BIBLIOTEKA POLITECHNIKI ŚLĄSKIEJ

FOUNDRY TRADE JOURNAL

Established 1902

Vol. 91 Thursday, November 1, 1951 No. 1835

PRINCIPAL CONTENTS

PUBLISHED WEEKLY : Single Copy, 9d. By Post 11d. Annual Subscription, Home 40s., Abroad 45s. (Prepaid).

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

The Purchasing Department

Of importance to the foundry industry is the creation of the Purchasing Officers' Association, as it provides a channel through which the age-old problem of co-operation between the designer, patternmaker and moulder can be solved. This new name—purchasing officer or purchasing agent as it is called in America—has for some reason replaced the older one of "buyer," yet we cannot imagine a large departmental store sending over to Paris a "purchasing officer" to attend the fashion parades. This relatively new association came into being during the period of a sellers' market, which reversed the normal conditions of easy choice to a game of "hunt the thimble."

It can be assumed that amongst the membership of the Purchasing Officers' Association there are some buyers from the foundry industry, and we look to them to make continuous propaganda for the more intelligent buying of castings in the future than has been done in the past. The elusive "thimble" will be more easily found by buyers where simplification of design has been studied and practised; where the use of standard pattern colours is in vogue; where knowledge of the moulding box-part sizes normally used by the suppliers is taken into consideration; where a knowledge of weight ranges is readily available, and, finally, as to which designs of castings give trouble and why.

A start at co-operation is to be inaugurated by the London branch of the Institute of British Foundrymen at a meeting next Spring, when members of the Purchasing Officers' Association will be the guests to hear Mr. J. F. Kayser, of Gillette Industries—a past-president of the branch—talk about "The Buyer's Point of View." The keynote of the purchasing of castings must be co-operation. Tolerance must be exercised by both parties, as the buyer cannot be expected to be an expert on all the components and raw materials entering the stores and stockyards. Foundry buyers, now at their wits' end to keep the works going, have to take what is offered, but in doing so they should very politely inform the suppliers of the existence of their normal specifications, which must be adhered to when conditions revert to normal. Otherwise *ersatz* material may continue to be sent long after the need has passed. When conditions become normal, salesmen visiting foundries will need to take a revision course on the art of selling. Too long have they been in the position of "obliging customers," whilst the buyers who order up 200 sets of castings in the hope of getting 50 will find that they have "burnt their fingers." There were a number of cases of awkward situations when a slight recession took place some months ago. Especially was this so where poor quality was put forward as an excuse for over-ordering. Nothing but good can come from a properly conducted association of buyers, as the members can learn so much from one another.

Skandinavisk Meehanite

THE Scandinavian Meehanite Research Institute, called *Skandinavisk Meehanite*, held its second annual meeting in Oslo from September 21 to 22. This—the sixth Meehanite research group—was formed about a year ago in Copenhagen. There are now eight licencees in Scandinavia, including some of the largest foundries in Denmark, Norway and Sweden. The object of this Institute, as the case with the other five, is to promote technical and industrial sales and merchandising research.

The meeting attracted 30 participants, three from England and 27 from Scandinavia. The following Papers were presented and discussed:—"Microstructure and Physical Properties of Diesel Cylinder-heads made in "B"-Metal"; "Atmospheric Shrink-bobs"; "Water-cooled Cupola Operation at A/S Krakeroy Verk"; "Olivine as Moulding Material in Iron Foundries"; "Alteration in Physical Properties of Meehanite as the Ladle Holding-time Increases"; "Scandinavian Casting Service Records"; "Casting Design as Influenced by Foundry Practice"; "Relationship of the Metallurgist to Sales Development," and "Synthetic Resins and Their Use in the Foundry."

The following firms were represented at the conference:—

Denmark.—A/S Atlas Maskinfabrik; A/S Burmeister & Wain, and A/S Volund, all of Copenhagen.

Norway.—A/S Krakeroy Verk, Fredrikstad; A/S Myrens Verksted, Oslo, and A/S Sandnes Stoperi, Sandnes.

Sweden.—Kockums Mekaniska Verkstads, A/B Malmö, and Limhamns Aduceringsverk, A/B Malmö.

Great Britain.—Butterley Company, Limited, Derby; International Meehanite Metal Company, Limited, London, and Richards (Leicester), Limited.

Work Saving in Industry

Foundries in the Birmingham area are co-operating with Professor John R. Immer, who is organising a "Work Saving Week" in Britain from November 19 to 25. Formerly assistant professor of Industrial Management at Minnesota University, Prof. Immer has been working in Birmingham for several months preparing his thesis on the development of production methods in the Midlands, for the degree of Doctor of Philosophy at Oxford. Prof. Immer has been interested to find that many so-called modern foundry techniques were, in point of fact, used by Boulton and Watt in their famous Soho Foundry. He believes, however, that new or modified methods can do a great deal to step-up production, if time, materials, floor space and employee movement is better planned. The "Work Saving Week" is therefore designed to exhibit how jobs can be done in easier and more effective ways, and exhibitions are being arranged in London and Birmingham, while one prominent Birmingham firm is putting on a special display of work-saving techniques. Firms, trade unions, as well as professional associations and civic authorities, are co-operating with Prof. Immer in this scheme.

Next Year's I.B.F. Conference.—The 1952 annual conference of the Institute of British Foundrymen is to be held at Buxton from June 10 to 13.

House-to-house Scrap Drive

The Mayor of Smethwick, Coun. H. Pinner, is organising a four-week scrap-drive for iron and steel from the gardens and houses of the district, beginning November 4. The town has been divided into four areas, each of which will be combed during a week. This scrap drive for ferrous metal from households and yards is the second to be held in the Midlands industrial belt. The first was at Walsall and the organisers for Smethwick are taking advantage of the experience gained in the Walsall drive. An improved method has been worked out to avoid a repetition of the confusion that arose when householders were warned by hand-bells when scrap-collecting lorries were coming. At Smethwick, labels are to be delivered to each house and if there is any scrap to be offered, the householder will tie the label to the dustbin to let the collectors know. At Walsall, during the scrap drive, 50 times the normal amount of metal scrap was collected in one week, and it is calculated that the yield will be higher from Smethwick.

Forty Years Ago

In our issue of November, 1911, one notes the increasing space given to the then new process of steel making by the electric furnace. An engineer still happily amongst us, and as energetic as ever, reported that the 1908 production of 30,000 had risen in 1910 to 120,000 tons. He has since seen that production rise to several million tons a year. It was a good issue and included a description of a mechanised core-shop, which, except that it used a battery of batch-type ovens, would be considered quite modern to-day; a visit by the Birmingham branch of the British Foundrymen's Association to a railway-wagon works, where there were in use more than 500 patterns for axle-boxes; and an excellent article on stack moulding.

The personal notes record a presentation to Mr. Percy Wilson on leaving Jas. Oakes & Company, and being appointed works manager of Staveley works, whilst "Trade Talk" announced that the British Thomson-Houston Company, Limited, were building a new foundry at Lincoln.

Tilghman Family History

The announcement that Tilghman's Patent Sand Blast Company Limited has been taken over by the Staveley Group reminds us that Capt. Tilghman once told us that his family originally came from Saxony, and during the middle ages settled at Tilmanstone in Kent. Then some of the family went to America in the "Mayflower" and became landowners. During the civil wars, however, some members of the family returned to this country, and one of them noticing the effect of wind-blown dune sand on the windows of the fishermen's houses, took out patent rights and formed a company for the manufacture of suitable plant for sand-blasting. When the civil wars were over the family returned to the United States to their estate. It is virtually true to say that they have never engaged in manufacturing in their own country but always retained their interest in the Altrincham concern.

DALLOW LAMBERT & COMPANY, LIMITED, of Spalding Street, Leicester, announce that, at the beginning of October, the unit dust collector department was transferred from the main works at Spalding Street, to Barkby Road, Leicester, where modern new premises have been acquired.

New Mechanised Cupola Charging System

Following the policy of publicising worthwhile installations of foundry equipment and plant, this account deals with the melting arrangements at the new foundry of the International Harvester Company of Great Britain, Limited, at Doncaster. The melting unit described, is serving the mechanised foundry for mass-producing castings for their farm-tractor works.

The works of the International Harvester Company of Great Britain, Limited, at Doncaster are part of the European section of the international concern, which as a group is probably the largest supplier of agricultural equipment in the world. In America, the parent company operates no fewer than eleven foundries which together with machine and assembly shops employ over 90,000 men, each geared to high-rate production of tractor and ancillary castings similar to those which are being produced at the British factory. It was not surprising, therefore, that when considering equipment for the recently-completed Doncaster foundry, the principal executive decided upon basic designs of equipment which had been well tried and tested in the States, namely, Whiting. The equipment selected has been manufactured in this country and supplied by the Foundry Engineering Division of the Incandescent Heat Company, Limited, the British manufacturing representatives of the Whiting Corporation of America. The first impression one obtains of this unit is its extreme robustness and yet it operates with reliability and efficiency remarkable in such a heavy piece of equipment. The melting unit generally, is extremely compact and a great deal of attention has been given in the design to ensure smoothness of operation and efficiency. This can be said also of other items of equipment in this foundry such as sand conditioning and distribution plant and the moulding system, which in some respects are unique in the writer's experience, but these will not be described in this article.

Cupolas

Two Whiting-type cupolas have been installed for use on alternate days. Each has a shell diameter of 78 in. and is 78 ft. high to the top of the stack, the charge opening being 27 ft. 3 in. from the ground. They are furnished each with two rows of eight tuyeres, the main tuyeres being below the windbelt and the auxiliary pipe tuyeres inside the windbelt area (see Fig. 1). Blast is supplied by centrifugal fans arranged to deliver up to 6,500 cub. ft. per min. regulated by a Foxboro' automatic airweight ratio controller. Though originally designed to melt 10 tons per hour each, at the commencement of operations they were lined down to give 5 tons and have since been opened up to yield 7 tons.

The cupola bottom doors are of cast iron and are pulled into position by a winch mechanism, the release being a knee-action prop. The furnaces are mounted on a platform 7 ft. above the shop floor and are arranged for continuous tapping through a front weir-slagging system into a 30-cwt. capacity U-type bricked receiver. (The latter is also shown in Fig. 1 as well as the air/gas torch used for its preheating at the commencement of a run.)

Receivers

The receivers, two of which have been supplied, are mounted on bogies running on short lengths of track so that they can be moved from one cupola to the other or to the re-lining station. The lining life is of the order of six months; there is a refractory cover over one end of the receiver and a tea-pot spout is built into the refractory at this end. Tilting operation is by handwheel at one of the end trunnions. It is claimed that this design of receiver has advantages of good heat conservation, rapid preheating and easy accessibility for relining. Gas consumption at the beginning from cold up to sufficient temperature to receive metal is of the order of 800 cub. ft. and is supplied to a portable, forced-air type of burner. Other details of equipment supplied

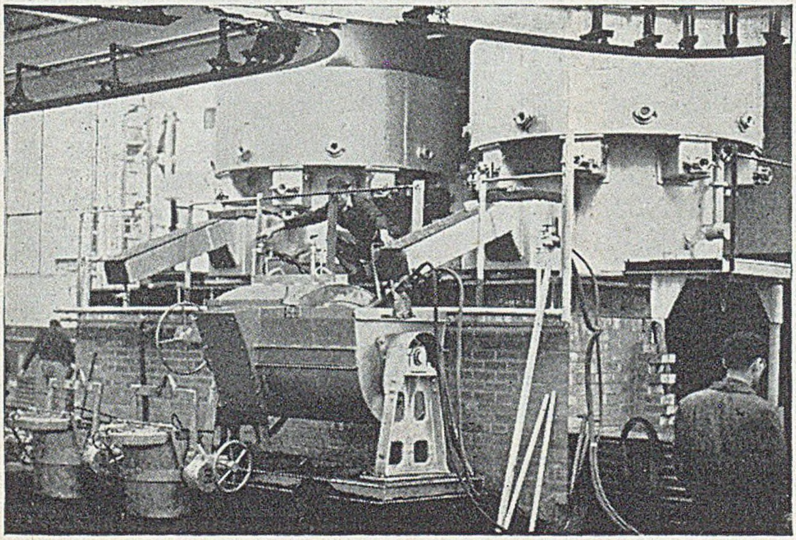


FIG. 1.—*General View of the Cupola Tapping Station at International Harvester, showing the Base of the Cupolas, U-form Receiver and Distribution Ladles.*

by the same firm include a number of covered ladles for metal distribution; two of these are shown in Fig. 1.

Charging Equipment

One of the salient features of this plant is the provision of an extremely heavy-duty charging device. This is known as the swivel-hoist charger and is the first of its type to be installed in this country, though a number are in use in the United States. Briefly, it consists of an inclined bucket-hoist mechanism pivoted at its base and movable in an arc at the top so as to serve two or more cupolas at will. A sectional elevation drawing of the arrangement as well as a plan is shown in Fig. 2 and in Fig. 3 is reproduced a side view of the plant taken looking over the roof of the foundry building. In the drawing, Fig. 2, the limestone and coke hoppers and automatic weigh mechanism yet to be installed are schematically shown; at present a dial-type pre-set scale is used for weighing all the constituents of the charge. This can be seen in Fig. 4, which shows a front view of the charger with the bucket about halfway up the incline. The British-made charger has its hoisting motor and gearing mounted on an easily accessible platform above the incline, whereas in the earlier models the drive was below the incline.

At its base the charger is mounted on a turntable at ground level and its head is wheel-located

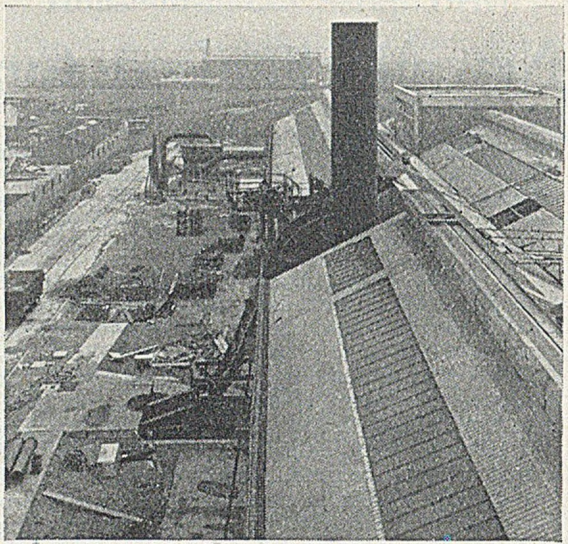


FIG. 3.—*Side View of the Swivel-hoist Mechanism taken looking over the Foundry Roof during Constructional Work.*

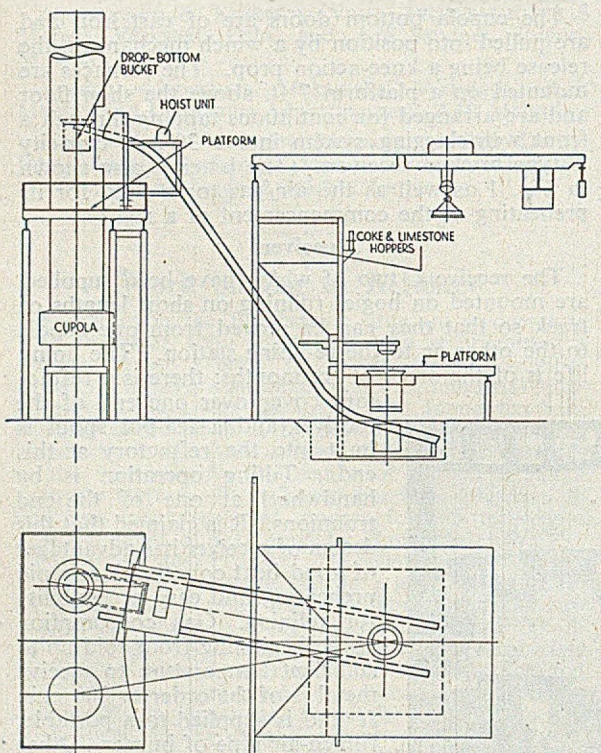


FIG. 2.—*Elevation and Plan of the Swivel-hoist Charging Mechanism fitted to the Cupolas at International Harvester, Limited. Although only two Furnaces are Served in this Installation, there is no reason why more Furnaces could not be Supplied, merely by Extending the Arc of Travel of the Hoist.*

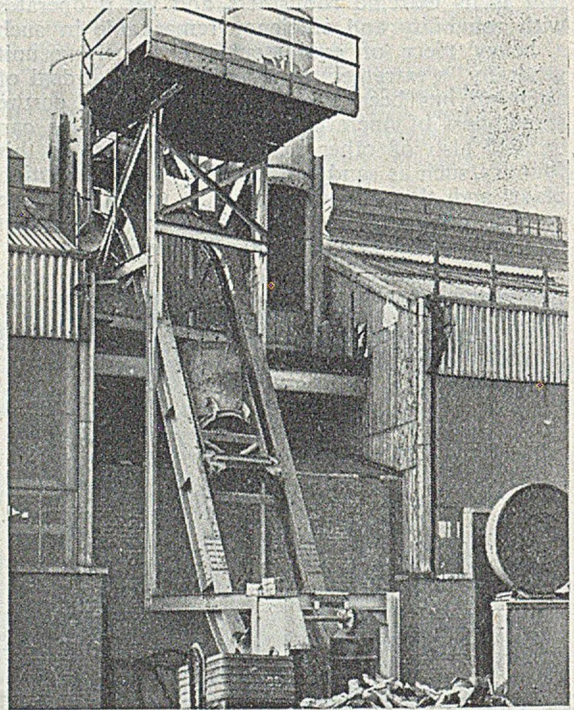


FIG. 4.—*Front View of the Swivel-hoist Charger arranged to serve the Left-hand Furnace. The Hoisting Mechanism is mounted on the Overhead Service Platform.*

on a small platform running in a short arc in front of and between the two cupolas. Fig. 5 shows the charge bucket entering the throat of the furnace at the top of its travel. In the foreground is the rack-and-pinion mechanism, which provides the means by which the hoist can be moved by hand from one cupola to another. When two cupolas are in operation simultaneously, the swivelling mechanism can be operated electrically, but it was noted that on this installation the hand operation was extremely simple.

