FOUNDRY TRADE JOURNAL

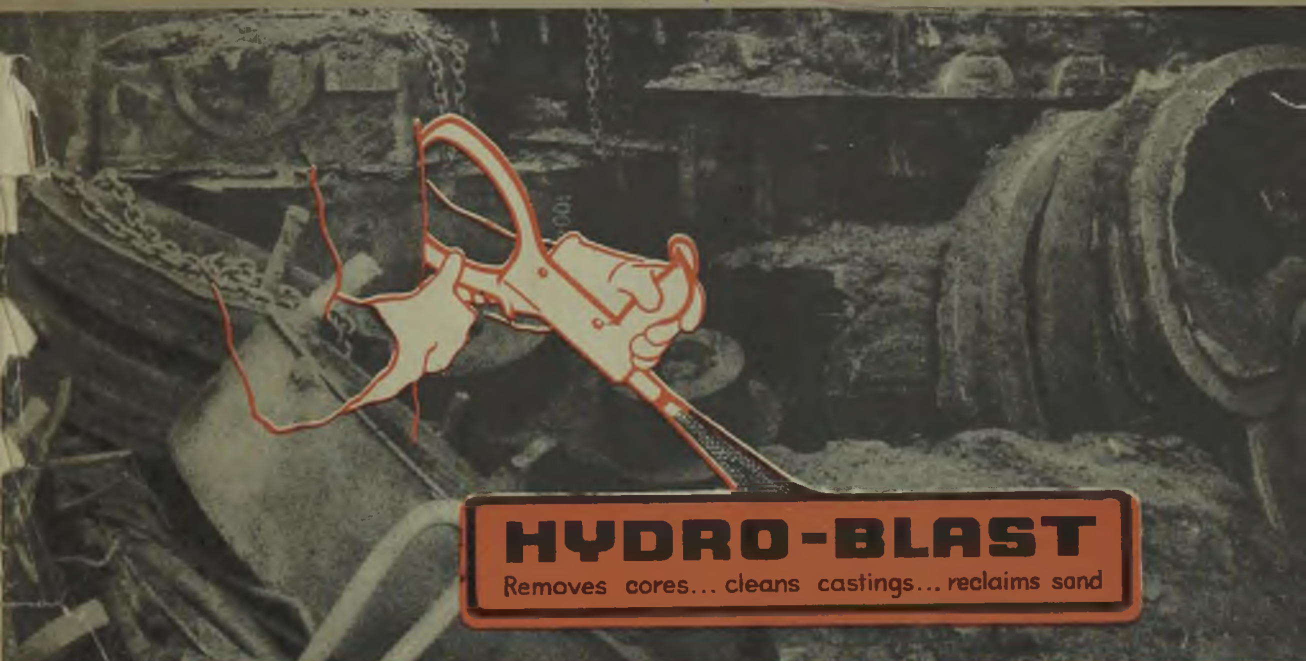
EST. 1902

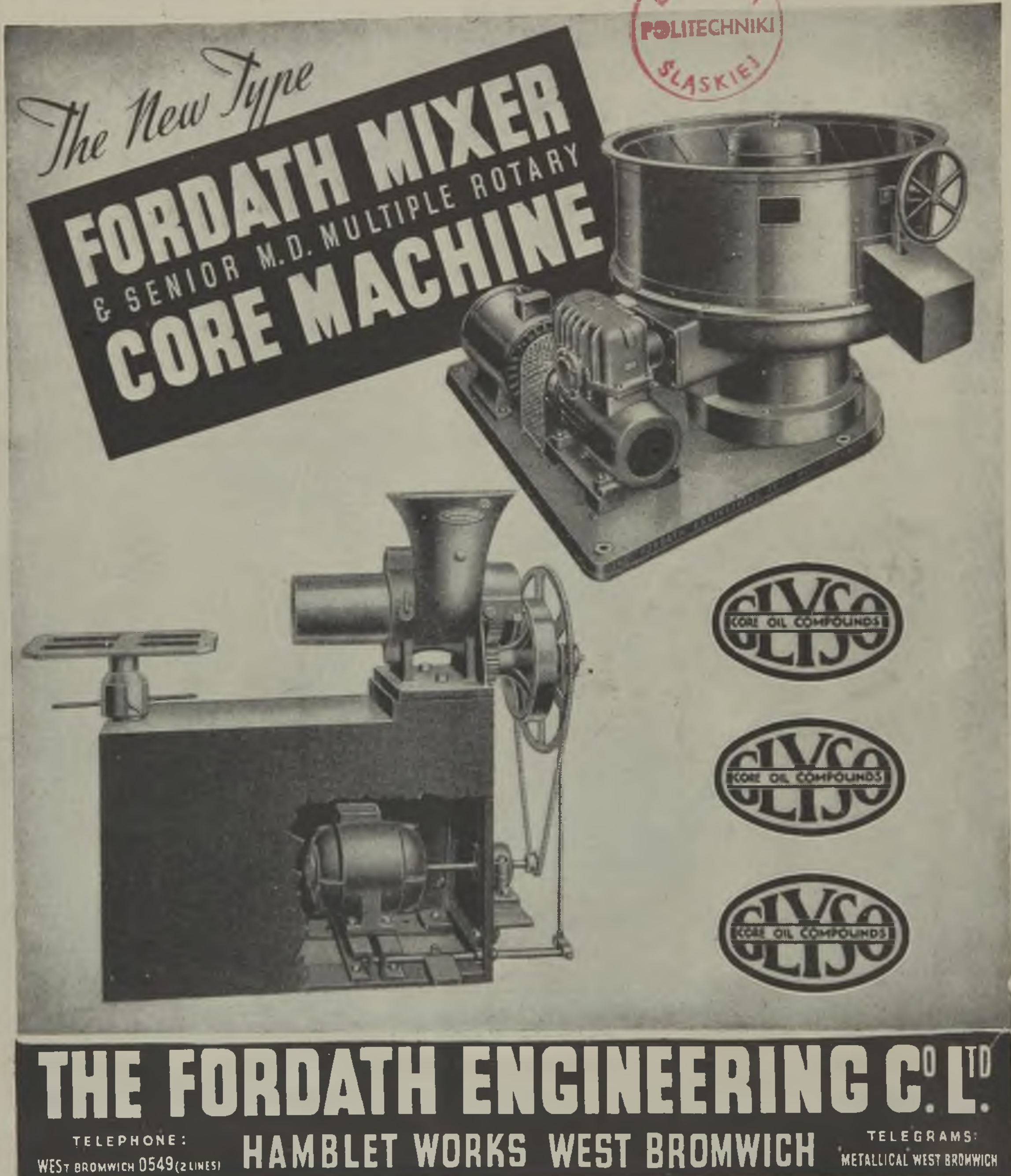
WITH WHICH IS INCORPORATED THE IRON AND STEEL TRADES JOURNAL

