the copper position remains largely unchanged, with supplies adequate to meet the demands of the war factories, which are now working at an appreciably lower level than they were some time ago. Although there are no indications that the stock position is anything but satisfactory, the Control are not easing the restrictions on civilian consumption. The latest reports from America have stated that although the demand, especially for shell manufacture, is still strong, the supply situation is now much more comfortable than it has been in recent months. Larger arrivals are coming from foreign countries, mainly from South American and Canadian sources. With consumption at a lower level, it is estimated that at the end of September the Government stockpile will amount to something well over 300,000 tons. In view of this easier tendency there has been a slight relaxation in the restrictions on copper for civilian use.

The tin situation is somewhat colourless at the moment. Consumption continues at a steady level, while output in the various producing countries remains satisfactory, with shipments arriving regularly. In the scrap market tin is still being taken up in quite large tonnages by manufacturers. This is in contrast to copper and other non-ferrous metal scrap, where the trading conditions are generally extremely difficult.

There is no change in the demand for lead in this country. Activity is concentrated on the battery and cable trades, which are consuming quite large quantities. In America, the effects of the Mexican strike are still being felt. The stocks held by the Government are stated to be declining, as withdrawals are having to be made to meet demand, which cannot be fully satisfied by domestic production.

Zinc is in comfortable supply on both sides of the Atlantic. Civilian releases in this country have only been very small, but they have been granted more freely by the Control than in the case of the other metals. These relaxations, which were made some time ago, were all connected with galvanising. Demand for zinc from the war industries seems to have undergone a further decline in recent months.

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.)

J. W. Hughes (Engineers), 42, Silver Street, London, N.18—£2,000. J. W. Hughes.

Fair Green Engineering Company, Love Lane, Mitcham, Surrey—£1,000. M. A. Brahms.

Clensmore Foundry Company (Kidderminster), Clensmore, Kidderminster—£3,000. J. J. Russell.

Precise Products—Engineers, etc. £3,000. J. Bailey, 19, Verulam Road, Churchtown, Southport, subscriber.

Heavy Duty Bearings—£100. A. J. Wheatland, Amberley House, Norfolk Street, London, W.C.2, subscriber.

Wardle Alloys, Corville Mill, Watling Road, Park Street, St. Albans—£5,000. H. H. Wardle and W. Kenworthy.

Tudor Metal Equipment, 6, Upper Brook Street, London, W.1—£1,000. A. A. Green and E. G. T. D'Eyncourt.

CURRENT PRICES OF IRON, STEEL AND NON-FERROUS METALS

(Delivered, unless otherwise stated)

Wednesday, September 6, 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. 3¾d. 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, 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. 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 Sept. 2, 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.*)

SMALL ADVERTISEMENTS

SITUATIONS

METALLURGIST and Foundry Technician, well known, seeks technical executive position, with possibilities of directorship or similar status. Would prefer appointment with small progressive foundry where keen personal interest would be appreciated; might consider small investment. Thoroughly experienced in all branches of metallurgy and foundry technique, as applied to the production of grey cast irons (including high duty and alloy) malleable (white and black heart), also non-ferrous (excluding light alloys) castings. Considerable experience—research, development and scientific control of kindred processes, including heat-treatment, zinc coating, plating, spraying, galvanising, enamelling, etc. Foundry and laboratory layout, organisation and control of labour, with particular reference to mechanised plants. Qualified member of British and American Metallurgical Institutions.—Please address replies, in confidence, to Box 652, FOUNDRY TRADE JOURNAL, 3, Amersham Road, High Wycombe.

WANTED.—WORKS MANAGER for Non-ferrous Foundry; applicant must be an experienced moulder; good prospects for right man.—Apply HOPE FOUNDRY (STOKE), LTD., Chesterton, Stoke-on-Trent.

FOUNDRY SUPERINTENDENT required for West of Scotland area; must be good disciplinarian; able to handle male and female labour; thorough knowledge of heavy and light moulding machine practice; also core making by core-blowing and other machines; output consists of various designs of gunmetal and cast-iron high-pressure castings; state age, experience, and salary desired; good post-war position assured, if suitable.—Box 646, FOUNDRY TRADE JOURNAL, 3, Amersham Road, High Wycombe.

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PATENT

THE Proprietors of Patent No. 530.774, for "Method and Apparatus for Washing Surfaces," are desirous of entering into arrangements, by way of licence and otherwise, on reasonable terms, for the purpose of exploiting the same and ensuring its full development and practical working in this country.—All communications should be addressed in the first instance, to HASELTINE, LAKE & Co., 28, Southampton Buildings, Chancery Lane, London, W.C.2.

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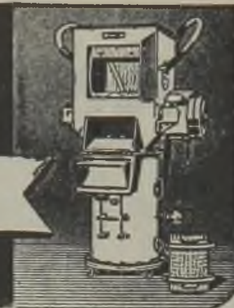

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