The drop-bottom bucket is itself extremely robustly constructed. It runs on wheels up the double H-section inclined beams, hoisted by wire-rope from above as described, return being in similar fashion. The whole action is automatic and follows a set sequence, controlled from below:—(*a*) The starter button is depressed when the bucket is loaded with its complement of pig-iron, scrap, coke and limestone; (*b*) the bucket travels up the incline (Fig. 4); (*c*) it enters the charging door of the cupola (Fig. 5) and trips the hoist motor; (*d*) the release device on the bottom of the bucket strikes a buffer piece (Fig. 6) located in the cupola lining opposite the charging opening; this releases the bottom doors of the bucket and the charge falls cleanly into the furnace shaft; (*e*) the hoist motor re-starts in reverse after a timed interval and returns the bucket, with its bottom doors still open, towards the ground, and, finally (*f*) on reaching ground level, the bottom doors of the bucket are caught by a trip rail, closed, and automatically locked (Fig. 7)

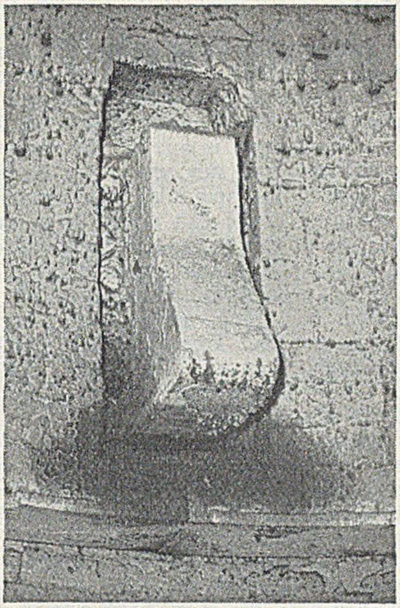


FIG. 6.—*Buffer Piece Inset in the Cupola Lining opposite the Charging Opening, which, on striking the Bucket's Mechanism, releases the Contents.*

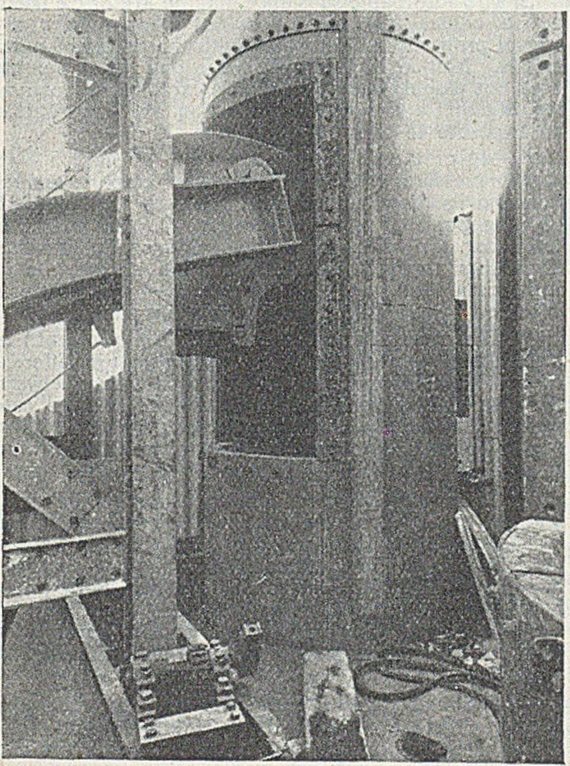


FIG. 5.—*Charge Bucket at the Top of the Incline about to enter the Furnace. In the Foreground is the Rack-and-pinion Device for Swivelling the Charger from one Cupola to Another.*

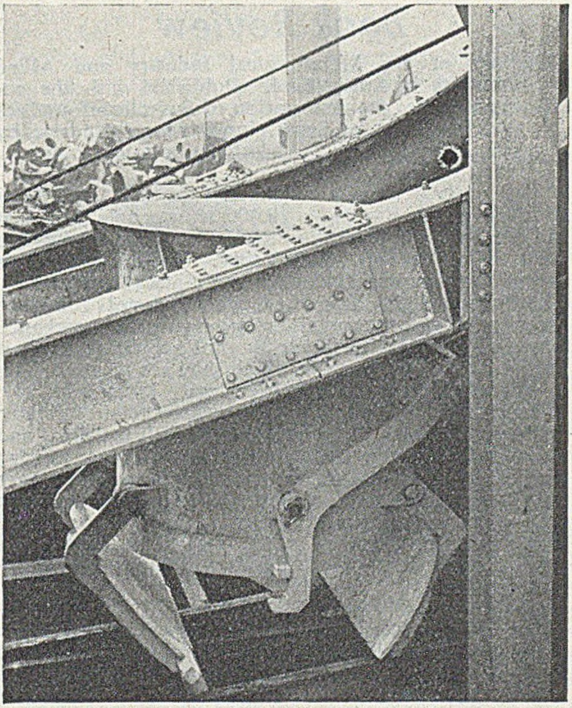


FIG. 7.—*Charge Bucket returning to Ground Level and Bottom Doors closing by Engagement with a Rail Trip Device.*

New Mechanised Cupola Charging System

as the bucket reaches its stationary position to receive another charge. The bucket capacity is up to 2 tons maximum, at present working on 10-cwt. metal charges conveyed at about 4-min. intervals.

The swivel-charger is one of the most complete mechanical charging devices so far designed. In brief, it does in one operation what the transfer car and a charging crane can do in three operations. With the use of this method in co-operation with a magnet crane, the labour required for charging is cut down to a minimum and two men, including the crane driver, can quite easily charge a cupola melting 10 tons per hr. This particular installation of swivel-charger uses a double-leaf drop-bottom bucket, but it is understood that a cone-bottom bucket can also be used.

The swivelling device obviates the criticism of "mixing" which is levelled at some fixed-type hoist-chargers, where the pig-iron, coke and scrap are jumbled-up during the final delivery into the cupola by way of a chute, capable of being diverted from one furnace to another. The drop-bottom bucket of the swivel charger delivers charges more or less as layered entities and operates with little or no maintenance.

The writer's thanks are due to Mr. E. Hunter, of Incandescent Heat Company, Limited, and to Mr. G. Gordon Davis, of International Harvester Company of Great Britain, Limited, both for permission to print this account and for facilities granted and illustrations freely prepared and supplied.

Book Review

Directory of the Metallurgical Industry and Allied Products in Switzerland. Published with the co-operation of the Association of Swiss Ironfoundries and the Union of Swiss Non-ferrous Foundries, by the Verlag für Wirlschaftsliteratur G.m.b.H., Zürich, 55.

The preface to this book tells us that the Swiss foundry industry employs 10,000 workpeople, and that in the employers' federation there are 70 concerns whose joint output exceeds 100,000 tons. There are 31 firms in the non-ferrous (including light-alloy) association. The book contains lists of the iron and steel founders, the non-ferrous, the metal dealers and scrap merchants. These are listed alphabetically; not according to their names but of the towns in which they are located. This is not satisfactory as foundries really located in, say, Zürich, may be listed in a small nearby town. Finally, however, there is an alphabetic list of all the firms and a reference to the earlier lists. In these a varying amount of information is given about each concern mostly but not always in German. It is fairly obvious that in the Swiss foundry industry, German (or should it be Sweitzer-Deutsch) is the major language used. British foundry equipment houses will find this directory most useful.

For the last four years secretary of Guest Keen Baldwins Iron & Steel Company, Limited, Cardiff, and its subsidiaries, Mr. H. W. A. Waring is relinquishing his post in order to take up an appointment as director of the power and steel division of the secretariat of the United Nations Economic Commission for Europe in Geneva. Mr. L. R. P. Pugh has been appointed to succeed him.

Theory of Globular Graphite Formation in Cast Iron

Mr. Ichiro Iitaka writing in the Bulletin of the Casting Research Laboratory, Waseda University, Tokyo, Japan, on globular graphite formation in cast iron has summarised his conclusions as follow:—

Considering the crystalline nature of graphite on the one hand, and the process of solidification of cast iron on the other side, the Author has put forward a hypothesis to explain the globular graphite formation. The experimental facts hitherto observed by many Authors will thus be explained by this hypothesis.

(1) The necessary quantity of Mg (0.06 per cent.) for globularisation is really very minute, yet this quantity corresponds to 2 per cent. of the carbon content (3 per cent.) in iron. However, 2 per cent. is not so small a value, and it is possible that this amount of Mg will bring about a significant influence upon the adsorption phenomenon and surface tension of graphite.

(2) Low percentages of S and P are desirable because they may reduce the adsorption.

(3) High-carbon iron is easily globularised because the time of contact of separated graphites with the liquid phase is longer, the higher the carbon content.

(4) The perfectly Mg-treated molten iron is reported to solidify into flake graphite iron if inoculated with graphite powder. (It of course solidifies into globular-graphite iron if ferro-silicon be used as an inoculant.) This fact is explained by previous adsorption of the adsorbable substance by the inoculating graphite powder.

(5) The adsorbable substance may be Mg or Ce itself, not its oxide. The oxide does not seem to have any special properties as compared with the oxides of other metals. Molten iron left for some time after treating does not globularise. This fact is explained by assuming Mg or Ce diminish by oxidation and vaporisation on exposure to air.

(6) Mg or Ce are in gaseous state (or have a high vapour pressure) at the temperatures of graphite separation and its growth, that is, at 1,100 to 1,200 deg. C. (Boiling point of Mg is 1,100 deg. C., that of Ce is 1,400 deg. C.) The solubility of Mg or Ce in metal diminishes abruptly on the separation of graphite or solidification of metal, and the evolved Mg or Ce is adsorbed by graphite mainly in gaseous state.

(7) The necessary amount of Mg (0.06 per cent.) in molten iron seems to remain nearly constant in different cases. There is no difference in this value between the case treated explosively by pure Mg and the case treated very quietly using 20 per cent. Mg alloy. Thus, Mg is considered to dissolve first in molten iron and to separate again on solidification.

(8) There are indeed an immense number of small graphite particles of the order 0.03 mm. distributed throughout the whole solid iron, and they all have a globular form. The globular form is not localised anywhere. Therefore, the cause of globularisation may not be of local or specific nature. The cause must be attributed to a phenomenon of general nature, for example, to a phenomenon accompanying the separation of graphite.

(9) Globular-graphite cast iron, when remelted and re-cast, turns back to ordinary flake-graphite iron. This is because Mg or Ce diminishes by oxidation and vaporisation in remelting.

(10) Recent personal experiments showed that elements of relatively low boiling points (high vapour pressures) such as Zn, Cd, Ca, have the similar globularising effect.

Institute of Vitreous Enamellers

Annual General Meeting in Birmingham

LAST month, the annual general meeting of the Institute of Vitreous Enamellers was held in Birmingham, with headquarters in the Grand Hotel. Committee meetings were held on the Wednesday evening, but the proceedings proper began with the formal business meeting on Thursday, October 2, with Dr. J. E. Hurst, the president, in the chair.

Chairman's Report

After the minutes of the previous general meeting had been approved, the ballot for three members of council was put in hand. Meanwhile, the chairman of council, Mr. S. Hallsworth, gave his report, in the course of which he referred, *inter alia*, to the satisfactory position of the membership, despite the increase in subscription rate. He expressed an official vote of thanks to Mr. W. Thomas, who had retired from the secretaryship after seven years in office and mentioned that the Spring conference of the Institute would be held in Southport, Lancs, and the next annual meeting in London. There had been progress in formulating research projects and, later on, Whittle Competition awards for the year would be announced. Mr. W. S. Grainger, he reported, has now endowed a senior competition award. A three-day summer school in vitreous enamelling was being organised for next year and members were reminded of a full-time course in enamelling which had been instituted at Stoke-on-Trent (leading to a diploma) and of a part-time course at Stourbridge. In closing, the chairman mentioned the work of the raw-materials committee and the imminent publication of a volume of proceedings for the years 1947 to 1950.

Next, the honorary treasurer, Mr. W. S. Grainger, presented his report on the financial position, and formally moved the adoption of the accounts which had previously been circulated. These disclosed income at £1,389, mainly from subscriptions, exceeding expenditure by a small margin, after allowing £180 for research and development. The report was duly adopted and a vote of thanks was accorded the honorary treasurer on a motion by Mr. S. Hallsworth.

The next item on the agenda was the appointment, which met with general approbation, of Dr. Harold Hartley (chairman, Radiation, Limited), as president-elect to follow Dr. Hurst's second term of office which is to expire in 1952.

The ballot for council members having been by this time completed, the result was announced as Mr. D. Baldwin, newly elected, and Mr. A. McLeod and Mr. W. Thomas, re-elected.

Whittle Awards

The Whittle Competition awards were then announced, the first place being accorded to Mr. F. G. Morriss, a 23-year-old junior executive, for an excellent Paper, "Scratch Resistance of White Cover-coat"; he received the gold medal and £10 prize. In addition, Mr. Eccleston received as a consolation prize, Prof. Andrews' book on enamels for a Paper entitled "From Pickle Plant to Inspection." An announcement at this stage concerned an exhibition of enamels and enamelling to be held at Wolverhampton Art Gallery from November 12 to 24, details of which will be circulated shortly. This concluded the formal meeting.

Film on Dust

The next item on the programme was the showing of the film on dust in steel foundries, with an introduction by MR. W. B. LAWRIE, of H.M. Factory Department, who briefly explained the application of the work of the various committees engaged generally on dust measurement and suppression in foundries. The single item in discussion was a remark by MR. G. CANNON, an American visitor, who considered this country was apparently lagging behind the United States in dust-control generally. He was amazed to find no protective hats or respirators being worn by operatives. A vote of thanks to Mr. Lawrie was proposed by Dr. Hurst and warmly supported.

Works Visit

The rest of the day's programme included a coach journey to Leamington Spa for luncheon, after which there was a visit to the enamelling shops of S. Flavel & Company, Limited in that town, where the visitors were much impressed by the modern methods, layout and plant.

Some 100 members participated in the visit, including Mr. S. Hallsworth, chairman of council; Dr. J. E. Hurst, president of the Institute; Mr. J. W. Gardom, Mr. C. P. Stone, and Mr. W. S. Grainger (hon. treasurer). Interest centred, naturally, round the porcelain enamelling department, and every facility was given for the party—which was split into small groups, each under a guide provided from the company's technical staff—to study the sequence of operations and the equipment in use.

In the cast-iron enamelling department two "Wheelabrator" airless blasting machines were in continuous operation, as was also continuous tunnel drying of sprayed cast components. On the sheet-iron side, pickling, continuous dipping and drying processes, and the automatic spraying of sheet-iron attracted considerable attention. There was one new-type Ferro "Junior" furnace in action for sheet-iron enamel fusing, and it was learned that a second unit is to be completed at the end of the year. Movement of work in progress, inspection of each individual part, and the disposal of finished ware proved also of much interest.

The party was afterwards entertained to tea in the works canteen, where the visitors were officially

Institute of Vitreous Enamellers

welcomed by the managing director, Mr. Duncan Wright. Identified also with the welcome were Mr. J. Allen, works director; Mr. F. M. Rogers, sales director; and Mr. W. E. Benton, technical director. Mr. S. Hallsworth, chairman of Council, replied on behalf of the guests.

Afterwards, in the evening, the party was augmented by the ladies' contingent at an informal dinner followed by dancing in the beautiful Chadwick Manor Hotel, Knowle, near Birmingham.

Technical Sessions

Friday, October 5, was given over mainly to technical sessions at the Grand Hotel, Birmingham. Two items, a Paper on "Colour" by Mr. W. BALL and a sub-committee report on scumming introduced by MR. H. LAITHWAITE* occupied the morning. A general discussion on "defects," and the proposed issue of an Atlas of Defects was held in the afternoon.

Annual Dinner

In the evening, the company, with ladies, reassembled at the Grand Hotel for the reception by the president, Dr. J. E. Hurst, J.P., and Mrs. Hurst, followed by dinner and dancing. After the Loyal Toast, Mr. S. Hallsworth proposed "The City of Birmingham," coupling with his remarks the deputy-mayor, Alderman A. Paddon Smith, J.P. The deputy-mayor suitably responded, causing much amusement when he referred to the unique experience of having Mr. Hallsworth, a Yorkshireman, congratulating Birmingham (Warwickshire) on its cricketing prowess.

The next Toast, that of the "Institute" was proposed by the chief guest of the evening the Rt. Hon. Lord Westwood of Gosforth, O.B.E., J.P., who mingled a fund of anecdote with an appreciation of enamellers and the enamelling art through the years up to its present-day excellence. In responding, Dr. Hurst explained the technical purposes of the Institute in detail to the guests. After naming some of the principal visitors, he included in his closing speech an appreciation of the work of co-operating bodies, the officers council of the Institute and his Lordship. The evening was carried to a successful termination with dancing.

TECHNICAL COMMITTEE WORK

On the Saturday, a somewhat depleted audience heard a general discussion of the work of the technical committees and sub-committees of the Institute, under the chairmanship of Mr. J. W. Gardom, who felt that not as many members as desired were working for the Institute through the sub-committees. He asked that any member of the Institute who felt that a particular man could usefully serve on a technical committee should communicate with headquarters. Many sub-committees were being formed, and he was trying to ensure that the chairman of each sub-committee should be a member of the Technical Committee.

The first sub-committee was that concerned with enamel standards, and had been running for quite a long time. Next was the sub-committee on the scumming of enamels, which had presented an interim report on the previous day. Then there was the "Atlas of Defects" sub-committee, under the chairmanship of Mr. A. Biddulph, who, with Mr. Gray and Mr. Williams, had been collecting examples of defects and photographing them. The publication of such an atlas would be most important, though it might be costly to ensure a really good job.

Work on Cast Iron

The sub-committee on quality of cast iron for vitreous enamelling was started at the Harrogate meeting in 1950. As had been indicated by the chairman of that sub-committee, Dr. Hurst, it was intended to send a questionnaire to a number of firms with a view to obtaining a reliable record of their scrap and of the defects they experienced. Mr. Stone in particular had offered some information he had collected some time ago on defects in cast iron, so that possibly there would be a chance to study the kinds of defects experienced then and now.

A new sub-committee, of which Mr. J. H. Gray was chairman and convener, had also been inaugurated to investigate suspension agents used in vitreous enamelling. Mr. Gray had been asked to put forward the names of people with experience and qualifications which would make them suitable members for that sub-committee. Mr. Gardom concluded by saying that several members of the technical committee were serving on various committees of the British Standards Institution.

Discussion

A member asked if it were permissible for the sub-committees to co-opt helpers from outside the Institute; for instance, the sub-committee dealing with suspension agents might desire the help of an extra chemist. The chairman agreed it was a ruling that members of the sub-committees had not necessarily to be members of the Institute, and in fact specialists from outside had been appointed to sub-committees. Mr. Stone added that Mr. Gray was endeavouring to co-opt to his sub-committee a representative of I.C.I. who had had a lot of experience of suspension agents.

With regard to the questionnaire on cast iron, Mr. Stone expressed the hope that the sub-committee would make it clear to the Companies they invited to give information that they should indicate the sizes of the castings having cracks or other defects, and the extent of those cracks.

A discussion then took place regarding the comparative enamelling properties of floor-moulded and machine-moulded cast-iron components. It was pointed out by Mr. Stone that the approach must be through mechanical moulding, for most foundries were mechanised today. A member asked if it was agreed that a casting made on a mechanised plant was far more porous than one made on the floor.

* See page 503 of this issue.

Mr. J. A. Clarke took a hand in the discussion on that point, pointing out that, in his recollection, the feeling at the Institute's meeting in 1950 was that a casting made on a mechanical plant was not up to the standard of the floor-moulded casting; and he believed that was fairly generally conceded. He appreciated that cast-iron enamel finishes had become increasingly difficult because pastel colours and the like had become the order of the day, as opposed to the older mottling, and that standards of inspection had become higher than they were formerly. He asked if it was reasonable ultimately to expect to receive machine-made castings the equal of those made on the floor.

The use of the word "ultimately" brought a further comment from the chairman, who said that in a mechanised plant uniformity was more likely. He doubted very much if there was any mechanised plant in this country or America producing castings more cheaply than by hand methods. The output per man was greater in the mechanised plant, but, in view of the enormous cost of the plant, economy was difficult to achieve. Any variation in casting quality may have been due solely to the metallurgist reducing the total-carbon content of the metal for the purpose of increasing strength. There was now, however, a swing-back to the use of higher-carbon content, which was the reason why many foundries were interested in the hot-blast cupola, for thereby the total-carbon content could be raised.