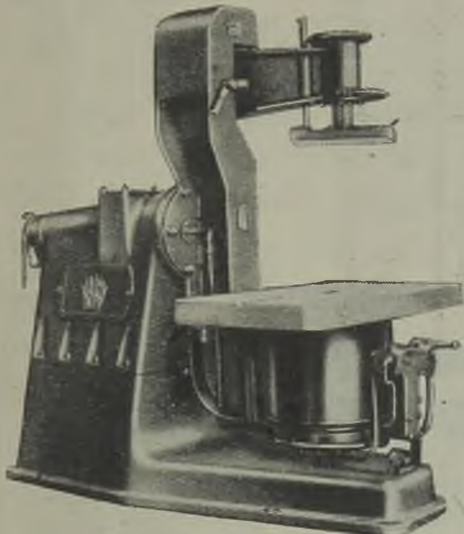
VOL. 72. No. 1445. APRIL 27, 1944

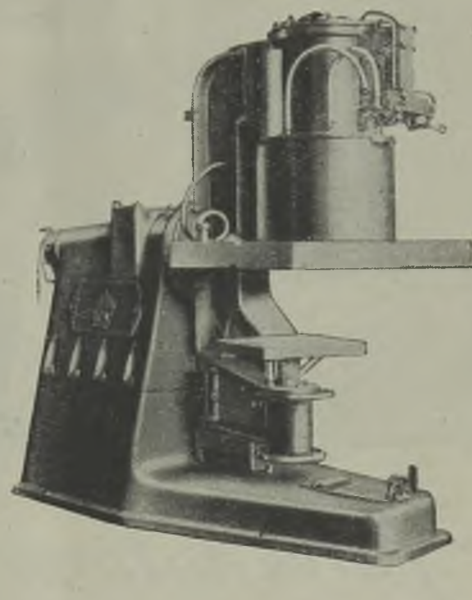
Registered at the G.P.O. as a Newspaper. Offices: 49, Wellington Street, Strand, London, W.C.2.