Mechanised Founding

Reviewing the functions of the mechanised plant, he said that from the same pattern we were probably obtaining per hour as many moulds as we should in a day or even a week on the floor. Therefore, there was not a lot of variation in the moulding practice. On the other hand, when making (say) a thousand cookers in the old-fashioned way per week, there would probably be 10 patterns in use, and there was less uniformity as between castings than when using mechanised plant. Whereas formerly sands were used once per week or once per day, in a mechanised plant the sands were used once every hour or two hours. These and other factors, such as sand grain-size and knock-out time, might be variables where extra control was required. He did not accept that all those factors were making differences in quality, but he did feel that, as suggested by Dr. Hurst, statistics must be collected on such matters.

Design of Cast Components

It was asked whether a sub-committee could be appointed to deal with the design of cast-iron components for vitreous enamelling, and to make recommendations and say what to avoid. Mr. Todd commented that good design for vitreous enamelling meant a balanced design. In the case of a cooker, he did not want a design having a panel on one side 4 in. wide and on the other side 1 in. wide; a balanced design meant one with plenty of radii, the avoidance of heavy lugs, and so on. The chairman recalled a Paper presented by Mr. McNair dealing with this question, and Mr. Grainger said the Vitreous Enamellers' Association had issued a booklet covering points of design generally, but it was suggested that some designers seemed not to be following the recommendations. The chairman, however, pointed out that the purpose of the product must be the first consideration. Further comment led Mr. Grainger to state that, bearing in mind functional requirements, it was still possible to maintain a good design. It must be agreed, he added, that enormous advance had been made in design during the last five or six years. As an example he mentioned the all-night-burning firegrates, some of which were beautifully designed, with even thickness all the way round, beautifully flowing curves, rounded corners, and so on.

Moulding Sand

Mr. Grainger, adding a comment on the sand problem, said it was very difficult to emulate mechanically a hand-treated pile of sand. The chairman said, apart from the question of cost, it was not difficult to mix the sand mechanically to the same conditions as by hand mixing, but the snag was that where sand was re-used every hour, it demanded such intensive handling and milling that the total cost of plant for milling about 15 tons of sand per hour was anything up to £10,000. Efforts were being made to find a way of doing it more cheaply and information was required as to whether it was worth while.

Surface Grinding

Mr. Grainger recalled having seen some nicely-designed and enamelled castings produced in a foundry abroad, and they were beautifully sound. On going round to the works, he had found to his amazement that every casting was surface ground, the castings being so designed that they could be put on a surface grinder. To secure that perfection must have cost as much as did the whole of the enamelling processes. Before visiting the foundry abroad he had been concerned about some gas-heater frames with curved sides which, however well they were sandblasted, were always too rough to be enamelled satisfactorily. Since his visit, the two surfaces had been ground, with the result they now enamelled very well.

Mr. Parkes confirmed Mr. Grainger's statement concerning Continental practice and also mentioned a foundry he had visited in France during the Spring, and where a mechanised plant was recently installed. Despite a lot of trouble in mechanising the sand plant, the executives of the foundry would not change the nature of the sand used. They had stated that their reputation had been built up on that particular naturally-bonded sand and the same percentage addition.

Enamel Standards

Mr. Grainger, speaking as chairman of the Enamel Standards sub-committee, said that some work was being done by Mr. Pedder and Mr. Gray. An attempt had been made to improve the criterion of acceptance for the alkali- and acid-resistance test, such as was established in B.S.S. 1344. He had hoped to make a definite report and recommenda-

Institute of Vitreous Enamellers

tion to the meeting, but unfortunately his information was not complete. However, he believed progress had been made as to specifications for acceptance or rejection in respect of acid attack but with resistance to alkali attack he had encountered much difference of opinion.

Surface Hardness.—The sub-committee had also tried to find a good method of assessing surface hardness, and a Paper was being presented by a junior member on some experiments he had made in relation to the surface hardness of white cover coats. Much work had been done; only that week he had distributed to his sub-committee a report showing the calculations and measurements made in connection with diamond scratching, using a particular type of diamond, specially ground for that purpose, and carried in a new type of carrier. Whilst the work had shown that it was possible to differentiate between surface hardness and scratch hardness in one laboratory with the one instrument, the difficulty was to get a series of instruments to give the same results. It was desirable to find some method of indicating resistance to scratching, to replace the Mohr Scale value, which was very unsatisfactory. A reliable instrument was wanted which could be used universally, but so far the sub-committee had not been successful in developing such a tool despite much research.

Considerable discussion on scratch testing followed at this point, covering such subjects as lubricating constituents in the enamel, etching prior to testing and the nature of diamond scratches on enamel as compared with glass. The surprising phenomenon was disclosed that a diamond scratch on enamel widened on standing. Another avenue investigated had been resistance of enamels to standard rubbing operations with several abrasives, but conditions were such as to preclude the development of a standard test, and enamels proved good in service gave indifferent response to the rubbing test. There was said to be less need for rejection of components deficient in scratch hardness, now that acid-resisting enamels had been developed so extensively.

Atmospheric Attack

Mr. Grainger said that another matter to which the sub-committee had given thought was to a method of testing advertising signs and the like, which were exhibited in the open. Americans had spent many thousands of dollars on investigating resistance to atmospheric attack, but results were inconclusive. They had had ideas such as warming up the specimen and quenching it with ultra-violet light on it, but a short method of testing the daily atmospheric effect on a plate which would last 40 years in a normal atmosphere could not be devised. On the other hand, there was a wide difference in service life and colour fastness of signs in different atmospheric conditions and he thought acid-resisting enamels might be specified.

Further comments were made on the scumming of enamels; the possible relationship between under-firing or over-firing and scumming; the reduction of scumming by using distilled water or condensed steam with enamels and experiences of the users of electric furnaces were among the points raised.

The session ended with a hearty vote of thanks to Mr. Gardom for having presided.

Heat-resistance of Cast Iron and Influence of Alloys

An extensive series of experiments has been undertaken by a committee of the *Verein Deutscher Giessereifachleute* (German Foundrymen's Association), to examine the influence of phosphorus on the heat-resisting properties of grey cast irons, including silicon, chromium/silicon and aluminium/silicon irons. The influence of silicon, aluminium, and total carbon on the combined carbon content, hardness, fluidity and heat-resisting properties has been worked out, and the results confirmed by 1,000-hr. heating tests in an ordinary atmosphere.

An alloy cast iron which proved to be particularly heat-resistant contained C, 1.85; Si, 6.0; Mn, 0.6; P, 0.6; S, less than 0.025; Al, 4.0; and Ti, about 0.2 per cent., and patents for this alloy have been applied for in Germany and elsewhere. If castings made from this alloy prove to be structurally suitable for the particular applications required of a heat-resisting alloy, then many practical applications may shortly be expected.

The committee of V.D.G. regard this investigation chiefly as a contribution to the practical knowledge of the application of the hitherto little-known aluminium/silicon irons. These alloys have proved themselves satisfactory in part of the temperature range in which up till now it has been necessary to use chromium alloys. The substitution of chromium-alloy castings by aluminium/silicon cast irons would mean a saving in alloying elements which are difficult to obtain.

Odds and Ends

Foundrymen will have noted with interest the urgent recommendation of Mr. S. W. Platt, president of the National Association of Non-ferrous Scrap Metal Merchants, that a national drive be launched to draw out the "odds and ends" which the metal industries have piled up over the years. Speaking at the Association's meeting in Birmingham, Mr. Platt said that in most foundries and engineering works, there were rejected castings, discarded oddments in zinc, aluminium, brass and lead, lying around in shop corners, departmental nooks and crannies, which, cumulatively, could make a substantial bulk of reclaimed non-ferrous metal. The present price of such scrap was an attractive incentive.

THE DEATH is announced of MR. E. W. WALKER, who joined the firm of Gibbons Bros., Limited, in 1907. In the 1914-18 war he went overseas with a Worcestershire Territorial battalion serving on the Western Front, later receiving a commission. On returning to the company in 1919, he joined the accounts staff, becoming chief accountant, a position which in 1943 he combined with the office of assistant secretary. In the second world war he commanded the Gibbons contingent of the Home Guard, holding the rank of Major. On the retirement of Mr. H. V. Stanton in April, 1946, Mr. Walker was appointed secretary of Gibbons (Dudley), Limited, and Gibbons Bros., Limited. In April, 1948, he was elected to the board of directors and continued to hold the combined office of director and secretary of the two companies until his recent death.

Scumming of Enamels

Some considerations of the Institute of Vitreous Enamellers Sub-committee, appointed to enquire into scumming. Originally, it was hoped to present the body of what follows as an interim report emanating from the sub-committee as a whole. In the proceedings at the Annual General Meeting, however, it soon became apparent that there was considerable disagreement among the committee and the findings enumerated need further substantiation. The work described should therefore be considered in relation to Mr. Laithwaite's introduction and general discussion which took place at the meeting and shortly to be printed. The sub-committee will deliberate further before issuing its Report; using the whole of the proceedings as a basis.

Members of the I.V.E. Sub-committee:
H. Laithwaite (Radiation Limited)
W. E. Benton (Flavel & Co. Limited)
J. A. Clarke (Stocal Enamels Limited)
A. W. Murdoch (Ferro Enamels Limited)
S. E. A. Ryder (Stoves Limited)

The Technical Committee of the Institute of Vitreous Enamellers last year set up a sub-committee under the chairmanship of Mr. H. Laithwaite with the following terms of reference:—"To investigate scumming of enamels," and the personnel appointed were as listed above. This sub-committee has now considered a substantial volume of experimental evidence, and decided to make an interim statement in the hope that the information contained therein would prove of practical value to the industry generally. Further work is already in hand or pending, but the additional investigations are likely to be somewhat prolonged, and it will be some little time before a report can be compiled.

Description of Defect

Scumming, as herein described, refers to an enamel surface which acquires a "bloom" or white surface deposit on standing in a damp atmosphere. The surface readily marks with the fingers or anything moist, and the marks cannot be removed. The effect may vary in intensity and speed of development; it is particularly noticeable with black enamels and is more prevalent on cast iron than on sheet iron.

In general, the enamel surface shows little or no loss of gloss on removal from the fusing furnace, but cases have been reported where the surface gloss was considerably impaired. This latter effect is very noticeable with some types of non-acid-resisting enamels.

Note:
The sub-committee wish to emphasise that other types of defect causing loss of surface gloss, *e.g.*, de-vitrification, clay flotation, etc., have been specifically excluded, as not coming within the definition given above. The characteristic feature of "scumming" is the development and intensification of the surface deposit on standing.

Cause of Defect

Scumming only appears when the surface of the fused enamel contains an excessive concentration of sulphur in the form of anhydrous sulphates. On standing in a damp atmosphere, the sulphates become hydrated, with an increase in the size of the nuclei due to crystal growth and thus a characteristic deposit appears on the surface. It has been established that this deposit usually contains sodium and/or calcium sulphate but may contain other constituents. Further work on this aspect of the subject is in hand.

Sources of Sulphate.—The sulphate appearing in the fused enamel coating can arise from all or any of three different sources:—(*a*) Sulphates present in the enamel slurry; (*b*) absorption of SO_2/SO_3 during drying (dryer or shop atmosphere) and (*c*) absorption of SO_2/SO_3 during fusing. (furnace atmosphere.) The relative significance of these factors, in practice, will depend on local conditions.

(a) Sulphates in Enamel Slurry

Potential sources of sulphate are frit, mill additions and water. It can be readily shown that salts in solution in the slurry liquor tend to concentrate

TABLE I.—*Enamel Composition ACG4 and Sulphate Contents.*

Raw material.	Batch weights for 100 pts. frit.	Per cent. SO_4 in raw material.	Per cent. SO_4 contributed to frit.
Borax (dehyd.)	13.7	0.23	0.032
Quartz	49.7	0.03	0.015
Soda ash	21.5	—	—
Sodium nitrate	10.0	0.17	0.017
Limespar	5.4	0.44	0.024
Titania	10.9	0.04	0.004
Fluorspar	4.6	—	—
Cobalt oxide	0.3	—	—
Manganese dioxide	1.5	0.04	0.001
Potassium dichromate	1.0	—	—
Total SO_4 content contributed by raw materials =			0.093 per cent.

Frit analyses.	Per cent. SO_4.
Source "A" oil-fired rotary furnace	0.53
Source "B" (i) oil-fired rotary furnace	0.32
Source "B" (ii) oil-fired rotary furnace	0.21
Experimental pot melt, gas-fired	0.32

Scumming of Enamels

at the surface of the biscuit layer as drying proceeds. Removal of a thin surface layer prior to fusing eliminates scumming due to sulphates in the liquor. In an attempt to obtain some quantitative data, a detailed investigation has been carried out with an acid-resisting black enamel for cast iron, and the results are presented in what follows.

Sulphate in the frit.—Table I gives the composition of enamel ACG4, together with the sulphate contents of each batch material as determined analytically.

The calculated SO_4 content of the frit is much less than that determined by chemical analysis, indicating a substantial absorption of sulphur oxide gases from the smelter atmosphere. The smelters in question operate on oil fuel with a sulphur content of approximately 2 per cent.

Changes in composition of the frit which reduce the solubility on milling, have the effect of decreasing scumming. It has been found that frits with low B_2O_3 contents have pronounced scumming tendencies. It is not yet certain whether this is due to the resultant high proportion of alkali in the slurry liquor facilitating the absorption of SO_2 and SO_3 during fusing and drying, or whether the frit itself has a reduced capacity for dissolving sulphate than one of higher B_2O_3 content. The sub-committee are hopeful that more precise information on the relationship between scumming tendencies and frit composition will be made available later, as a result of the further experimental work in hand.

Frit ACG4 smelted at two different works has been milled with distilled water only (in the proportion normally used in the slurry) and the sulphate contents of the resulting liquors are given in Table II.

TABLE II.—*Sulphate Contents of Mill Liquors.*

	SO_4 content of liquor, gm. per litre.
Works "A" (i)	0.133 (scumming)
(ii)	0.103 (no scumming)
Works "B"	0.080 (no scumming)

Sulphate in mill additions.—Following a similar principle as used for the frit, the sulphate contributions to the mill liquor of the clay and colouring oxide have been evaluated (Table III).

TABLE III.—*Sulphate Contributed by Mill Additions.*

Mill addition.	SO_4 contributed to mill liquor gm. per litre.
Clay "C"	0.153
Clay "D"	0.089
Black oxide "E"	0.118
Black oxide "F"	0.135
Water—source "A"	0.055
Water—source "B"	0.027

Combining the figures given in Tables II and III a calculated SO_4 content of the slurry can be obtained and this has been compared with an experimental determination of the sulphate content. Results obtained are given below:—

Total Sulphate Content of Slurry in gm. per litre.

Works "A"	Calculated	0.489
	Measured	0.539
Works "B"	Calculated	0.364
	Measured	0.391

This means that scumming should be less likely to occur at works "B," due to the lower sulphate content of the slurry, and this has been confirmed in practice. Slurry at works "B" can be used without scumming even after the addition of potash alum as setting agent, bringing the total sulphate content to about 3 gm. per litre. Such an addition at works "A" causes severe scumming, the critical figure being about 0.5 gm. per litre.

A possible explanation can be found in the calcium content of the water supply, which is low at works "B" but high at works "A." The water hardness at the two works is:—

		gm. per litre.
Works "A"	13 degrees temporary $CaCO_3$	0.186
	6 „ permanent $CaSO_4$	0.117
Works "B"	Nil temporary	
	3 „ permanent $CaSO_4$	0.058

For a slightly-soluble salt such as calcium sulphate, the solubility depends on the molecular concentrations of other sulphate and calcium ions present, the relationship being given by:—

$$[Ca] \times [SO_4] = K[CaSO_4] = 6.1 \times 10^{-5}$$

If it is assumed that only $CaSO_4$ in solution can cause scumming then an increase in calcium ions present will mean less sulphate and (*vice versa*) a solution saturated with $CaSO_4$ will thus cause maximum scumming. Calculating the molecular concentration of calcium and sulphate ions from the above hardness figures gives for works "A":—$Ca = 0.108$ gm. per litre; $SO_4 = 0.083$ gm. per litre, and for works "B":—$Ca = 0.017$ gm. per litre; $SO_4 = 0.041$ gm. per litre. Then, at works "A" where scumming just does not occur:—

$$Ca/40 \times 0.5/96 = 6.1 \times 10^{-5}$$

While, at works "B," adding together the sulphate contributed by potash alum, frit, clay, black colouring oxide and water:—

$$Ca/40 \times (3.14 + 0.04 + 0.066 + 0.155 + 0.118)/96 = 6.1 \times 10^{-5}$$

Hence, works "B" will not have scumming if the calcium concentration of its water is less than that at works "A" in the ratio 0.5/3.51, *i.e.*, 0.14. Actually it is seen to be 0.017/0.103 = 0.16, which is in reasonable agreement.

(b) Absorption of SO_2/SO_3 during Drying

Previously published work[1] had indicated that absorption of sulphur gases could occur during drying of the enamel prior to fusing, and might cause scumming. It is not possible at present to lay down operating limits, but in one case where some trouble was being experienced it was found

(*Continued on page 506*)

Apprentices and the Institute

Mr. C. Lashly's Presidential Address

AT THE FIRST meeting of the session of the Newcastle-upon-Tyne branch of the Institute of British Foundrymen, held on September 8, in the Neville Hall, Westgate Road, Mr. C. Lashly, M.C., gave his presidential address.

The theme of the address was the education of the apprentice in the industry and the part played by the Institute. To illustrate how the welfare of the junior members of the craft had been the concern of the branch members in the past, Mr. Lashly reviewed the history of the Newcastle branch since its formation in 1912. From the first meeting on February 3, 1912, the minutes of which were read, the emphasis was laid on an interchange of views and information on technical and practical founding. Then, as now, Papers were read by Authors, both local and farther afield, works were visited, the first being those of Smith & Sons, of South Shields.

Extracts from the minutes of various meetings through the history of the branch where some item of particular interest to apprentices was recorded, were next read, among which were the following:—

At a meeting on May 18, 1912, the formation of a branch library was suggested, but the difficulties anticipated in working it must have been too great, for this subject was discussed once more only. Since then, due to the generous assistance of Mr. Tottle, late of King's College, a branch library had been established, but its operation had presented problems. Mention of King's College brought Mr. Lashly to the minutes for October 26, 1912, when the first foundrymen's class was established at Armstrong College—now King's—after much preliminary work. Thus 39 years ago there began an association between the college and the branch which had endured to a greater or lesser degree—depending upon the times—ever since. The branch now had a strong link with the College in Prof. Preece, head of the Department of Metallurgy, who was an active member of the branch council.

On March 25, 1916, Mr. Mayer, then president of the Institute, visited the branch, and in his address suggested that the memory of John Surtees, a native of Newcastle-upon-Tyne, be perpetuated because his original work and research in dry-sand moulding had been of such importance to ironfounders. Later, Mr. Lashly gave details of the John Surtees Memorial Examination and informed members that it was his intention to foster its revival and to ensure its continuance in the future. Several other instances where the education of apprentices was of primary consideration included the first mention of the use of a film for educational purposes in 1912 (this happened to be a film of the works of the North Eastern Marine Company), the formation of a junior branch proposed in December, 1922, and the first meeting held a month later, and the introduction to the branch of coloured slides during a lecture in 1923 given by Mr. Colin Gresty, now president of the Institute.

Nurturing the Curiosity of Youth

Through the years, apprentices were well catered for in the branch and Institute activities, as should be so, for they were the managers and employers of the future. The branch had always encouraged apprentices and before the war a series of foundry classes were held in the city. Two members of the branch had served on an advisory committee and all students attending the classes were encouraged to enter for the John Surtees Examination. Mr. Lashly continued his address by saying:—The revival of foundry classes might present difficulties, but there was none which could not be surmounted. Perhaps the greatest was to persuade youths not merely to attend classes, but, in the first place, to enter the industry. The days when founding was regarded as an occupation to be shunned were past and it was certain that improvements had been made in all foundries in recent years.

There were, he knew, a number of foundries where there was a good system of recruitment and in which no effort was spared in education for the job by means of organised classes and proper supervision. To his mind, however, the process of education should be continuous. It should never flag. This applied to all, not only to apprentices, but the apprentices were the shock troops of the future. He also felt that on the North-East Coast the training of apprentices to real craftsmanship was of greater importance than in any other areas, for there was little mechanisation there compared with most areas. A number of foundries were essentially of a jobbing nature and he commended attention to the preamble of a Paper by Mr. D. Redfern, which appeared in the FOUNDRY TRADE JOURNAL of August 9.* The normal youth was filled with curiosity, and "wanted to know." After all, nothing was done without a reason, and it should be a first principle in the training to say why "this" or "that" was necessary.

It was in that field that every craftsman, every technician, and everyone with higher scientific attainments within the industry could, and should, give full encouragement. Why was a certain box selected for a job? Why were grades of sand mixed? What should be the density of ramming? Why was venting necessary? The lad should be told and he would in due course tell others. He thought the right attitude was that displayed throughout the branch and the Institute, which he summed up in Kipling's words:—

> It ain't the guns nor armaments, or the funds that you can pay;

* "Castings for the Corliss Steam Engine," p. 157.

Apprentices and the Institute

It's the close co-operation what makes 'em win the day.
It ain't the individual, nor the army as a whole;
It's the everlastin' team work—of every blooming soul.

A discussion on the training and education of apprentices then ensued, and, in conclusion, Mr. E. B. Ellis proposed a vote of thanks to Mr. Lashly for his Address. This was seconded by Prof. A. Preece, M.SC., F.I.M., and carried with enthusiasm.

Scumming of Enamels

(*Continued from page* 504)

that the concentration of SO_2 in the immediate vicinity of an open gas-fired dryer was 620 × 10^{-7} gm. per litre (0.002 per cent. by volume) compared with 2.9 × 10^{-7} gm. per litre for the general shop atmosphere. It is hoped to obtain further experimental data on this subject, but meanwhile the sub-committee feel that this may often be an unsuspected source of trouble where products of combustion come into contact with the enamel biscuit during drying.

(c) Absorption of SO_2/SO_3 during Fusing

It is probable that most cases of scumming arise from contamination of the furnace atmosphere by sulphur-containing gases in the products of combustion. Mond gas with a sulphur content of approximately 150 grains per 100 cub. ft. gives more trouble than town-gas, oil- or solid-fuel firing. Trials have been made in similar coal-fired furnaces in two works using identical samples of milled enamel and with processing conditions as far as possible the same in both cases. In one works, the coal being used had a sulphur content of 2.6 per cent. and pronounced scumming occurred; in the other, the coal contained 0.8 per cent. sulphur and no scumming was experienced.

There is some evidence to suggest that SO_2 is most active in causing scumming in the presence of high concentrations of water vapour. Experiments with ACG4 frit (not slurry) heated in a laboratory furnace in an atmosphere of dry SO_2 have failed to produce scumming, although the same experiment with normal enamel slurry gives the defect, probably due to the water vapour liberated from the clay on fusing. It is significant that scumming troubles are most frequently encountered in winter when atmospheric humidity is high. It is often beneficial to vent the fusing furnace in cases where the fuel in use has a high sulphur content.

REFERENCE

[1] Ryder, S. E. A., and Culshaw, G. W. I.V.E., 15th Annual Conference, October, 1949, printed in the FOUNDRY TRADE JOURNAL, November 3, 1949.

MR. A. E. WHITEHEAD has been appointed works manager of the pneumatic division of the Carrier Engineering Company, Limited, London. He was formerly technical manager of S. Dodd & Sons, Limited, textile machinists and ironfounders, of Oldham (Lancs).

Institute of Vitreous Enamellers

Midland Section

Two social functions have been organised for this session by the Midland section of the Institute of Vitreous Enamellers; they are:—

A men-only dinner, to be held at the Imperial Hotel, Birmingham, on January 25, 1952. Tickets, price 17s. 6d. each, may now be obtained from the hon. secretary, Mr. D. Sleath, c/o Borax Consolidated, Limited, 87, Edmund Street, Birmingham (remittances payable to Mr. Sleath).

A dinner-dance for members and guests and their ladies on March 14, 1952, at the Star and Garter Royal Hotel, Wolverhampton. It is hoped that this second function, which is by way of being an innovation in the branch activities, will be supported by members who find it less convenient to join social activities in Birmingham. Tickets are available from the secretary at 17s. 6d. each, and attendance is limited to 120, so that early application is desirable.

Southern Section

At the first meeting of the 1951/52 session of the Southern section of the Institute of Vitreous Enamellers held last week at the Norfolk Hotel, London, W.C.2., Mr. R. Robinson of Crane Limited, showed a film and gave a commentary entitled "Methods of Obtaining Major Production from Limited Floor Space" to an audience of about 50 members. This illustrated the methods adopted in the enamelling shop of Crane, Limited, Ipswich. Particular prominence was given to two-, three- or even four-tier loading of the firing furnaces so as to secure maximum output. The chromium cast-iron bars and cradle supports used for building-up the tiers were said to give adequate service "life." Another feature was an arrangement of compressed-air nozzles operated by the charger along the furnace door for blowing dust off the ware as it was traversed into the furnace. Full details of production, fuel consumption and labour requirements were quoted for the sequence of operations followed. Methods of spraying were outlined and considerable interest was focused in the discussion which followed on the method of coating, annealing and firing the centrifugally-cast iron chimneys used on various models of stoves. Although there was some criticism from the audience of tier loading and alternative methods, including hanging, were put forward, it seemed certain that, so long as the weight of perrits and stools was kept to a minimum, a definite increase in terms of output of ware per hour could be secured by Mr. Robinson's methods.

In proposing a formal vote of thanks at the conclusion of the meeting, Mr. S. Hallsworth, chairman of Council of the Institute, praised the workmanship which had gone into the making of the film and the enthusiasm with which Mr. Robinson had organised his shop and placed his findings at the disposal of other members. He felt sure all members had gained useful ideas and this impression was supported by the warmth of the final applause.

MR. T. CAVEN IRVING, from 1937 until recently the representative in Spain and Portugal of the Metropolitan-Vickers Electrical Export Company, Limited, has died suddenly following a serious operation. He received his technical education at Edinburgh University, and joined the company as a college apprentice in 1925.

Thermal Considerations in Foundrywork*

Discussion of Dr. V. Paschkis' Paper

This discussion is divided into three sections: (1) a report of oral discussions at the Conference proper and interim replies by Mr. J. F. B. Jackson on behalf of the American Author; (2) written comments from various members of the Institute, some of which were read at the meeting, and (3) Dr. Paschkis' own written replies to the whole of the contributions grouped according to subject. In general, the comments, as would be expected from practical foundrymen, mainly concerned applications of the Analogue Computer to everyday problems. So many limiting factors seemed to arise, that it was difficult to distinguish any clear-cut spheres of application. Nevertheless, several workers were of the opinion that given a knowledge of sufficient factors, some as yet imperfectly understood, there were avenues of research where the Computer could be helpful.

IN THE ABSENCE of Dr. Paschkis, the Paper "Thermal Considerations in Foundrywork" was introduced by Mr. J. F. B. Jackson, director of research, British Steel Founders' Association, with Mr. Colin Gresty, president of the Institute, in the chair.

After presenting the Paper, anticipating a general question "how are the findings with the Analyser to be translated into practical foundrywork?" MR. JACKSON said that he knew Dr. Paschkis had been faced with it many times already. It was only reasonable, he thought, that most foundrymen should at first sight regard the electrical analyser as being somewhat remote from the making of castings in the foundry. Dr. Paschkis had, however, pointed out that if by the use of his Analyser he could ultimately distinguish between those thermal factors which matter to the foundryman and those which do not, he would have achieved something of practical importance. Personally, he felt that Dr. Paschkis's work could go further than that, and that it might well be able to establish quantitatively the influence of the various factors which were significant as far as casting theory and casting practice were concerned. Mr. Jackson had referred to this at greater length when introducing the Paper.

On the other hand, Mr. Jackson felt it should be remembered that the work being done by Dr. Paschkis could only go so far and no further, and that it would necessarily remain with the foundrymen to see that the results of the pioneer work in this field were put into use. No doubt the foundry research organisations had a duty to fulfil in helping in the translation of such results into actual foundry practice.

Exceptions to the Rules

MR. F. HUDSON said he would like to comment on some of the assumptions in the Paper, particularly when those assumptions were based on what might be called tradition. Looking at the Paper, and particularly that section of it dealing with the influence of moisture in the sand on conductivity, he had been most interested in the statement made that:—"When casting in moist sand, the moisture is driven towards the cold surface. This occurs by evaporating the moisture in layers from near the hot surfaces; the steam thus formed flows through the pores and condenses as soon as it reaches portions of the sand which are at temperatures below the boiling point of water." Did this actually happen when casting a mould or was it based on an assumption of what was thought to happen?

Actually, in practice, if the moulding sand was a little too damp, not permeable enough, or rammed too hard, then conditions could easily arise which upset the theory that moisture was driven towards the cold surface. In fact the reverse applied, and as the molten metal flowed over the surface of a green-sand mould, in many instances it might be that moisture, in the form of steam or gas, took the path of least resistance and came through the molten metal. This might occur until such time as the pressure head of molten metal within the mould was sufficient to force the steam away from the metal surface and through the sand mould.

This preliminary reaction could not of course be seen and was over by the time pouring was completed, so to the observer the casting appeared normal in every way. In such cases, however, it was obvious that the steam or gas passing through the shallow layer of molten metal must tend to cool the molten metal, and it might be that this cooling effect was actually greater than that exerted by the moist sand of the mould surface.

MR. JACKSON thought Mr. Hudson had put his finger on a major issue in relation to the electrical analyser. While he thought that Dr. Paschkis had a very useful tool for investigating foundry problems, at the same time, obviously, care would have to be taken when using the method to ensure that what was deduced lined up with other experimental work and that in every case there should be consideration of established metallurgical and foundry knowledge of the sort to which Mr. Hudson had referred. In fact the Computer could quickly get out of hand if it were not kept on the rails at all times by reference to other research work. That much Dr. Paschkis had said himself in pointing out that the heat-transfer expert had many parts to play and that he must work alongside the metallurgist and the foundryman. At the same time, he thought Mr. Hudson had emphasised the particular point very graphically.

MR. G. M. MICHIE thought the heat-transfer

* American Exchange Paper presented to the Newcastle-upon-Tyne Conference of the Institute of British Foundrymen and printed in the JOURNAL, June 21 and 28, 1951.

expert was very dependent on the metallurgist to provide him with the right data to feed into the Computer. As he understood the matter, the Computer could deal with a large number of problems, but would only give the right solution if the data fed into the machine was correct. The heat-transfer expert could not do that himself, he had to rely on the metallurgist to provide the right information.

MR. JACKSON thought Mr. Michie was emphasising the beginning or the tackling of the problem rather than the interpretation of the results obtained. He thought Mr. Hudson was going further in assuming the information given was correct and drawing attention to the fact that it was more in the interpretation of the results that the danger lay.

Separation of Casting and Mould Face

DR. A. B. EVEREST said one point mentioned had struck him as significant. There had been a reference to the separation of the metal from the face of a chill during cooling, *e.g.*, in chilled-roll manufacture, and he thought Dr. Paschkis mentioned that it was not known at what point the separation took place or its influence on the cooling rate. It seemed to him that the study of the conduction of heat from the body of a chilled-roll during cooling after casting was one of the most vital problems to which the sort of analysis developed by Dr. Paschkis could be applied. Here, however, one was beset at once by practical considerations, and it was a very real problem to control cooling on account of the separation of the body of the roll from the chill. He thought it was the practice of some foundries to pour molten lead between the roll and the chills in order to maintain metallic continuity and therefore direct heat-flow between roll and chill. It would be interesting to have the views of Dr. Paschkis on this problem.

MR. JACKSON said he did not know whether Dr. Paschkis could answer the question or not, but reading between the lines, he thought he would be able to introduce an analogy to the method of getting over the resistance to heat-flow by pouring in molten lead, by suitable adjustment to the Computer circuit.

DR. EVEREST added that he had not seen lead added, but he imagined it was common practice.

Hot-mould Casting

THE CHAIRMAN (Mr. Colin Gresty) said that, as one who had had considerable experience with the hot-mould process (to which Mr. Longden also referred in writing), he would like to make one or two comments. He was afraid that they had never considered heat-flow on such scientific lines as Dr. Paschkis had suggested but, from the practical angle, certain things occurred of which advantage was taken. There was no doubt that the process depended on the considerable effect of delayed heat conduction.

Going back some 25 years to some early experiences with the process, he could remember one experience in particular. Prior to using hot moulds, it had been their custom when casting large Diesel cylinders to release the bar holding down the main centre core after a certain interval—he thought it was 15 min.—after the completion of pouring. In the case of the first one cast by the hot-mould process, the same procedure was followed and the core just jumped up. It had not been appreciated that the metal would still be sufficiently liquid for the core to float up. They found out later that it was not safe to release the bar for something like three-quarters of an hour to one hour. Ultimately, as a matter of fact, it was found that no advantage at all was gained by releasing the bar and the practice had been discontinued.

In concluding the oral part of the discussion at the Conference, the Chairman asked for a vote of thanks to Dr. Paschkis for his Paper, and to Mr. Jackson for the able way in which he had presented it and dealt with the points which had been raised. This was accorded with acclamation.

WRITTEN COMMENTS

Relations with Foundrywork

DR. W. T. PELL-WALPOLE wrote:—

The Author stated in his introduction that progress in foundrywork necessitated a critical review of the present situation and claimed that his Paper gave such a review of one aspect of the field—that of heat flow and heat transfer. He also stated that he was not a foundryman but a heat transfer man examining foundry problems. It was necessary to have these statements clearly in mind when attempting to assess the Paper's merits. Thus the concluding sentence of the introduction would be more generally acceptable to foundrymen if the word "complement" were used instead of "replace." Only a non-foundryman would think it conceivable that the skill and craft of the foundryman could ever be completely replaced by science.

The section on Fundamentals of Heat Transfer was treated in a very elementary manner with the analogy of the flow of liquids; it assumed no prior knowledge of the subject whatsoever. The conception of boundary conductance was not made very clear, however.

Under the heading of "Practical Consequences of Heat-transfer Theory," the Author next explained in simple language the importance of the parabolic law of heat-transfer, and gave some practical examples of its application in foundry practice.

The next section was a brief but clear survey of heat flow problems in design of castings, in melting practice and in mould- and core-baking. In treating the last, the difference in the mechanism of heat extraction by di-electric and by conventional methods of drying respectively were illustrated briefly and clearly.

A more detailed consideration of heat-flow problems in castings occupied the next section. The methods available for study were stated as (1) direct experimental observations on castings or model castings (2) mathematical methods and (3) the electrical analogy method, which was the Author's special field.

For a critical review of the subject, methods (1) and (2) appear to be dismissed too lightly, the former on the grounds of practical difficulties in the control of variables, and the latter as involving too many unwarranted assumptions. In fact, however, a good case could be made out for the practical usefulness of a combination of methods (1) and (2), as shown by the excellent work of Ruddle and his colleagues in this country. The remainder of the Paper was concerned solely with the principles, advantages and achievements of the electrical analogy method of studying heat flow in castings. The general principles of the method were explained simply but clearly, while further details of the method were given in an appendix. The general idea of this method was that heat flow was mathematicaly analogous to the flow of electricity; while foundry problems were too complex to permit of direct mathematical solutions of the heat equations involved, it was possible to set up the equivalent conditions in an electrical circuit, to measure the electrical quantities in relation to time, and thus to obtain by the analogy the results of the equivalent thermal problem. In the analogy, temperatures = potential, rate of heat flow = current, thermal capacitance (volumetric specific heat × volume) = electrical capacitance: thermal resistivity (the reciprocal of thermal conductivity) = electrical resistivity. The main advantages of the method are claimed to be:—

(1) The possibility of using a time-scale so that processes occupying unduly long or very short times could be re-scaled to a more convenient time for testing.

(2) The many variables of the casting process could be studied completely independently and limiting conditions of such variables which could be obtained in practice could be studied for determining limiting trends.

(3) Temperatures and rates of heat flow could be measured at any desired position in the casting, without the difficulties encountered in practical measurement.

Some Limitations

The main limitations of the method were not mentioned. These were (1) since the method depends on measurements of electrical quantities, it could only be applied to check investigations made by direct experiment; (2) the curves obtained could only be interpreted satisfactorily in the light of metallurgical knowledge of the process concerned. These limitations were the main reason for the complexities and apparent contradictions which occurred in the final section of the Paper. This section aimed at giving a review of the achievements of the electrical analogue method as published in various papers, many of which were given to the American Foundrymen's Society. It was a pity that the papers concerned were summarised chronologically for some of the early ones led to completely erroneous conclusions due to incorrect metallurgical interpretation of the data obtained by the electrical method. Thus the first investigation reported was to check Clarke's work on solidification rates of steel castings, which was carried out by the bleeding technique. The electrical method gave perfect agreement with Clarke's results, provided it was accepted that the end of solidification coincided with the liquidus! This astounding conclusion was accepted, and later, on the basis of this conception, Chvorinov's work on the relationship of solidification time to volume/area ratio was disputed, the electrical analysis giving different results. The fundamental error involved in this work, and realised later, was referred to by the Author in a later section, but not until complete chaos might have been created in the mind of the reader who was not very sure of his ground. The trouble was an example of the limitations mentioned above. The results of the analyses were quite accurate, as was established later by direct experiment. The error lay in assuming that the "bleeding" technique could give an accurate indication of the extent to which *complete* solidification had proceeded in an ingot of an alloy having a freezing range. The thickness of the solid shell of a bled ingot indicated the limit to which the growth of solid crystals had proceeded. In a single-melting-point alloy, this gave a true indication of the freezing point, but in an alloy having a freezing-range, the liquid in the pasty zone of the solidifying ingot was retained between the interstices of the solid crystals, and only the free liquid, *i.e.*, the liquid which was still above the liquidus temperature, was ejected. Consequently with such an alloy the limiting thickness of the shell after a bleeding experiment, could not indicate the position to which the solidus isotherm had progressed at the time of bleeding, but it would give rather an approximate guide to the position of the liquidus isotherm at that time. This was exactly what was indicated by the analogous electrical set-up.

When this limitation of the bleeding method was realised, it was easy to see why the electrical method (with the correct assumption that solidification was completed at the solidus) gave poor agreement with the results of bleeding tests on white iron (a long-freezing-range alloy) but excellent agreement with bleeding tests on pure aluminium (constant freezing point).

Re-checking of some of Chvorinov's work on later tests on the electrical analyser, this time with the correct assumption that solidification was completed at the solidus, not at the liquidus, showed that the relationship

$$T = S^2$$

(where T = time of solidification, S_1 the shape factor = $\frac{\text{volume}}{\text{surface area}}$ held for comparative tests on spheres and slabs for high pouring temperatures, but was less satisfactory for low pouring temperatures.