Single Copy 6d. By Post
Annual Subscription, H
and Overseas, 21/- (Prepa




The New Type
FORDATH MIXER
& SENIOR M.D. MULTIPLE ROTARY
CORE MACHINE
GLYSO CORE OIL COMPOUNDS
GLYSO CORE OIL COMPOUNDS
GLYSO CORE OIL COMPOUNDS
THE FORDATH ENGINEERING Co. Ltd.
TELEPHONE: WEST BROMWICH 0549 (2 LINES)
HAMBLET WORKS WEST BROMWICH
TELEGRAMS: METALLICAL WEST BROMWICH





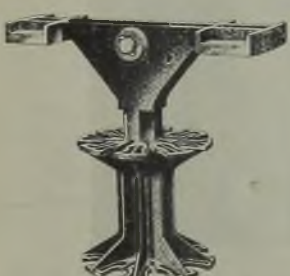
Mr. Huntsman breaks a spring

Benjamin Huntsman, the inventor of crucible cast steel as we know it to-day, practiced as a Watch and Clock Maker in Doncaster in the middle years of the eighteenth century, and the constant failure of British Spring Steel caused him to experiment and later perfect the manufacture of the fine quality steel which made him world famous. We propose to illustrate some of the interesting episodes from Mr. Huntsman's life in this series of advertisements.

BROCKHOUSE CASTINGS LTD. now produce Steel Castings to all commercial specifications and specialise in Heat Resisting Steels produced by the modern equivalent of the Huntsman process.