Other Findings Summarised

The remainder of the work reviewed by the Author includes the effects of "sand conductivity," moisture content, pouring temperature, the air gap, and the thermal properties of the metal being cast. Some very useful and apparently satisfactory conclusions were reached from these sections of the work. These might be summarised, *e.g.*:—

(1) Sand conductivity had a most pronounced effect on solidification time, particularly when value of K is less than 0.65. Further, the value of K (apparent conductivity) for all sands increased rapidly with temperature due to the intersticial radiation effect.

(2) During solidification in green-sand moulds, moisture was driven from the hotter to the colder

zones, carrying heat away with it, and thus increasing the apparent conductivity of the sand. This effect occurred within a short time after casting; hence it was concluded that moisture content would have a marked effect on the solidification of the surface skin of the casting, but little effect on solidification of the interior.

(3) Pouring temperature was found to have a very marked effect on solidification times. Variations in the thermal properties of the steel had less effect.

(4) The time to reach the air-gap had a pronounced effect in chill-casting, much less in sand casting.

The section dealing with the above variables might cause some confusion owing to lack of clarity in respect of one point, *viz.*, the Author talked of various factors such as " latent heat of fusion " and " time to form the air gap," having a more pronounced effect on the time to reach the liquidus, than on the time to reach the solidus. Such statements appeared meaningless or impossible unless it was realised that solidification was taking place progressively from the wall inwards, so that the cooling rate of the liquid in the interior of the casting could be affected by the latent heat of fusion of that part of the casting which had already solidified, and by the air gap which formed between the outer solid crust of the casting and the mould wall.

The Author claimed good agreement by the electrical method with the freezing of steel spheres as studied by Briggs and Gezelius.

In conclusion, it might be stated that the electrical method appeared to be a most useful tool if used in conjunction with reliable direct experimental work and if the results were interpreted carefully in the light of established foundry and metallurgical knowledge.

Orderly Appreciation

Mr. T. Land wrote that the Exchange Paper by Dr. Paschkis was a summary of several years' work and in making a review of the Paper the first task must be to see how this programme of work, which the Author was here reporting, fitted into the overall picture of the application of scientific principles to foundry practice.

The first stage in developing an applied science was usually the development of methods of measurement. This stage was now well advanced in the foundry and methods of measuring the physical properties of foundry sands and the temperature of liquid metals had been established and were widely used. The second stage was the application of the methods of measurement to reproduce with ease and confidence a practice which had, by trial and error, been found to give satisfactory results and to a large extent this was becoming a normal procedure. A third and much more difficult stage now presented itself. The attempt must be made to develop a theory of casting so that castings could be designed which would be certain to give good results when cast in a given metal at a specified temperature in moulds of prescribed design and material. The programme of work which Dr. Paschkis had reported did not attempt to do more than lay the foundations for the superstructure of a theory of casting and it must be judged on this basis.

Correct Choice of Approach

There was no doubt that Dr. Paschkis and his colleagues had been right in selecting heat flow as the most important factor in the process of casting and a proper understanding of the mechanisms of heat transfer was the main requirement in the development of casting theory. Again it must be agreed that it was most difficult to express the flow of heat in simple mathematical terms when one had to deal with physical properties varying with temperature, latent heats, air gaps and other complexities. Even for simple shapes the complexities soon became unmanageable by the established analytical methods.

The use of some physical aid to computation was clearly essential, and Dr. Paschkis had chosen the electrical analogue of the flow of electricity through high resistances between condensers of large capacity. This involved two kinds of difficulty. First it was not quite so simple as might be imagined to provide a system of this kind which would operate without trouble. It was necessary to use equipment of the highest quality and to take elaborate precautions to maintain extremely good insulation throughout the system. A slight deterioration in the insulation of a single component could ruin the operation of the whole equipment. It must be assumed that Dr. Paschkis had overcome all such difficulties, but it would be interesting to know whether trouble of this kind proved of serious consequence.

The second difficulty was that it was essential to simplify the problem by " lumping." This means that the real problem in which temperature and physical properties vary continuously from point to point was replaced by a closely similar system in which all values were constant over each of a number of discreet volumes or areas. This could lead to errors and uncertainties which are not always easy to define or estimate, but the writer was aware that the Author had given particular attention to this problem.

Alternative Means

The electrical analogue computer was not the only possible physical aid to mathematical theory and it would be interesting to know whether Dr. Paschkis would now consider it to be the most suitable. The new electronic calculating machines could be applied to this problem or there were other analogues, such as fluid flow, which might prove more convenient to use. A computer based on air flow was recently described by M. B. Coyle (British Journal of Applied Physics, Jan. 1951). If work on these lines were to be developed, in this country, careful consideration of the best method would be needed and Dr. Paschkis' views would be most useful.

Dr. Paschkis had wisely confined himself to the consideration of simple shapes and had determined which physical properties were of greater or less importance under particular conditions. This kind of work was essential in the present early stages of development. The clarification of the effect of moisture on thermal conductivity and the establishment of a clearer understanding of the effect of an air gap were examples of the kind of preliminary work which was of the utmost value. Likewise, the elucidation of the significance of the liquidus and solidus in solidification was of basic importance and the writer would have liked to have the final opinion of the Author on this subject a little more clearly defined if this were possible at the present time.

Necessity for Confirmation

It was clear that Dr. Paschkis was well aware of the need for experimental confirmation of each important deduction from the theory and the satisfactory agreement obtained seemed to indicate that the mathematical technique was on sound lines.

There were a few points of detail in the Paper which might be worth mentioning. In the fifth paragraph on page 3 of the Preprint, the analogy involving pouring metal from a spoon inside a ladle of metal seemed more confusing than helpful. On page 2, the paragraph beginning "Chvorinov in his Fig. 19 . . ." was quite unintelligible without the figure to refer to. If reference was to be made to this picture perhaps it might be included in the present Paper. On page 4, at the end of the fifth paragraph "six to nine times" should surely be "three to nine times."

Two final queries were that on page 6 it was stated in paragraph 10 that "for reasons not known, heat flow and the flow of electricity . . . follow the same mathematical laws." This seemed the height of caution or modesty. He thought he knew the reasons, but perhaps this led one into deep waters. On the other hand it seemed a little reckless on page 7 to assume that a slab 6 in. by 12 in. by 12 in. would exhibit no end effects.

Ruling Metallurgical Considerations

MR. B. GRAY, B.A. (English Steel Corporation) wrote that he congratulated Dr. Paschkis on his excellent Paper and on the ingenious tool he had invented which could not fail to be of immense assistance in the study of many foundry problems. It could be of assistance even in the problems of the freezing of steel but it was too much to expect that it would ever predict results from thermal considerations only, because the metallurgical mechanism of freezing in steel castings above say 3 in. section had a preponderating effect on the result.

This Paper and all other theoretical work on thermal distribution in a cooling steel casting appeared to assume tacitly that a solid wall was always formed up to the point where the calculations indicated that the liquidus had been reached. In practice this was never true in large castings after the early stages of freezing except in some degree on a top surface. Although the metallurgical implications were not clearly understood and would take too long to discuss this practical fact remained. It had been demonstrated in a number of samples drained in special ways of which Figs. A and B from a paper* contributed by the writer to the Iron and Steel Institute in 1944 could be cited as examples.

The bottom box of the mould of this casting (Fig. A) was slipped-off and the end of the casting burnt-off 10½ min. after pouring. Judging by thermocouples in a similar casting, freezing would have been complete half way up the casting after

* *Iron and Steel Institute Journal*, 1944, Vol. 150, No. 11.

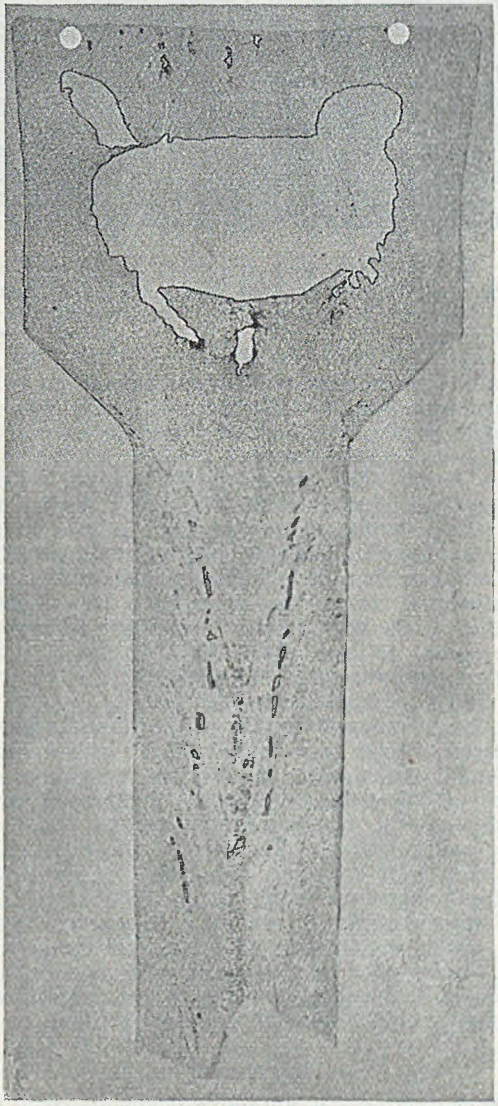


FIG. A.—*Sulphur Point off a Steel Casting drained after 10 min., with Cavities Outlined in Ink. Sample cast Vertically with a Bottom Runner and Top Head.*

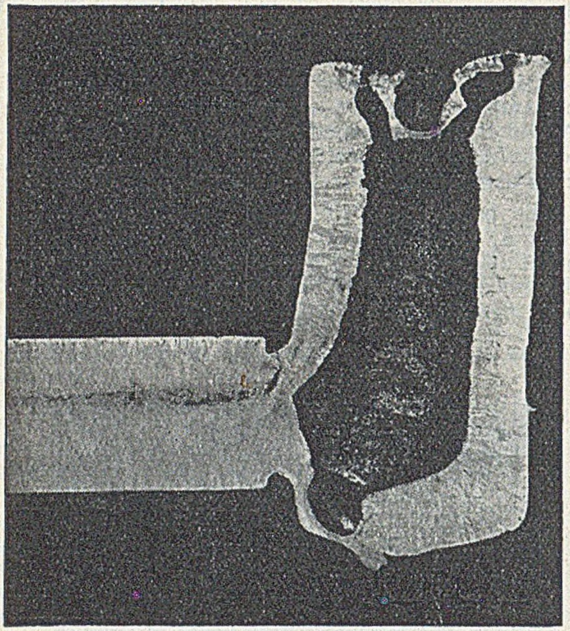


FIG. B.—*Second Example of a Steel Casting Drained after an Interval. Sample cast Horizontally with a Whirl-gate Head at One End, drained after 8½ min.*

about 14 min. so that the liquidus-phase must have been nearly complete. The hole was soon plugged by solids in the liquid and only a small amount of liquid metal came out as could be seen by the level in the head. The metallurgical structure of the section shown indicated that the undisturbed solid wall was not more than ½ in. thick in places and nowhere was as much as 1 in. thick. Within this was a layer that had been distorted and could, therefore, be taken to have been only lightly attached to the wall. Actual separation seemed to have existed or taken place along the line of small cavities, the nearest to the surface of which was less than 1 in. from the mould face.

In the other example, Fig. B, the liquidus-phase appeared to have been completed and only a small amount of liquid came out leaving the cavities on the centre-line rather more extensive than was usual for this casting, of which a large number had been made and examined. The upper half was a solid wall-growth of columnar dendrites, but there was no doubt that there would be liquid between them in passages too fine to permit its escape on draining. Later experiments had shown that the bottom half, which appeared to be solid, was not so in fact but could be distorted or removed to a considerable depth by more violent methods of draining.

Inferences

The samples given showed why the statement in the Paper that bleeding tests were not valid was correct. Some of the solid came out and some of the liquid remained. Equally, thermal calculation could only hope to indicate the presence of solids and not real wall-growth. Even that forecast might be inaccurate owing to the variation in carbon and other elements in different parts of the casting which could fail to affect the freezing range.* For instance, in the casting 4 in. sq., shown in Fig. B, the upper half was always richer in non-ferrous elements than the bottom half and in larger castings the differences could be much greater.

A further difficulty with the analysis of heat-flow was that, for one of the plates cast on the flat, the theory would possibly give uniform results near the truth, but the plate itself would be unsound. If the same plate was cast in a vertical plane, much of the lower part would be solid and would freeze much earlier than the unsound upper half. The reason for this difference was, almost certainly, the action of convection currents in transferring heat from the bottom to the top. This, of course, was a heat effect and it was possible that Dr. Paschkis could throw some light on that subject. Even if he only proved that convection currents were produced by the cooling effect of the mould-wall on the outer layers of the liquid, it would be a great contribution to the study of the freezing of steel castings.

There was no doubt that great use could be made of this Analyser technique in the foundry, but it could do nothing but harm if the practical foundryman was led to believe that by itself it could solve problems outside its range.

Some Apparent Anomalies

MR. R. W. RUDDLE wrote:—

The first three pages of the Paper were devoted to an elementary explanation of heat flow in relation to foundry operations and called for little comment. Note the printer's error in the spelling of "reverberatory" on page 3 of the pre-print.

At the bottom of page 3 and on page 4 the Author compared the various methods available for the study of heat flow in castings. The writer could not altogether share the Author's view of the temperature-measurement method which, at any rate for research purposes, was more useful than he seemed to imply. It was interesting, however, that he stated later that the temperature measurement method had been used to check the accuracy of the electric analyser.

The discussion of "time scales" at the bottom of page 4 of the Pre-print was a little vague and badly worded.

The description on pages 5 and 6 of the results obtained with the analysis was quite straightforward. The conclusion reached (top of p. 6) as to the importance of pouring time and temperature was most important and should be emphasised.

The Author's comments (p. 6) on Chvorinov's Rule did not seem to be valid, for the Author based all his arguments on the analyser curves for the liquidus instead of the solidus, as appeared correct.

* "The Mechanism of Freezing of Horizontal Steel Castings." A report of the Melting and Metallurgical Committee of the British Iron and Steel Research Association, *Iron and Steel Institute Journal*, August, 1949.

Chvorinov's Rule was certainly intended to refer to the solidus. In any case, the analyser experiments were confined to small castings in which corner effects and other factors likely to lead to departures from the law would be relatively large. If a larger range of casting sizes were considered, Chvorinov's Rule would certainly give better agreement with practice. Chvorinov himself made experimental investigations on castings up to 50 tons weight.

One page 7 the Author rejected the "bleeding test" as unsatisfactory, although his previous arguments about Chvorinov's Rule were based on a comparison with the results of this test. The Author reconsidered Chvorinov's Rule, this time correctly taking the solidus to be the criterion of complete solidification, but again the discussion was confined, so far as the analyser was concerned, to relatively small castings—it should be noted that the Author ignored edge effects in his slabs.

On the whole, the Paper was a useful summary of the work carried out with the electric analyser. More might have been said with advantage about the potentialities of the instrument for the solution of the practical problems which were of everyday occurrence in foundries.

Suggested Revisions

MR. T. F. RUSSELL wrote, as regards the Paper as a whole, that Dr. Paschkis had tried to present what was really a difficult subject in such a way that it would be of interest to the foundryman. The first three pages of the Paper were elementary, and the real interest was "the Application of the Analogue Computer to Thermal Problems in the Foundry." The writer would suggest that the title of the Paper should be altered in some way, so as to be more specific and less general than the one which it now bore.

To what extent the Paper would appeal to foundrymen was doubtful. It would be poor satisfaction to them to be told that if a core of given size and shape required two hours to dry, then another core with all dimensions increased threefold would require between 6 and 18 hours.

Unfortunately, Dr. Paschkis was neither a foundryman nor a metallurgist; otherwise he could have narrowed this time range considerably, and he could, it was thought, have given better explanations of the apparent discrepancies between some of his own results and those of other workers.

The chief value of the Paper was to let the British foundryman know what was being done with the electrical analogue computer at Columbia University to help the American foundrymen in solving their thermal problems.

Significant Omissions

MR. H. J. YOUNG wrote:—

This Paper had much of interest and enlightenment to persons intimately familiar with daily phenomena in an iron foundry, but on the other hand, it neglected to deal with some of the least understood of those phenomena.

The conductivity of sand was a case in point. When cupola-melted iron containing, say, with 0.50 per cent. silicon was poured into an ordinary green- or dry-sand mould the result was a casting of white or mottled iron, no matter whether the section of the casting was one-eighth of an inch or five inches. Let the mould, however, be pre-heated throughout to a temperature of 750 deg. F. (400 deg. C.) and it would be found that the result was a casting of grey pearlitic iron containing flake graphite, no matter whether the section of the casting was one-eighth or five inches. In view of Dr. Paschkis's statement that "the conductivity of all sands increases markedly with temperature," what thermal considerations, in his opinion, explained the above phenomenon.

A further point concerning sand-conductivity arose when one investigated the temperature of the sand across the section of the mould of a heavy casting, one side of the mould being against the moulding box and the other against the molten metal. It had been proved that there was very little conduction for some considerable lapse of time after the mould has been filled. For instance, the thermocouple positioned ½ in. from the mould face did not indicate any rise in temperature during the first ½ hr. He (Mr. Young) had always contended that this proved that gases did not pass through a sand-mould save at joints and at prick-holes, but Dr. Paschkis's Paper gave rise to yet other ideas.

An important thermal consideration, which no one appeared to take into account, was when a cupola was tapped and the molten iron ran down a "spout," of any length up to about 15 ft., then dropped through the air into a ladle, a distance of anything up to, say, 18 ft. The length of the spout and that of the drop were ruled largely by fate plus the design of the foundry and the size of ladle being filled. A little information upon the heat-losses possible during these processes might well be valuable to a number of iron-foundries.

Density in the Liquid State

Finally Mr. Young put to the Author a proposition which had intrigued him for many years. Water at less than 4 deg. C. or so of its freezing point was lighter in weight than at 4 deg. Suppose one erected an iced-water system on the same lines as those of the hot-water system in an ordinary dwelling house. There would be a refrigerator and refrigerating tubes where now there was a kitchen fire and boiler. Also, in a fully lagged system, cold iced water would ascend to the storage tank and warmer water would descend to the refrigerator tubes. The point he wanted to make was whether it has been proved that no molten metal or alloy got lower in density as it approached its freezing point. Mr. Young had been familiar all his life with the pouring of heavy castings in bronze, brass and cast iron, and very many times had reason to think that the behaviour of the still-molten metal within the mould, or even in the ladle, was influenced by some such factor as that affecting water.

(To be continued)

New Catalogues

Steel Castings. The British Steelfounders' Association, of Broomgrove Lodge, Broomgrove Road, Sheffield, 10, have just issued a leaflet illustrating and very shortly describing the really complex castings to be used in various engineering applications. The one shown on the front is an excellent example of an extremely difficult job—a cutter casting for the textile industry.

Rails and Accessories. A catalogue received from Thos. W. Ward, Limited, of Albion Works, Sheffield, is a brilliant example of how to make the best of what at least some people would deem a dull subject. By using on the cover a picture of what must surely be the world's largest siding, the attention of the reader is immediately held. The reviewer never realised how many permutations there were in the branching out and crossing over of rails. No fewer than 17 are illustrated and duly annotated. The actual rails are simple—there are but two types, but of innumerable weights. Next there are very clear line drawings of crossing chairs, check chairs, heal chairs, side chairs and special chairs requiring 25 pictures for their illustration. Finally, all sorts of bits and pieces are dealt with. By the use of very clear diagrams associated with the choice of appropriate type, an essentially useful catalogue has been endowed with a maximum of reader interest. Copies may be obtained on writing to Albion Works.

Phosphor Bronze Castings, etc. The "etc." used in this caption is essential, as the catalogue under review received from Williams Alexandra Foundry, Limited, East Moors Road, Cardiff, includes many pieces of plant for tinplate and sheet industries, white-metal bearings, gravity die-castings in light alloy and brass and other lines of manufacture. Its object is obviously to acquaint industry with the lines of goods and their special manufacture by the issuing house. The lay-out of some of the pages is capable of improvement, as, for instance, the remarkable casting shown in the upper half of page 6 is certainly worth a full-page "splash" instead of looking like a half-page advertisement in a trade magazine. The reviewer believes that with such good material available, a more exciting publication could have been got together, for there are other castings illustrated which are really intricate and merit the full approbation of the foundry industry. It may be obtained on writing to Alexandra Foundry.

Bronze Castings. The David Brown Group of Companies whose office is located at Meltham, near Huddersfield, have achieved an enviable reputation for the high standard of the publicity matter they issue. This high standard, however, has never been shown to better advantage than by the issue of "Taurus" Bronze Castings. The cover, carried out in gold and black, shows a wild bull and is particularly arresting. Yet perhaps the outstanding feature of this 84-page brochure is the inclusion of a dozen coloured macrographs and photo-micrographs of various bronze alloys cast under different conditions. Apart from these, the other illustrations are all excellent and emphasise the measure of control imposed by the David Brown Foundries Company on their products. Wisely there has been included at the end of the book a couple of conversion tables—one of which gives the changing of lb. per sq. in. into tons per sq. in., which is extremely useful. Very unfortunately, because of its high cost, this brochure is not available to our readers except those entering into the category of "important users of bronze castings." Such people should write to Meltham, and they can count themselves fortunate should their request be granted.

Increases of Capital

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

CONEYGRE FOUNDRY, LIMITED, Tipton (Staffs), increased by £50,000, in £1 shares, beyond the registered capital of £100,000.

E. & E. KAYE, LIMITED, copper manufacturers, etc., of Ponders End (Middx), increased by £100,000, in £1 ordinary shares, beyond the registered capital of £200,000.

SANBRA, LIMITED, manufacturers of hot brass pressings, etc., of Birmingham, increased by £25,000, in 1s. ordinary shares, beyond the registered capital of £175,000.

JOHN ALLAN & COMPANY (GLENPARK), LIMITED, metal refiners, etc., of Glasgow, increased by £482,000, in £1 ordinary shares, beyond the registered capital of £18,000.

S. H. HEYWOOD & COMPANY, LIMITED, mechanical, electrical, hydraulic, and general engineers, etc., of Manchester, increased by £32,000, in 10s. shares, beyond the registered capital of £34,000.

ROBERT JENKINS & COMPANY, LIMITED, electrical and mechanical engineers, etc., of Rotherham (Yorks), increased by £130,000, in £1 ordinary shares, beyond the registered capital of £120,000.

DUCTILE STEELS, LIMITED, Short Heath, near Wolverhampton, increased by £375,000, in 50,000 6 per cent. cumulative preference shares of £1, and 1,300,000 ordinary shares of 5s. each, beyond the registered capital of £125,000.

COX & DANKS, LIMITED, iron and steel merchants, of London, N.W.10, increased by £400,000, in £1 ordinary shares, beyond the registered capital of £100,000. At September 12, 1950, Metal Industries, Limited, held practically all the issued shares.

LAYCOCK ENGINEERING COMPANY, garage equipment manufacturers, etc., of Sheffield, increased by £380,000, in £1 ordinary shares, beyond the registered capital of £20,000. At February 7, 1951, Birfield Industries, Limited, held 19,997 shares of £1 out of 20,000 issued.

YORKSHIRE ROLLING MILLS, LIMITED, Bradford (Yorks), increased by £45,000, in £1 ordinary shares, beyond the registered capital of £45,000. At July 14, 1950, Low Moor Alloy Steel Works, Limited, Guest, Keen & Nettlefolds, Limited, and Clifford Motor Components, Limited, each held 15,000 shares.

NASH-KELVINATOR, LIMITED (formerly Kelvinator, Limited), refrigeration engineers, etc., of Crewe (Ches), increased by £500,000, in £1 ordinary shares, beyond the registered capital of £500,000. At May 24, 1951, the Nash-Kelvinator Corporation of Michigan, U.S.A., held practically all the issued shares.

J. & J. DYSON, LIMITED, firebrick manufacturers, etc., of Sheffield, increased by £76,000 and £200,000, in 76,000 ordinary and 200,000 redeemable cumulative preference shares of £1 each, beyond the registered capital of £25,000 and £101,000, respectively. The £1 ordinary shares have been sub-divided into 5s. ordinary shares.

J. A. PRESTWICH INDUSTRIES, LIMITED, manufacturers of stationary engines, etc., of London, N.17, increased by £799,900, in 399,950 5½ per cent. redeemable cumulative preference shares of £1 each and 1,599,800 ordinary shares of 5s. each, beyond the registered capital of £100. The existing ordinary £1 shares have been sub-divided into 5s. ordinary shares. The company was made "public" on June 18, 1951.

Board Changes

CRAVEN BROS. (MANCHESTER), LIMITED—Mr. W. D. Moore has retired from the board.

VICKERS - ARMSTRONGS, LIMITED — Major General C. A. L. Dunphie has been appointed a director.

PARKINSON STOVE COMPANY, LIMITED—Dr. A. Rees Jones, technical manager, has been elected a director.

STANCROFT, LIMITED—Mrs. D. E. Croft has been appointed chairman and managing director in succession to the late Mr. Stanley Croft.

HENRY MEADOWS, LIMITED—Mr. E. J. Batchelor has been appointed managing director. He has previously been a director and general manager.

LAPOINTE MACHINE TOOL COMPANY, LIMITED—Mr. E. P. Edwards has been elected a director and Mr. T. P. C. King, managing director, has retired from the board.

WIDNES FOUNDRY & ENGINEERING COMPANY, LIMITED—Mr. Ralph Credland, assistant managing director for the last four years, has been appointed joint managing director.

Institute Elects New Members

At a meeting of the Council held at the Royal Station Hotel, York, on October 20, the following were elected to the various grades of membership of the Institute of British Foundrymen:—

FIRST LIST

As Subscribing-firm Members

Parson & Colls, Limited, Gateshead, 8, foundry and engineering supplies (representative: T. H. Grief); Rhodesian Castings, Limited, P.O. Box 490, Gwelo, Southern Rhodesia, iron and brass foundry, and lead works.

As Members

Shafiq Ahmad, melter (superintendent, melting department), Pakistan Mint, Lahore, Pakistan; G. J. P. Benson, senior instructor in metal founding, Melbourne Technical College, Victoria, Australia; H. Birkhead,* foundry foreman, Summersgill, Bradford, Yorks; Jas. Breslauer,* works manager, Loewenthal Metals, Johannesburg, South Africa; J. W. C. Butler, secretary, Ironfounding Employers' Federation & Council of Ironfoundry Associations, London; E. Dicker, engineers' patternmaker, E. Dicker, London, S.E.3; K. W. Findlay, managing director, Caloric Corporation (Pty.), Limited, Johannesburg, S.A.; T. H. Grief, director, Parson & Colls, Limited, Gateshead; W. A. Hearsum, assistant works manager, J. Maddock & Company, Limited, Oakengates, Salop; W. A. McLaren,* proprietor, Master Patterns, Capetown, South Africa; C. Powney,* training officer, Beeston Boiler Company, Limited, Beeston, Notts; G. B. Taylor,* foundry manager, Ashmore Benson Pease & Company, Limited, Stockton-on-Tees; H. G. Titmus, metallurgist and assistant foundry manager, Revo Foundry Company, Limited, Tipton, Staffs.

As Associate Members

R. B. L. Bharadwaj, foundry foreman, United Manufacturers, Limited, Agra, India; A. M. Burton, coremaker and loam moulder, Hawthorn, Leslie, Limited, Newcastle-upon-Tyne, 6; M. A. Farrell, assistant foundry superintendent, High Grade Castings, Limited, Leighton Buzzard, Beds; A. McK. Forbes, foreman moulder, Barry Henry & Cook, Limited, Aberdeen; H. Gibbings, foreman, Sturlas Bronze Foundry, Waltham Cross, Herts; Jas. Gibson, foreman melter, Brockhouse Castings, Limited, Wednesfield, S. Staffs; G. E. Jones, G.I.Mech.E., designer draughtsman, Paterson Hughes Engineering Company, Strand, London, W.C.2; D. Lewis,* foundry metallurgist, Beans Industries, Limited, Tipton, Staffs; H. Platts, foundry foreman, Manor Precision Foundry, Limited, Ossett, Yorks; C. Preston,* assistant foundry manager, Ashmore Benson Pease Company, Limited, Stockton-on-Tees; Jas. Queen, junr., iron foundry foreman, J. Stone & Company (Charlton), Limited; P. Riley, foreman, J. Frankel (Alum), Limited, Wednesbury, Staffs; R. F. Sharp, chief inspector, sand foundries, Stanton Ironworks, Limited, Stanton; G. N. Shepherd, foundry foreman, Lomax & Smith, Limited, Dundee; H. Ward, foundry manager, The Midland Monolithic Furnace Lining Company, Limited, Leics; V. F. Williams, assistant foreman moulder, S.A.R. & H., Natal, S. Africa; H. Wilson, works manager, John Vickers & Sons, Darlington; E. D. Woodall, foundry technician, J. Stone & Company (Charlton), Limited, London, S.E.; H. N. Young, partner, Rowe & Young, Wednesbury, Staffs.

As Associates (over 21)

H. Atkins, pyrometer electrician, Sterling Metals, Limited, Coventry; S. F. Crowe, assistant metallurgist, Dartmouth Auto Castings, Limited, Smethwick, Staffs; T. H. Flack, moulder and coremaker, Baker Perkins, Limited, Peterborough; D. H. Goss, foundry technician, Leys Malleable Castings Company, Limited, Derby; P. J. Jeffrey, patternmaker, Reay Gear Works, Hebburn-on-Tyne; Odd Olsen, student, National Foundry College, Wolverhampton; E. Player, foundry trainee, Sterling Metals, Limited, Coventry; J. R. Simpson, patternmaker, Lloyds (Burton), Limited, Burton-on-Trent; R. W. Thomas, metallurgical engineering apprentice, Dartmouth Auto Castings, Smethwick, Staffs.

As Associates (under 21)

W. Brown, foundry metallurgist, C. A. Parsons & Company, Limited, Newcastle-upon-Tyne; A. S. Goldingham, engineering apprentice, International Combustion, Limited, Derby; J. F. Loe, apprentice patternmaker, Carbodies, Limited, Coventry; D. F. Plowman, metallurgical chemist, East Sussex Engineering Company, Limited, Lewes, Sussex.

SECOND LIST

As Subscribing Firm Members

Aero Research, Limited, Duxford, Cambridge, makers of synthetic resins; Ferrous Castings, Limited, Stafford Road, Wilderspool, Warrington, Lancs, ironfounders and patternmakers (representative: D. Robertson); W. Richards & Sons, Limited, Britannia Foundry, 80, North Ormesby Road, Middlesbrough, ironfounders and engineers (representative: R. W. Granger).

As Members

J. Blackburn, chief metallurgist and assistant works manager, Samuel Osborn & Company, Limited, Sheffield, 3; H. A. Bonney, managing director, Follsain-Wycliffe, Limited, near Rugby; R. E. Boone, managing director, The High Wycombe Foundry Company, Limited, High Wycombe, Bucks; F. Evans, director, Crown Castings, Limited, London, N.W.1; R. W. Granger, works manager, W. Richards & Sons, Limited, Middlesbrough; T. F. Howarth, research and development engineer, J. W. Jackman & Company, Limited, Manchester; D. Morley, assistant foundry manager, East Sussex Engineering Company, Limited, Lewes, Sussex; A. V. Patel, director, New Standard Engineering Company, Limited, Bombay; S. J. Sargood, assistant foundry metallurgist, Ford Motor Company, Limited, Dagenham, Essex.

As Associate Members

T. C. Andrews,* student for practical training, Bryan Donkin & Company, Limited, Chesterfield; T. Atkinson, floor moulder, David Bridge & Company, Limited, Castleton, Rochdale; F. G. Colledge, foundry superintendent, Herbert Morris, Limited, Loughborough, Leics; A. Cumming, patternmaking foreman, Babcock & Wilcox, Limited, Renfrew; L. Harrop, sales office manager, Sheepbridge Works, Chesterfield; W. L. Haygarth, foundry foreman, W. Richards & Sons, Limited, Middlesbrough; J. P. Maher, metal patternmaker, Ford Motor Company, Limited, Dagenham, Essex; N. Y. Newton,* metallurgist, K. & L. Steelfounders & Engineers, Limited, Letchworth; W. D. Owen, chief estimator and planning engineer, Ferranti, Limited, Hollinwood, Lancs; A. E. Stocker, assistant foreman loose-pattern moulder, Town End Foundry, Chapel-en-le-Frith; G. Teasdale, assistant to works manager, M. Cockburn & Company, Limited, Falkirk, Stirlingshire; W. H. Thorpe, foreman dresser, Brightside Foundry & Engineering Company, Limited, Sheffield.

As Associates (over 21)

K. Arnold, metallurgical chemist, Brightside Foundry & Engineering Company, Limited, Sheffield; J. A. Barrett, foundry trainee, Foundry Equipment, Limited, Leighton Buzzard; M. R. Manning, core-maker, Sir W. H. Bailey & Company, Limited, Patricroft, Lancs;

* Transferred.

Institute Elects New Members

H. W. Nicholls, chief casting inspector, Goulds Foundries, Limited, Newport, Mon; D. R. R. Rutherford, student foundryman, The Ford Motor Company, Limited, Dagenham, Essex; P. G. Spencer, foundry trainee, Foundry Equipment, Limited, Leighton Buzzard, Beds; R. V. Willis, laboratory assistant, Dartmouth Auto Castings, Limited, Smethwick, Staffs.

As Associate (under 21)

P. C. Littleales, foundry trainee, Foundry Equipment Limited, Leighton Buzzard, Beds.

THIRD LIST

As Member

J. Chippendale,* foundry foreman, Pease & Partners, Limited, Middlesbrough.

As Associate Members

J. W. D. Gibson, engineer, Head, Wrightson & Company, Limited, Thornaby-on-Tees; J. S. P. Phillips, assistant works manager, The Nigerian Railway, Nigeria.

As Associate (under 21)

R. H. Howard, student, J. Blakeborough & Sons, Limited, Brighouse, Yorks.

* Transferred.

Personal

Mr. and Mrs. W. Atkinson, of Stanbury, who lived at Keighley until a few years ago, celebrated their golden wedding anniversary on October 19 while on holiday in Lincolnshire. Mr. Atkinson was employed as a moulder for nearly fifty years by Jonas Wells, Limited, brassfounders, Greengate Works, Keighley.

Mr. John Forrester, chief engineer of Mitchell, Russell & Company, Limited, ironfounders, Bonnybridge, was honoured on the occasion of his retirement after 34 years' service, by members of the staff and engineering department. Mr. James Mitchell, joint managing director, presented him with a wallet of notes.

President of the Thos. W. Ward, Limited, group of companies, Mr. Ashley S. Ward has recently returned from a business tour of Canada in company with Mr. Jack Holmes, chief export manager of the group. Mr. Ward believes that Canada will prove the most fruitful development areas in the British Commonwealth and that Canadians welcome British capital in preference to American. It will be remembered that Mr. Ward made a similar trip to Australia in December, 1948.

Mr. Richard Elsdon, who has been librarian of the Iron and Steel Institute since 1908, is retiring at the end of December. During this period, the collection of volumes has grown from 2,000 to 30,000, and the number of books borrowed each year from 100 to 12,000. A fitting pseudonym might be " the man with the photographic memory," for he has seldom been known to forget a face, and his ability to find among the library's vast collection just the very information sought by an inquirer, however vague the inquiry, has amazed many who were expecting a lengthy search. Mr. Elsdon has introduced several developments since he became librarian, including the compilation of bibliographies; the information department; and the abstracting and compilation of indices for the Institute's journal. The library itself stands as a lasting tribute to his organisation

Mr. A. E. Chattin, assistant secretary since 1925, is to take over Mr. Elsdon's duties, while retaining his present post. Mr. A. Post, who joined the staff in 1946, is to become joint assistant secretary to the institute. These appointments date from January 1, 1952.

Obituary

Mr. C. P. Newman

A correspondent writes:—Mr. C. P. Newman was born in Gloucestershire in 1875, and was educated at Wycliffe College. He joined the firm of Newman & Company, brassfounders, Woodchester, on leaving school in 1890. This business had been established by Mr. Newman's father in 1879. He learnt the art of brass finishing and founding as then practised on what to-day would be regarded as very simple single-purpose machines. Mr. Newman gradually assumed the management of the business, and, following amalgamation with another local firm, Hender, Stevenson & Company, in 1896, he became joint managing director of the new company, Newman, Hender & Company, Limited, being then 21 years of age.

The firm made steady progress in both home and export trade, and it is to-day regarded as one of the leading manufacturers in this country of bronze, cast iron, cast and forged steel valves and fittings for the control of water, air, oil, and gas services. The number of employees has grown from about 20 in 1890 to well over 1,000 to-day. At the time of his death, Mr. Newman was chairman of the company, his son having assumed the managing directorship. He was also chairman of Le Grand Sutcliff & Gell, Limited, and Wright, Bindley & Gell, Limited, and was also a director of S. Smith & Sons (England), Limited, and S. Smith & Sons (Cheltenham), Limited. He was a member of the Council of the British Engineers' Association, and of the Grand Council of the Federation of British Industries, for upwards of 25 years. A founder member of the Works' Management Association, Mr. Newman was invited to become a vice-president on the incorporation of the Association in 1936. His keen interest in management was evinced by the fact that he presided over the Board of Management Journals, Limited, for a number of years.

Mr. V. W. Bone

Mr. Victor W. Bone, formerly chairman of Ruston & Hornsby, Limited, engineers, etc., of Lincoln, died last month at the age of 68. After serving his apprenticeship with Ransomes, Sims & Jefferies, Limited, engineers, of Ipswich, he rose through a series of managerial appointments to the post of joint managing director in 1917. Following the amalgamation of the company with Ruston & Hornsby, Limited, in 1919, Mr. Bone was transferred to Lincoln, where he became a director in charge of manufacturing. From 1930 to 1944 he was managing director of Ruston-Bucyrus, Limited, manufacturers of excavating machinery, in whose formation he had played a leading part. He became managing director of the parent company, Ruston & Hornsby, in 1944 and on the death of Mr. G. R. Sharpley, succeeded him as chairman of the company. This dual appointment he held until his resignation because of ill-health in 1949. During the last war he served as vice-chairman of the East Midlands Regional Board of the Ministry of Production and for over 20 years he was a member of the management board and negotiating committee of the Engineering and Allied Employers' National Federation. A widely travelled man, Mr. Bone had made frequent visits to Canada and the U.S.A. on behalf of his firm.

Mr. J. W. Darlington, who has died at the age of 65, held an executive position with Kendal & Gent, machine tool makers, Gorton, and the Sentinel Wagon Works, Shrewsbury.