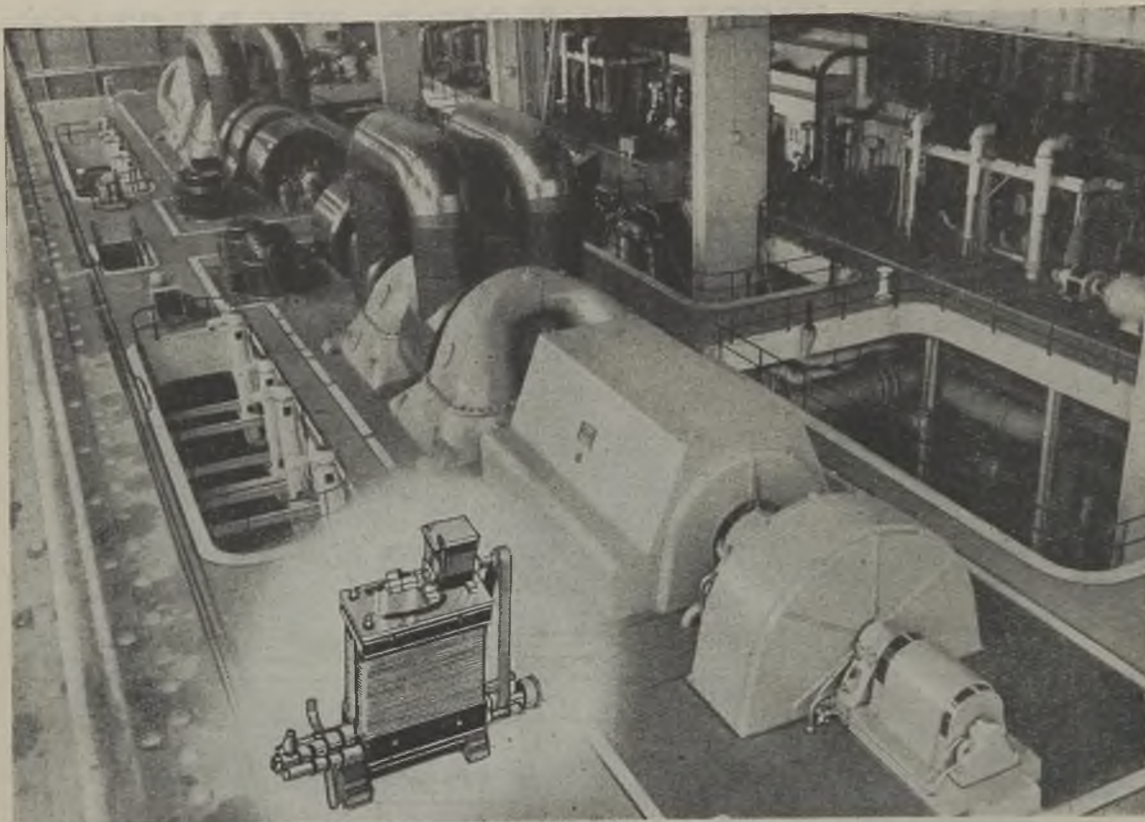
CASTINGS IN STEEL

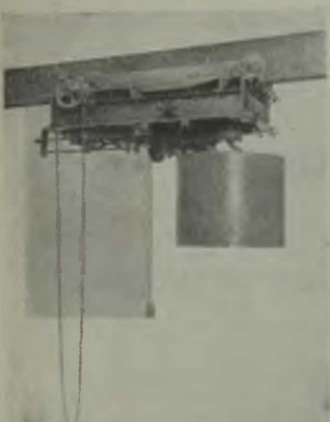
BROCKHOUSE CASTINGS LTD.
WEDNESFIELD · WOLVERHAMPTON
Telephone : Fallings Park 31221



Gun Quenching Jig cast in Heat Resisting Steel by BROCKHOUSE CASTINGS LIMITED

HOLDENS





FOUNDRY TRADE JOURNAL

Established 1902

WITH WHICH IS INCORPORATED THE IRON AND STEEL TRADES JOURNAL

49, Wellington Street, London, W.C.2.

WARTIME ADDRESS to which all communications should be sent :—
3, Amersham Road, HIGH WYCOMBE, Bucks.
'Grams : "Zacatecas, High Wycombe."
'Phone : HIGH WYCOMBE 1792 (3 lines).

PUBLISHED WEEKLY : 21s. per annum (Home and Overseas

OFFICIAL ORGAN OF :

COUNCIL OF IRONFOUNDRY ASSOCIATIONS

Chairman : FitzHerbert Wright, The Butterley Company Ripley near Derby. Secretary : V. Delport, 2, Caxton Street, Westminster, S.W.1.

Participating Associations : British Bath Manufacturers' Association; British Ironfounders' Association; British Malleable Tube Fittings Association; Cast Iron Axlebox Association; Cast Iron Chair Association; Cast Iron Heating, Boiler and Radiator Manufacturers' Association; Cast Iron Segment Association; Greensand Pipe Founders Association of Scotland; Ironfounders' National Confederation; National Association of Malleable Ironfounders; National Ingot Mould Association; National Ironfounding Employers' Federation Association of Automobile and Allied High Duty Ironfounders; British Cast Iron Research Association (affiliated); British Grit Association (affiliated); Institute of British Foundrymen (affiliated).

INSTITUTE OF BRITISH FOUNDRYMEN

PRESIDENT, 1943-44 : D. Sharpe, Foundry Plant & Machinery Ltd. 113 West Regent Street, Glasgow.

LIST OF SECRETARIES—

General Secretary : T. Makemson. Acting Secretary, J. Bolton, Saint John Street Chambers, Deansgate, Manchester 3.

BRANCHES

Birmingham, Coventry and West Midlands : A. A. Timmins, F.I.C. 33, Carters Lane, Quinton. Bristol and West of England: A. Hares, 20, Greenbank Road, Hanham, Bristol. E. Midlands : S. A. Horton "Three," Mostyn Avenue, Littleover, Derby. Lancs : H. Buckley, Ellesmere, Norfolk Avenue, Burnley. London : V. C. Faulkner, 3, Amersham Road, High Wycombe. Middlesbrough (*pro tem.*) : J. K. Smithson, North-Eastern Iron Refining Company, Limited, Stillington, Stockton-on-Tees. Newcastle-upon-Tyne : C. Lashly, Sir W. G. Armstrong, Whitworth & Co. (Ironfounders), Ltd., Close Works, Gateshead. Scottish : J. Bell, 60, St. Enoch Square, Glasgow. Sheffield : T. R. Walker, M.A., English Steel Corporation, Ltd., Sheffield. Wales and Monmouth : A. S. Wall, 14, Palace Avenue, Llandaff, Cardiff. West Riding of Yorkshire : Douglas Jepson, M.Sc., 9, Ambleside Avenue, Bradford. South Africa : B. P. Skok, Mutual Building, Johannesburg.