Heat-treatment of Grey Cast Iron

*Discussion of the Report of Sub-committee T.S.31**

DR. A. B. EVEREST, speaking on behalf of Mr. Peace, the chairman of the Technical Council, said the Council were very gratified at the way in which Mr. Twigger and his committee had tackled their particular job. As Mr. Twigger had explained, the work had been exploratory in nature, to ascertain whether there was work which the Technical Council could usefully undertake on the general question of the heat-treatment of cast iron, or on some particular aspect. Much excellent work had been done in this field, but the difficulty was that heat-treatment was so dependent on all the variables of composition and structure in cast iron that it was extremely difficult to put one's finger on any particular part of the problem which could usefully be studied.

Referring to the annealing of cast iron to remove massive carbides, it was quite true that there was very little published information on that subject, but there must be a great wealth of practical information in the industries where annealing to remove massive carbides was undertaken every day, and possibly if it were thought more work was needed on that aspect, help could be obtained from those people.

Critical Range

On the general question of annealing for machinability, practice depended on the time at temperature in or above the critical range; he thought Mr. Twigger already had the feeling that the technicians did not know enough about the critical range. In this connection it was perhaps of interest to report that in the previous week a Paper† had been read before the French Foundry Congress in which figures were given for the critical temperature and in which it was shown that a 1 per cent. increase in silicon raised the critical figure by 25 deg. C. That Paper would be published in due course; it was actually on spheroidal-graphite cast iron, but the influences of silicon on the critical value would apply to all types of cast iron. He agreed that some of the difficulties which were encountered in practical heat-treatment might be due to lack of more precise information on the critical range.

The question of stress-relief still entered into the studies of various sub-committees of the Technical Council. The main point he wished to make was that Mr. Twigger had produced an excellent Report on information available, but the Technical Council now wished to have the views of members as to what further work was required in this field, and they looked to the members of the Institute to give them some guidance.

MR. TWIGGER thanked Dr. Everest for his remarks and pointed out that, as several members of the committee were in constant touch with industrial annealing practice, much useful information had been available. On the question of the critical range, Dr. Everest's mention that the French Paper showing an increase of 25 deg. C. on the critical point for every 1 per cent. in silicon, reminded him of an American Paper dated 1928, which gave the same temperature effect due to silicon, and also recorded that the critical point was lowered by 28 deg. C. for each 1 per cent. manganese added.

MR. HALLETT said that the calculation of critical temperatures was not very reliable, in view of the large number of factors which might influence the result in a normal cast iron. It was easy in a research laboratory to produce regular results on single alloys, but in the foundry one dealt with matters which were far more variable. While for general purposes figures such as those which had been quoted were very useful, he still believed that the average foundry, in specifying a heat-treatment, must determine by experiment its own figures on its own irons under its own conditions.

Phosphorus Content

MR. MCRAE SMITH said he had listened with a great deal of interest and he did not want to make any criticism whatsoever of the technical aspect of annealing cast irons. There was, however, one major point which he would like the committee to keep in mind on the purely practical aspect of the textile machinery trade in Lancashire and Yorkshire. Since long before he was born it had been the practice to use annealed cast iron, but it had always been high-phosphorus cast iron and therefore, when annealed, it had a Brinell hardness of about 150 to 160; because the phosphide constituent was still there, they got reasonably good wear-resistance. Since the end of the last war, some people had encountered serious trouble from the economic and the engineering point of view because they had been supplied with low-phosphorus cast iron fully annealed, and that had very poor wear-resisting qualities. In his view, a word of warning should be offered in the final Report that the properties of fully-annealed low-phosphorus cast iron were very different from the properties of fully-annealed high-phosphorus cast iron.

On the question of breaking down unbalanced compositions in regard to massive carbides and white iron, there must be a tremendous amount of information available in the white-heart malleable trade, because they used a white iron usually with 0.4 to 0.6 per cent. silicon, 0.2 per cent. sulphur, and about 0.1 to 0.3 per cent. manganese.

MR. TWIGGER, in reply, said he was aware of the fact that a high-phosphorus content in an annealed iron was sometimes relied upon to give some degree

---

* Report published in the FOUNDRY TRADE JOURNAL on August 2, 1951.

† Ballay, M., Chavy, R., and Grilliat, J. *Etude de Quelques Propriétés de Fontes à Graphite Spheroïdal*. A.T.F. Congress, Paris, June, 1951.

Heat-treatment of Grey Cast Iron

of wear resistance. Such material, undoubtedly might have its uses in a certain industry, but he felt sure that the degree of wear-resistance was still very low by comparison with an un-annealed pearlitic iron.

On the question of breakdown of massive carbides with unbalanced sulphur and other unusual compositions, it was noted in the Report that the committee were well aware of the large volume of literature on malleable cast iron. Their search had been directed chiefly to finding cases of iron having a white iron structure, resulting from compositions outside those of the malleable-iron range.

MR. MCRAE SMITH remarked that they should not be accidentally chilled, to which MR. TWIGGER replied that he had said that, too.

The CHAIRMAN proposed a formal vote of thanks to Mr. Twigger, which was carried with acclamation.

B.B.C. to Give Power-cut Warnings

It is announced by the British Electricity Authority that the B.B.C. will broadcast warnings of power cuts on the 1,500-metre wavelength at any time between 7.30 a.m. and 12.30 p.m., and 3 p.m. and 6 p.m. on Monday to Friday, starting this Monday. The country, the B.E.A. explained, has been divided into load-shedding areas and the extent of the shedding will be conveyed by numbered 5 per cent. stages. The warnings can only be issued after the decision to shed load has been taken by the engineer in the authority's national control centre and the actual load shedding must start within a few minutes.

In view of the complexity of the grid system, power cuts may have to be made in emergencies before a warning is possible. Important industrial consumers will be notified by the area electricity boards. Other users requiring similar information should approach their local area boards for details.

Appleby-Frodingham Steel's Extensions

Plans for extensions, costing £10,000,000, to the Scunthorpe works of the Appleby-Frodingham Steel Company (branch of the United Steel Companies, Limited) have been approved by the Iron and Steel Corporation. The company has been urged to go ahead as rapidly as possible with the installation of the two new blast furnaces and ancillary plant.

When the project was announced nearly two months ago by Lieut-Cmdr. G. W. Wells, general manager of the company, it was stated that the main object was to increase the ironmaking capacity of the works to keep pace with its own steelmaking possibilities and to supply iron to the Steel, Peech & Tozer branch of the United Steel Companies.

STEEL PRODUCTION in the Sheffield area during September averaged 40,900 tons a week, compared with 45,100 tons a week in September, 1950. Shortage of raw materials, which has caused the closure of some steel-melting furnaces in the area, is the main reason for the lower output this year. In July, August, and September the weekly average output in the district was 36,900 tons, compared with 41,300 tons in the corresponding period of last year.

Iron-ore Imports

Imports of iron ore in September and the first nine months of the year, with comparative figures for 1950, are shown below. There were no imports of manganiferous ore during the first nine months of this year. In the first nine months of 1950, 10,876 tons of manganiferous ore were imported, against 11,726 tons in the corresponding period of 1949.

Country of origin.	Month ended September 30.		Nine months ended September 30.	
	1950.	1951.	1950.	1951.
	Tons.	Tons.	Tons.	Tons.
Sierra Leone	63,070	42,005	596,205	418,025
Canada	40,795	107,902	46,320	422,259
Other Commonwealth countries and the Irish Republic ..	1,855	10,857	21,003	28,081
Sweden	278,904	324,594	2,655,537	2,544,022
Netherlands	5,450	7,141	31,185	34,689
France	32,345	26,483	291,957	275,772
Spain	56,975	45,979	600,383	602,325
Algeria	65,910	107,835	1,122,903	1,067,608
Tunis	31,970	37,350	382,215	371,524
Spanish ports in North Africa	44,250	33,800	362,856	262,030
Morocco	17,544	12,914	237,799	206,867
Other foreign countries	19,415	35,869	186,967	158,612
TOTAL	658,483	792,729	6,535,330	6,391,814

September Iron and Steel Production

September steel production was at an annual rate of 15,749,000 tons, compared with the August rate of 13,855,000 tons, when holidays interfered with output, and 16,954,000 tons in September, 1950. If the target of 16,000,000 tons for the current year is to be achieved, the industry must produce 4,250,000 tons in the final quarter, equivalent to an annual rate of 17,116,000 tons.

Latest steel and pig-iron output figures (in tons) compare as follow with earlier returns:—

	Pig-iron.		Steel ingots and castings.	
	Weekly average.	Annual rate.	Weekly average.	Annual rate.
1951—August ..	182,800	9,506,000	266,400	13,855,000
September	189,500	9,854,000	302,900	15,749,000
1950—August ..	177,000	9,205,000	279,400	14,530,000
September	186,800	9,712,000	326,200	16,954,000

West of Scotland Iron and Steel Institute

A draft syllabus for the 1951-2 session of the West of Scotland Iron and Steel Institute has just been issued by the secretary. The following Papers are to be given:—November 16, "Basic Refractories," by Dr. J. R. Rait and Dr. W. F. Ford; December 13, "Factors determining the Teeming Temperature of Open-hearth Steel," by Mrs. A. Donald and D. Hadfield; January 25, "Die Forging," by J. D. Latta; February 22, "Metallurgical Applications of Radioactive Tracers," by Dr. H. M. Finniston; March 21, short Papers by members; April 4, "Operating Experience with the Blast Furnace under High Top Pressure," by R. P. Towndrow.

THE BRANCH in this country of the French firm of Prat-Daniel, 64, rue Miromesnil, Paris, 8, specialists in dust-removal and ventilation plant for foundries, will be known as Thermix Industries, Limited, with offices at 110-112, Kings Road, Chelsea.

Imports and Exports of Iron and Steel in September

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

Total Exports of Iron and Steel (tons)

Destination.	Month ended September 30.		Nine months ended September 30.	
	1950.	1951.	1950.	1951.
Channel Islands ..	699	440	6,343	6,563
Gibraltar	288	95	1,384	618
Malta and Gozo ..	276	204	3,307	2,421
Cyprus	749	511	6,800	3,670
Sierra Leone	183	476	3,370	3,974
Gold Coast	1,276	1,764	18,841	13,901
Nigeria	3,335	2,605	44,320	40,251
Union of South Africa	16,723	11,856	133,452	100,903
Northern Rhodesia ..	1,670	1,898	22,159	11,463
Southern Rhodesia ..	3,336	3,390	55,025	28,884
British East Africa ..	7,988	4,203	74,484	57,356
Mauritius	476	277	6,743	4,999
Bahrein, Kuwait, Qatar and Trucial Oman..	485	682	5,475	5,808
India	5,577	4,710	77,223	67,522
Pakistan	9,554	4,615	75,560	57,212
Malaya	5,779	5,570	59,160	56,141
Ceylon	2,174	1,493	20,638	20,291
North Borneo ..	75	358	4,365	3,888
Hongkong	3,267	1,591	34,480	41,488
Australia	46,917	19,229	299,520	247,137
New Zealand	17,053	7,692	132,525	76,564
Canada	21,354	25,967	145,201	201,157
British West Indies ..	3,893	4,414	46,758	49,723
British Guiana ..	535	319	5,588	4,177
Anglo-Egyptian Sudan	1,291	849	13,097	7,058
Other Commonwealth	2,683	1,045	12,396	8,735
Irish Republic ..	9,066	3,210	71,297	65,092
Soviet Union	16	22	529	2,258
Finland	4,927	3,383	54,018	27,962
Sweden	4,948	10,643	64,353	83,174
Norway	7,557	2,971	65,008	45,869
Iceland	163	139	3,407	2,110
Denmark	4,563	3,020	88,241	58,935
Poland	150	29	1,281	659
Germany	104	127	682	877
Netherlands	6,759	5,087	59,247	65,525
Belgium	1,343	690	9,536	8,882
France	1,819	193	18,835	4,371
Switzerland	853	826	8,236	8,662
Portugal	2,015	1,192	16,277	10,682
Spain	342	208	6,070	3,220
Italy	2,344	2,487	9,037	27,088
Austria	134	32	872	367
Hungary	1	—	329	23
Yugoslavia	899	217	10,954	7,157
Greece	1,305	93	6,195	2,129
Turkey	747	593	7,427	4,493
Indonesia	650	287	9,818	6,324
Netherlands Antilles..	408	1,313	6,674	6,534
Belgian Congo ..	190	173	1,218	1,758
Angola	112	101	1,909	1,704
Portuguese E. Africa	260	499	3,460	3,052
Canary Islands ..	357	75	1,747	1,505
Syria	224	44	880	4,440
Lebanon	622	711	8,528	9,884
Israel	1,648	2,683	17,408	24,143
Egypt	3,241	2,826	45,210	33,450
Morocco	903	7	2,498	1,340
Saudi Arabia	88	359	2,096	924
Iraq	3,109	2,738	27,615	20,105
Iran	4,515	1,869	79,084	58,074
Burma	1,051	747	8,947	10,090
Thailand	1,803	1,026	5,708	12,480
China	1,228	14	3,207	4,656
Philippine Islands ..	229	24	7,353	2,619
U.S.A...	5,850	3,071	22,401	123,440
Cuba	227	60	1,541	2,933
Colombia	246	690	4,923	6,575
Venezuela	1,559	1,151	24,989	32,823
Ecuador	516	638	2,752	1,585
Peru	1,137	574	9,198	9,368
Chile	1,035	336	12,633	6,273
Brazil	2,229	1,598	24,588	17,202
Uruguay	1,044	645	7,194	9,140
Argentina	4,783	2,218	49,071	33,832
Other foreign ..	1,561	1,259	14,690	14,045
TOTAL	249,416	170,141	2,224,354	2,011,737

* The figures for 1951 are not completely comparable with those for previous years.

Total Imports of Iron and Steel (tons)

From	Month ended September 30.		Nine months ended September 30.	
	1950.	1951.	1950.	1951.
India	46	5	22,930	12
Canada	2,953	4,327	29,054	36,208
Other Commonwealth and Irish Republic	156	212	1,273	1,271
Sweden	1,415	1,394	9,408	15,905
Norway	3,725	4,645	37,669	38,681
Germany	5,512	2,050	63,000	16,554
Netherlands	3,082	7,789	38,952	56,389
Belgium	8,892	15,609	78,008	128,487
Luxemburg	3,371	9,707	33,114	64,352
France	28,569	23,325	221,634	187,565
Austria	—	232	3,286	10,013
U.S.A...	3,938	7,784	50,566	31,500
Other foreign ..	766	791	5,978	3,942
TOTAL	62,425	77,330	595,472	599,879
Iron and steel scrap and waste, fit only for the recovery of metal	82,756	45,641	1,075,951	469,780

Exports of Iron and Steel by Product (tons)

Product.	Month ended September 30.		Nine months ended September 30.	
	1950.	1951.	1950.	1951.
Pig-iron	2,706	404	20,926	14,691
Ferro-alloys, etc.—				
Ferro-tungsten ..	123	76	880	372
Spiegeleisen, ferro-manganese ..	249	26	1,605	823
All other descriptions	120	65	1,152	796
Ingots, blooms, billets, and slabs	274	130	4,924	5,160
Iron bars and rods ..	368	509	3,295	7,117
Sheet and tinplate bars, wire rods ..	2,252	1,083	11,195	10,851
Bright steel bars ..	3,465	1,080	32,131	24,597
Alloy steel bars and rods	773	1,192	11,109	12,025
Other steel bars and rods	23,786	8,204	182,755	136,432
Angles, shapes, and sections	12,034	8,861	108,245	121,994
Castings and forgings	509	1,143	6,025	8,869
Girders, beams, joists, and pillars (rolled)*	4,762	2,078	48,666	30,643
Hoop and strip ..	10,787	8,699	84,426	56,967
Iron plate	26	16	1,943	1,630
Tinplate	22,675	13,568	186,848	180,006
Tinned sheets.. ..	248	65	2,256	1,906
Terneplates, decorated tinplates	69	43	712	1,310
Other steel plate (min. ⅛ in. thick) ..	26,118	16,533	240,627	202,196
Galvanized sheets ..	10,757	5,169	87,836	41,718
Black sheets	11,471	11,470	104,105	114,801
Other coated plate ..	1,508	359	9,526	6,775
Cast-iron pipes up to 6 in. dia.	5,298	7,806	57,276	61,296
Do., over 6 in. dia. ..	6,075	3,924	60,783	52,364
Wrought-iron tubes ..	19,776	20,734	257,283	295,116
Railway material ..	26,925	9,915	231,858	168,114
Wire	8,278	3,528	58,618	44,622
Cable and rope ..	2,096	1,814	25,001	21,949
Wire nails, etc. ..	2,567	1,168	17,152	20,471
Other nails, tacks, etc.	360	262	3,796	3,066
Rivets and washers ..	702	734	6,171	5,551
Wood screws	319	373	2,776	2,967
Bolts, nuts, and metal screws	2,316	2,476	23,282	21,088
Baths	861	1,208	10,375	10,664
Anchors, etc.	1,010	1,072	6,803	7,076
Chains, etc.	680	856	7,629	8,393
Springs	441	461	6,455	4,702
Holloware	8,604	2,389	64,640	26,119
TOTAL, including other manufactures not listed above	249,416	170,141	2,224,354	2,011,737

News in Brief

COCHRANES (MIDDLESBROUGH) FOUNDRY LIMITED have installed bathing and washing facilities for 580 men.

GRAVEL GATE FOUNDRY COMPANY, LIMITED, have had plans approved to erect a new foundry at Alford Street, Oldham, Lancs.

TYNESIDE shipyard and engineering workers are to meet at Newcastle-upon-Tyne on November 3 to discuss the latest claim for a wage increase of £1 a week.

SIXTY MAIL LOCOMOTIVES, valued at £50,000 each, are to be built in Glasgow by the North British Locomotive Company, Limited, for South African Railways.

DUDLEY & DOWELL, LIMITED, ironfounders, etc., of Cradley Heath (Staffs), have commenced a superannuation scheme covering all male employees at its Cradley Heath and Blackheath works.

NEWTON CHAMBERS & COMPANY, LIMITED, ironfounders, etc., of Sheffield, have been granted a building licence for extensions to the Warren Lane factory and welding bay costing £85,000.

JOHN HARPER & COMPANY, LIMITED, of Willenhall, have just completed the purchase of the foundry known as the St. James Works, Thames Street, Poole, previously operated by Poole Foundry, Limited.

AMONG the sections of the final report on the Census of Production for 1948, which are now obtainable from H.M. Stationery Office, are those on wrought iron and steel tubes (price 1s. 9d.) and blast furnaces (1s. 6d.).

ALL OUTSTANDING LICENCES permitting the export of arms, ammunition, aircraft, armoured vehicles, munition-making machinery, and other specialised war material to Egypt have been revoked by the Board of Trade.

IT IS REGRETTED that in briefly announcing the death of Mr. C. P. Newman in last week's JOURNAL, his age was given as 84; actually he was in his 76th year. Some details of his career are included under *Obituary* on page 516 of this issue.

THE IMPORT of alloys vitally needed for the production of high-grade steels has been arranged as a result of three trips to Vereeniging (South Africa) by Mr. Eric Midgley, managing director of Midgley & Son, Limited, ferro-alloy merchants, etc., of Sheffield.

THE CONTRACT to build the new factory of Standard Motors, Limited, at Kirkby has been secured by a Coventry firm. The Carrier Engineering Company, Limited, London, has been awarded the engineering contract, the total cost of the factory being estimated at £1,000,000.

SCOTTISH INDUSTRIAL ESTATES are to build a factory in the Kip Valley, Greenock, for International Business Machines World Trade Corporation, an American concern. Mr. Hector McNeil, Secretary of State for Scotland, said last week that the Government would give financial help.

A PILOT PLANT for the centrifugal casting of steel will shortly be ready for operation at the Rotherham works of Steel, Peech & Tozer branch of the United Steel Companies, Limited. Plant of this type is successfully operating in Australia in the production of railway wheels and gears.

THE WARTIME UTILITY FRONTAGE of the Castle Bromwich section of the British Industries Fair is to be scrapped and a new permant façade of imposing design in keeping with the status of one of the largest exhibition buildings in the world is to be erected for the 1952 Fair, to be held from May 5 to 16.

IT IS REPORTED from Sweden that imports of scrap from Western Germany, provided for in the Swedish-Western Germany trade agreement, are heavily in arrears. With total requirements estimated at 180,000 tons this year, only 36,000 tons were imported during the first six months from all sources.

KODAK, LIMITED, of Wealdstone, Harrow, Middlesex, announce that a further important step in the rationalisation of quantity packaging of sensitised photographic material will come into operation in the not-too-distant future. Sheet films and X-ray films will then have a basic minimum packing unit of 25 sheets.

FOR THE PURPOSE of the introduction of the building steel allocation scheme (see FOUNDRY TRADE JOURNAL, October 25, page 485), the Ministry of Works now announces that the date of delivery means the date of delivery of unfabricated, finished steel, whether to the site or to a fabricator. The Ministry has made this announcement after reconsidering the matter.

SHOWER BATHS and locker rooms for foundry workers at the International Combustion, Limited, Sinfin Lane, Derby, are now nearly completed, and have cost about £9,000. At a later date, similar accommodation will be provided for the women employed in the foundry. Extra shower baths are also being installed for foundry employees at Qualcast, Limited, Victory Road, Derby.

ONE THOUSAND EMPLOYEES and their families and friends made a tour of the 12-acre works of Robey & Company, Limited, Lincoln, and saw equipment that this firm produces in many parts of the world. Some of the heaviest castings that may be found in the industry are produced in the foundry. It is about 15 years since the firm had an "Open Day."

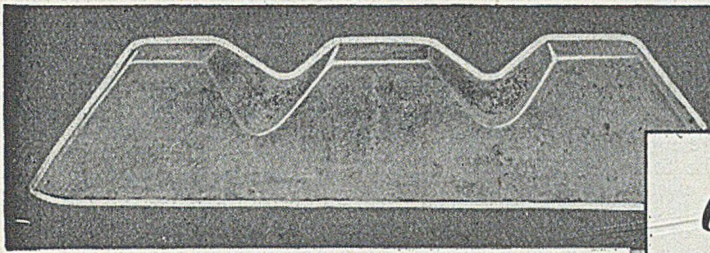
AGAINST strong German competition, the Davy & United Engineering Company, Limited, Sheffield, have secured a further large order for rolling-mill equipment from the Norwegian steel company, A/S Norsk Jernverk. The order, for a Morgan combination merchant bar, wire rod and strip mill, brings the total value of business now being handled by the company for A/S Norsk Jernverk to over £2,000,000.

IT IS REPORTED FROM PARIS that Britain, France, the United States, and the Benelux countries have agreed to remove the limitations on German steel production when the Schuman plan for the pooling of European coal and steel comes into effect. Such controls as are necessary to complete the breaking up of German coal and steel trusts will be retained and instructions will be sent to Allied High Commissioners in Germany.

JOHN CROWN & SONS, LIMITED, Sunderland, launched the 275-ft. long fore-part of the 23,000-ton Norwegian tanker, Rondefjell, which is being built in two sections owing to the small size of the company's shipyard. The after-section, 290 ft. in length, was launched last April, and the completed ship will be ready for trials by the end of this year, after being assembled by the Middle Docks & Engineering Company, Limited, South Shields.

STATING that he hoped to assist the Irish steel industry, which he believed to be capable of great expansion, Mr. Sean Lemass, Minister of Industry and Commerce, said in Dublin recently that Irish Steelholdings, Limited, had been assured that the Government would back the company, financially and otherwise, in any developments it considered practicable. It was hoped to install a sheet mill soon—an entirely new venture for Ireland.

IN VIEW of the numerous changes in import licensing arrangements since the last consolidated list was published in September, 1950, amended lists are now available showing the goods exempt from import licensing when shipped from particular groups of countries. The lists, which cover all goods on open general licence, are known as "Notice to Importers No. 458." A copy can be obtained on application to the Import Licensing Branch of the Board of Trade, Romney House, Tufton Street, London, S.W.1. An addressed envelope, suitable for a bulky foolscap document, should be enclosed.



Cut down costs in your cupolas by using

STANTON

FOUNDRY PIG IRON

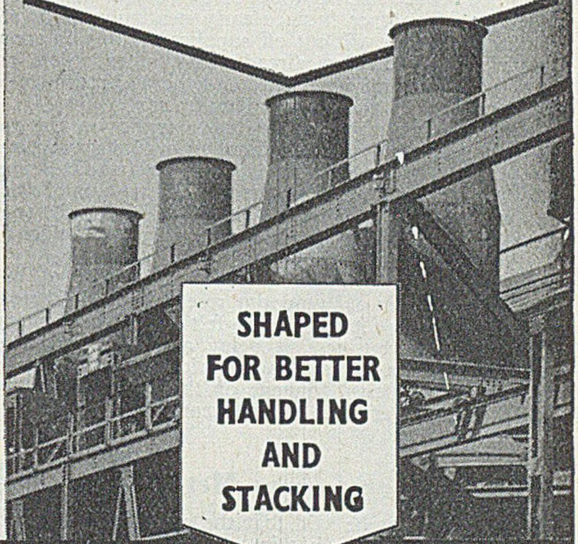
Stanton Machine-cast Pig Irons are clean-melting, and economical in cupola fuel.

All types of castings are covered by the Stanton brands of pig iron, including gas and electric fires, stoves, radiators, baths, pipes, and enamelled products generally ; repetition castings requiring a free-running iron, builders' hardware and other thin castings.

Other grades of Stanton Foundry Pig Iron possess the necessary physical properties and strength ideal for the production of fly-wheels, textile machinery, etc.

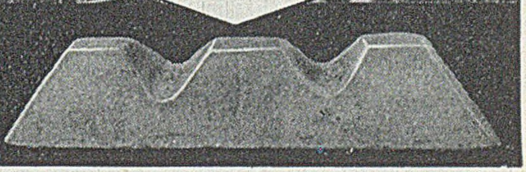
Stanton Foundry Pig Iron in all grades is also available in sand cast form.

We welcome enquiries on foundry problems and offer free technical advice.



SHAPED FOR BETTER HANDLING AND STACKING

THE STANTON IRONWORKS COMPANY LIMITED – NEAR NOTTINGHAM



Raw Material Markets

Iron and Steel

The demand for castings calls for much larger quantities of pig-iron and scrap than are available. Many foundries are meeting with increasing difficulty, with the result that not only is production adversely affected, but some foundries are unable to keep fully operative. Now that stocks at both the foundries and the furnaces have been practically eliminated, it becomes daily more apparent that outputs from the furnaces at present in blast are inadequate to satisfy the needs of the foundries as well as the steelmakers, and that in existing circumstances the prior claims of the latter will continue to act detrimentally to the interests of the foundries.

The shortage of scrap necessitates the provision of larger tonnages of pig-iron for the steelworks, and this diversion of supplies is curtailing deliveries of hematite and foundry irons to the foundries. The general engineering and speciality foundries had hoped for increased supplies of hematite pig-iron, now that ore deliveries have increased, but these are not yet forthcoming to the extent expected. The blowing-in of additional furnaces would help the position considerably, but this requires supplies of blast-furnace coke which apparently are not available, while the shortage of suitable labour also is a handicap. The call for the low- and medium-phosphorus irons is much in excess of available supplies, and the refined irons are readily accepted to the limit of production.

The users of high-phosphorus pig-iron, including the light and jobbing foundries, the textile and some of the engineering foundries, are beset with equal if not greater difficulty in securing their requirements, due to the continued reduction in outputs of this grade. The closing down of another furnace early next month for repairs and relining will cut off supplies entirely to some foundries, as producers already have more orders on hand than they can cope with, and there appears to be little prospect of adding to commitments.

Insistent demands continue to be made on the re-rollers for all steel sections, bars, strip, and sheets, but the shortage of steel semis is a severe handicap and outputs are considerably restricted. No reserves of steel are available and operations depend entirely on the tonnages currently coming forward, which are only sufficient to permit part-time working.

Output of heavy finished products is maintained, but only at the expense of liquidating reserve stocks of ingots and scrap. The effect is being felt by all consumers. Very little new business is being accepted, and then only for defence orders under priority, as the mills have already sufficient tonnage on their books to carry them well into Period I of next year.

Non-ferrous Metals

While it cannot be said that the excitement fostered by a General Election has in any way interfered with the current activities of the non-ferrous industry, business last week was certainly overshadowed on Thursday and Friday, at any rate, by passing events. Now that a new Government has been elected it is much to be hoped that the country will settle down to a spell of steady, and, if possible, expanding production. But this must depend a good deal, at any rate in metals, on the ability of the Ministry of Materials to find adequate supplies of raw material.

A greatly increased flow of scrap would be of the greatest importance in this connection, but at the moment one sees little sign of that happening. Is secondary metal being held back, or is the shortage real? Opinions are divided on this point. At the moment the trade is expecting a reduction in the upper limits permitted for both copper and brass scrap, for it is understood that the Ministry of Supply intends to adopt this course in connection with the enforcement of a maximum figure for secondary copper ingots and cathodes. It seems probable that the order giving effect to these changes will make its appearance shortly.

Price movements on the tin market last week were rather erratic. Warehouse stocks in the country show an improvement and it may well be that this trend will go farther during the next month or two.

No agreement has been reached between the Bolivian producers and the Reconstruction Finance Corporation on the matter of arranging a further long-term contract for the concentrates. Indeed negotiations were suspended entirely a few weeks ago but there seems to be some prospect of the parties getting together again. The disagreement turns upon the question of price, for the Bolivians are asking for $1.50, while the Americans are not prepared to pay anything like as much. In the meantime the United States is still withdrawn from the world market.

London Metal Exchange official tin quotations were as follow:—

Cash—Thursday, £1,017 10s. to £1,025; Friday, £992 10s. to £997 10s.; Monday, £1,000 to £1,010; Tuesday, £1,002 10s. to £1,005; Wednesday, £990 to £995.

Three Months—Thursday, £985 to £987 10s.; Friday, £965 to £970; Monday, £982 10s. to £987 10s.; Tuesday, £985 to £987 10s.; Wednesday, £972 10s. to £977 10s.

House Organs

Broomwade News Bulletin, Vol. 14, No. 5. Issued by Broom & Wade, Limited, High Wycombe.

This issue announces the coming into production of a new line of portable compressor—SV 245. It has a piston displacement of 245 cub. ft. and a free air delivery of 210 cub. ft. per min. at 100 lb. pressure when running at 1,150 r.p.m.

The Stantonian, Vol. 17, No. 9. Published by the Stanton Ironworks Company, Limited, near Nottingham.

An excellent elementary story has been written on the Blast Furnace by Mr. R. Sharp, the manager of the smelting department. In it there has been incorporated a coloured flow chart which simplifies explanation to a remarkable degree. Readers should certainly be able to follow the process quite easily. This magazine regularly prints the awards that have been made for suggestions during the previous quarter. The one gaining the highest commendation was an "Attachment on a Sandslinger Arm for Spraying Patterns Prior to Ramming." It is a point worth looking into by other foundries.

S. & W. Magazine, Vol. 5, No. 3. Issued by Smith & Wellstood, Limited, Bonnybridge, Scotland.

This issue tells of the ceremonies which marked the retirement of Mr. George Ure and Mr. R. Bell from the board of directors, the former of whom has taken up a position in Australia. Of local importance is an article by Mr. R. F. T. Paterson, who details a scheme devised for the training of apprentices at both the works of Smith & Wellstood and Mitchell, Russell & Company, Limited. It is written in quite an interesting manner and should attract the right type of entrant.

GENEFAX HOUSE · SHEFFIELD 10 · Telephone SHEFFIELD 31113

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

(Delivered, unless otherwise stated)

October 31, 1951

PIG-IRON

Foundry Iron.—No. 3 Iron, Class 2:—Middlesbrough, £11 10s.; Birmingham, £11 4s. 6d.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent. P, £13 0s. 6d., delivered Birmingham. Staffordshire blast-furnace low-phosphorus foundry iron (0.10 to 0.50 per cent. P, up to 3 per cent. Si), d/d within 60 miles of Stafford, £13 12s. 3d.

Scotch Iron.—No. 3 foundry, £13 1s., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £15 7s.; South Zone, £15 9s. 6d.

Refined Malleable.—P, 0.10 per cent. max.—North Zone, £15 17s.; South Zone, £15 19s. 6d.

Cold Blast.—South Staffs, £17 5s. 6d.

Hematite.—Si up to 2½ per cent., S. & P. over 0.03 to 0.05 per cent.:—N.-E. Coast and N.-W. Coast of England, £12 17s.; Scotland (Scotch iron), £13 3s. 6d.; Sheffield, £13 13s. 6d.; Birmingham, £14 0s. 6d.; Wales (Welsh iron), £13 3s. 6d.

Spiegeleisen.—20 per cent. Mn, £18 15s. 9d.

Basic Pig-iron.—£11 15s. 6d. all districts.

FERRO-ALLOYS

(Per ton unless otherwise stated, delivered.)

Ferro-silicon (6-ton lots).—40/55 per cent., £40 15s., basis 45% Si, scale 15s. 6d. per unit; 70/84 per cent., £56 2s. 6d., basis 75% Si, scale 16s. per unit.

Silicon Briquettes (5-ton lots and over).—2lb. Si, £48 5s.; 1lb. Si, £49 5s.

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

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

Ferro-titanium.—20/25 per cent., carbon-free, £175; ditto, copper-free, £190.

Ferro-tungsten.—80/85 per cent., 33s. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 35s. per lb. of W.

Ferro-chrome (6-ton lots).—4/6 per cent C, £74, basis 60% Cr, scale 24s. 6d. per unit; 6/8 per cent. C, £70, basis 60% Cr, scale 23s. 3d. per unit; max. 2 per cent. C, 1s. 8½d. per lb. Cr; max. 1 per cent. C, 1s. 8¾d. per lb. Cr; max. 0.15 per cent. C, 1s. 9½d. per lb. Cr.; max. 0.10 per cent. C, 1s. 9¾d. per lb. Cr.

Chromium Briquettes (5-ton lots and over).—1 lb. Cr, £78 9s.

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

Metallic Chromium.—98/99 per cent., 5s. 11d. per lb.

Ferro-manganese (blast-furnace). — 78 per cent., £40 8s. 9d.

Manganese Briquettes (5-ton lots and over).—2lb. Mn, £50 6s. 6d.

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

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—Basic: Soft, u.t., £21 11s. 6d.; tested, 0 08 to 0.25 per cent. C (100-ton lots), £22 1s. 6d.; hard (0.42 to 0.60 per cent. C), £23 19s.; silico-manganese, £29 15s.; free-cutting, £24 15s. 6d. Siemens Martin Acid: Up to 0.25 per cent. C. £27 16s.; case-hardening, £28 4s.; silico-manganese, £30 16s. 6d.

Billets, Blooms, and Slabs for Forging and Stamping.—Basic, soft, up to 0.25 per cent. C, £25 15s.; basic, hard, over 0.41 up to 0.60 per cent. C, £26 15s.; acid, up to 0.25 per cent. C, £28 4s.

Sheet and Tinplate Bars.—£21 16s.

FINISHED STEEL

Heavy Plates and Sections.—Ship plates (N.-E. Coast), £25 6s. 6d.; boiler plates (N.-E. Coast), £26 14s.; chequer plates (N.-E. Coast), £26 15s. 6d.; heavy joists, sections, and bars (angle basis), N.-E. Coast, £23 15s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., untested, £27 11s.; flats, 5 in. wide and under, £27 11s.; hoop and strip, £28 6s.; black sheets, 17/20 g., £35 15s. 6d.; galvanised corrugated sheets, 17/20 g., £49 18s. 6d.

Alloy Steel Bars.—1-in. dia. and up: Nickel, £44 17s. 3d.; nickel-chrome, £65 2s. 9d.; nickel-chrome-molybdenum, £72 10s. 3d.

Tinplates.—52s. 1½d. per basis box.

NON-FERROUS METALS

Copper.—Electrolytic, £227; high-grade fire-refined, £226 10s.; fire-refined of not less than 99.7 per cent., £226; ditto, 99.2 per cent., £225 10s.; black hot-rolled wire rods, £236 12s. 6d.

Tin.—Cash, £990 to £995; three months, £972 10s. to £977 10s.; settlement, £992 10s.

Zinc.—G.O.B. (foreign) (duty paid), £190; ditto (domestic), £190; "Prime Western," £190; electrolytic, £194; not less than 99.99 per cent., £196.

Lead.—Good soft pig-lead (foreign) (duty paid), £175; ditto (Empire and domestic), £175; "English," £176 10s.

Zinc Sheets, etc.—Sheets, 15g. and thicker, all English destinations, £210 10s.; rolled zinc (boiler plates), all English destinations, £208 10s.; zinc oxide (Red Seal), d/d buyers' premises, £205.

Other Metals.—Aluminium, ingots, £124; antimony, English, 99 per cent., £390; quicksilver, ex warehouse, £73 5s. to £73 15s.; nickel, £454.

Brass.—Solid-drawn tubes, 25d. per lb.; rods, drawn, 32⅞d.; sheets to 10 w.g., 29⅜d.; wire, 31¼d., rolled metal, 28⅜d.

Copper Tubes, etc.—Solid-drawn tubes, 26d. per lb.; wire, 254s. 9d. per cwt. basis; 20 s.w.g., 281s. 9d. per cwt.

Gunmetal.—Ingots to BS. 1400—LG2—1 (85/5/5/5), £255 to £280; BS. 1400—LG3—1 (86/7/5/2), £275 to £300: BS. 1400—G1—1 (88/10/2), £330 to £360; Admiralty GM (88/10/2), virgin quality, £330 to £360 per ton, delivered.

Phosphor-bronze Ingots.—P.Bl, £340 to £370; L.P.Bl, £295 to £315 per ton.

Phosphor Bronze.—Strip, 38¼d. per lb.; sheets to 10 w.g., 40¾d.; wire, 42¼d.; rods, 38d.; tubes, 36¼d.; chill cast bars: solids 4s., cored 4s. 6d. (C. Clifford & Son, Limited.)

Nickel Silver, etc.—Ingots for raising, 2s. 7d. per lb. (7%) to 3s. 6¾d. (30%); rolled metal, 3 in. to 9 in. wide × .056, 3s. 1d. (7%) to 4s. 0¾d. (30%); to 12 in. wide × .056, 3s. 1¼d. to 4s. 1d.; to 25 in. wide × .056, 3s. 3¼d. to 4s. 3d. Spoon and fork metal, unsheared, 2s. 10d. to 3s. 9¾d. Wire, 10g., in coils, 3s. 6¼d. (10%) to 4s. 6¼d. (30%). Special quality turning rod, 10%, 3s. 5¾d.; 15%, 3s. 10½d.; 18%, 4s. 2¼d. All prices are net.