SECTIONS

Burnley : H. Buckley, Ellesmere, Norfolk Avenue, Burnley, Lancs. East Anglian : A. N. Sumner, 516, Norwich Road, Ipswich. Falkirk T. R. Goodwin. "Viewfield," Falkirk Road, Bonnybridge. Lincoln : E. R. Walter, Ph.D., The Technical College, Lincoln.

ASSOCIATION OF BRONZE AND BRASS FOUNDERS

President : H. Bissell, J. Stone & Co., Ltd., London. Secretaries, Heathcote & Coleman, 25, Bennetts Hill, Birmingham, 2

THE INSTITUTE OF VITREOUS ENAMELLERS

President : W. H. Whittle, W. H. Whittle, Limited, Eccles, near Manchester. Chairman : W. Todd, Parkinson Stove Co., Ltd., Stechford, Birmingham. Hon. Sec. : W. Thomas, A.I.C., Bank House, High Street, Rickmansworth, Herts.

FOUNDRY TRADES' EQUIPMENT AND SUPPLIES ASSOCIATION

President : G. E. France, August's, Limited, Thorn Tree Works, Halifax. Honorary Secretary : K. W. Bridges. Assistant Secretary : Miss L. Cox, 52, Surbiton Hill Park, Surbiton, Surrey.

WELSH ENGINEERS' AND FOUNDERS' ASSOCIATION

President : W. E. Clement, C.B.E., Morfa Foundry, New Dock, Llanelly Secretary : J. D. D. Davis, 1, St. James Gardens, Swansea.

BRITISH CAST IRON RESEARCH ASSOCIATION

Alvechurch, Birmingham. 'Phone and 'Grams : Redditch 716.

Scottish Laboratories :—Foundry Technical Institute, Meek's Road Falkirk. ('Phone : 332.)

FOUNDRY TRADE JOURNAL

Established 1902

WITH WHICH IS INCORPORATED THE IRON AND STEEL TRADES JOURNAL

Vol. 72 Thursday, April 27, 1944 No. 1445

£8,700,000

During the debate in the House on the Education Bill, the cost for the expansion of technical and general adult education was at first estimated at £2,700,000, but later, after strong protests by the representatives of both industry and education, Mr. Butler raised the estimate to £8,700,000. This figure is deemed by many still to be inadequate. We are ill-informed as to whether this grant has to take care of agriculture, mining, textiles, and the brewing and chemical industries, and to what extent these industries are in need of additional craft training facilities. We do feel, however, that the thorough re-equipment of our technical schools and colleges should have prior consideration, if for no other reason than because of the great contribution they have made to the winning of two wars. Because many of our technical colleges are old, much of their plant is ready for either the scrap heap or the museum. What one can buy for £8,700,000 depends on the wisdom of the policy of the buyer.

We suppose the process will be for each regional educational authority to apply for a grant, and the ones which will receive the most favoured treatment will be those which carry the hall-mark of true worth. This cachet can only be obtained by the local educational authority providing it is assured in advance of the co-operation of local industry. Thus a scheme which carries the phrase, " there are 15 foundries in the area served, which should provide an annual influx of 25 to 30 students for the proposed foundry workshops," will not carry as much weight as one reading—" The local foundry industry has guaranteed an annual intake of 20 students." This can only be done by employer co-operation. Again, a very high percentage of the machinery—especially machine tools—belongs to the Government, and much of it can be expected to come on to the market during the immediate post-war years. In this connection we suggest that the educational authorities should be granted priority. Here, again, the practical advice of the industrialist will be required.

The division of this £8,700,000 will not be decided by industry, but by the educational authorities, and it is only natural that they will cater for those sections of industry which lend the most practical support. Hence the time to stake one's claim is now. It will come as a surprise to many foundry owners, when they meet higher officials of the Board of Education for the first time, to find how great is their knowledge of the practical requirements for teaching foundry science. For instance, being well aware of the output of even quite small commercial cupolas and the difficulty of the useful disposal of its production by students, the officers of the Board have already caused to be designed a small plant exhibiting all the essential features of its larger counterpart, but with an output eminently suited for teaching purposes. After trial, we understand, this is to be standardised for this purpose. A letter to " The Times " signed by a number of distinguished industrialists and trade union leaders very strongly urges the immediate appointment of a commission to review the field of technical education, especially to examine and " to define the regions into which the country would naturally fall, according to its geographical and industrial needs," and then " to recommend a system of administration, both economic and executive, which would be directive for such regions."

This aspect was taken up in a further letter from Sir Harold Hartley, F.R.S. He referred to the fact that Mr. Butler had appointed on April 5 a Committee to consider the needs of higher technological education and the relationship of technical colleges and universities. We were pleased to see that he interposed a plea for con-

(*Continued overleaf, col.* 1.)

Contents

£8,700,000, 343.—Resettlement after Demobilisation, 344.—Notes from the Branches, 344.—Ironfounding Industry Fuel Committee, 344.—The Laboratory and the Foundry, 345.—Standard Costing and Cost Control, 351.—Higher Technological Education, 354.—Siting of New I.C.I. Factories, 354.—Control in the Magnesium Foundry, 355.—Using a Pattern as Corebox, 358.—News in Brief, 360.—Personal, 360.—Company Results, 362.—Obituary, 362.—Raw Material Markets, 364.—New Companies, 364.

RESETTLEMENT AFTER DEMOBILISATION

As part of the resettlement scheme and as a means of furthering the supply of skilled workers in industry to meet abnormal deficiencies in the post-war period, industrial training will be introduced to assist men and women released from war service who are in need of a course of training to enable them to obtain employment of a kind likely to lead to permanent resettlement, having regard to their capacity and to the estimated probable needs of industry. A statement issued by the Ministry of Labour states that in order to provide opportunities for those who are the last to be released from the Forces, the training scheme will be continued until the end of the demobilisation of persons who have served during the period of hostilities.

The scheme will apply to men and women released from the Armed Forces, Merchant Navy, Civil Defence Services, National Fire Service, Police Auxiliaries and Civil Nursing Reserve and to persons whose war service has been on other types of work of national importance, including industrial work. In administration of the scheme special care will be taken to ensure that men and women who have served in the Armed Forces and are eligible for training under the scheme receive their training as early as possible after release from the colours, and, if at any time the facilities for training are insufficient to meet the needs of all applicants without delay, men and women released from the Forces or from the Merchant Navy will, in general, be admitted first.

The training will be given in Government Training Centres administered direct by the Ministry of Labour and National Service and also, under arrangements made by the Ministry, in consultation with the Board of Education and the Scottish Education Department, in Technical Colleges, or in other educational institutions. During training adequate allowances, including supplementary allowances in respect of dependants will be paid. The detailed application of the training scheme to the different industries will be worked out in consultation with the representative organisations of employers and workpeople concerned.

£8,700,000

(*Continued from previous page.*)

sideration to be given to industrial design. The main point of his letter, however, was that the regions suggested by the earlier letter should have as the lynch pin of the structure one of the great technical institutes "equipped with the most modern facilities for teaching and research, to which all technical colleges and schools in the area would be affiliated, so that it would act as a focus for the planning of technical training in the area." We heartily endorse this, as it would tend to prevent the over-crowding of the envisaged junior technical schools with "dud" eleven-year olds.

NOTES FROM THE BRANCHES

South Africa.—Some fifty members were present at the January meeting held in Johannesburg, when Mr. G. S. Reid presented a Paper on the "Extrusion of Brass and Copper." Though not exactly a foundry subject, a good discussion followed, in which a wide range of related topics was introduced.

On February 10, over 80 members were the guests of Iscor, when an inspection of the Vereeniging works was made. During the morning, which was spent in the foundries, much interest was shown in 5½-ton ingot moulds cast in green sand, and in a 30-ton cast steel rolling mill housing.

During luncheon, over which Dr. Meyer presided, Mr. J. M. Stones, the Branch-President, expressed the thanks of the members for the hospitality shown. After Mr. Tonge had seconded, Mr. Simpson, the works manager, said that the present monthly output of 1,400 tons of grey iron castings was shortly to be increased to 1,600 tons. After luncheon, the party spent an instructive afternoon visiting the blast furnaces and rolling mills.

The Cape Town section has been successfully launched, with Mr. L. Rawley as chairman and Mr. K. J. Zwanziger as hon. secretary. It starts with an initial membership of 55.

IRONFOUNDING INDUSTRY FUEL COMMITTEE

IRONFOUNDRY FUEL NEWS

Most ironfounders will, by now, be aware of the existence of the Ironfounding Industry Fuel Committee which was formed more than a year ago to assist the whole of the ironfounding industry to save fuel. Contacts between ironfounders and the Committee are generally made through the Committee's Regional Panels, of which there are fourteen, covering the whole area of Great Britain. The principal activity of the Panels is the visiting of foundries to give advice on fuel economy problems.

More than 200 firms have so far been visited, and an appreciable amount of information on fuel saving in ironfoundries has been obtained. It is intended to make this information as widely known as possible by means of brief notes in this Journal under the heading of "Ironfoundry Fuel News." This medium will also be used for announcements, etc., in connection with the fuel economy campaign in the industry.

An Outsize Electric Furnace Installation.—Mr. W. O. Philbrook, writing in "Mining and Metallurgy," gives the following details as the most outstanding example of an integrated electric steel plant. One blast furnace of 27 ft. hearth diameter and 450,000 short tons capacity supplies hot metal for four 250-ton tilting open-hearth furnaces. These prepare liquid charging metal for nine electric furnaces of 750,000 tons annual ingot capacity.

THE LABORATORY AND THE FOUNDRY*

Applying science to the whole field of foundry work

By D. FLEMING

Long ago, probably some 6,000 years ago, an impure form of copper was smelted and cast. It is natural to suppose that in these early times one man would direct the whole of the operations, and whilst the first man to succeed in smelting and casting copper was no doubt justifiably proud of his success, it is very doubtful that he would realise that he was to be the father of the three great families that are now broadly classed as foundrymen, metallurgists, and chemists, yet such was the case. It is hardly necessary to define a foundryman! And just about a year ago the Lancashire branch was very ably given a glimpse into the early history of the foundryman's craft by Mr. Brown.

A metallurgist is essentially "one skilled in the art of extracting or working metals," and thus it will be seen that as time passed and operations were conducted on a larger scale, the function of the metallurgist would tend to be split. The foundryman took to his branch a part of the art of working metals, the smith at his forge took another, and as extraction slowly became a process apart from the foundry and more a specialised function of the miner and melter, so did the extraction side of metallurgy become a separate family branch.

The copper age introduced by the successful smelting of copper ores led progressively to the bronze age, when copper was smelted with tin ores, and/or, lead ores, there being some confusion between these two in the early days and at a still later date to the age of brass produced by the smelting of copper and zinc ores. Throughout all these changes, the smelting of the metallic copper with some other ore or ores was often performed in the foundry proper so that the intermingling of the family persisted in part over a long period.

It can well be imagined that among these early foundrymen-smelters were some who became more interested in what happened when different materials were added to, and smelted with, the various metals and ores, than in the later use to which the alloys were put. This branch similarly tended to separate, although they remained for thousands of years essentially practical experimenters who were not very concerned with why the various results were obtained, but who had, by now, a great knowledge of the results that were obtained when many substances were mixed and heated together, both metals and non-metals.

The centre of civilisation at this time was ancient Egypt, and this branch of ancient Egyptians who were in the main now the priests attached to the temples, had much knowledge of copper, gold, lead, silver and tin, iron, and many minerals. They were also conversant with the manufacture of glass, soap, resins, pigments and dyes. Visiting Greek-Romans who were much impressed by the art of these Egyptians in metal working and these other crafts, called these arts by the collective term "The Art of Egypt"—the Egyptian word for Egypt being "Kemi." From this description "The Art of Kemi" has developed our present word of "chemistry."

Greek Philosophy

Thus the third member of the family was evolved from the same root as the foundryman and the metallurgist. The Egyptians, however, were very practical in their treatment of the subject, and do not seem to have bothered much about explaining their processes or theorising, whilst the Greeks were theorists without parallel, having many wonderful theories to explain almost everything in the world with little or no facts to support them. In the seventh century A.D., however, the tribes of Islam conquered the whole Mediterranean area, and when these conquerors settled down, they started a fresh era of learning and knowledge was sought all over the area. Thus, in the field of chemistry the arts of Egypt were joined with the theories of Greece.

The first really great chemist lived in this period under the Caliph Harun Al-Rashid, and was called Jabir-Ibn Hayyan, generally known as Geber. Whilst much time was wasted, even after his day, in fruitless searches for the philosopher's stone and synthetic gold, and whilst chemistry was made subservient for a period to the art of medicine, progress never really stopped from this time until the beginning of the 19th century, when Dalton's atomic theory laid the foundations of modern chemistry as it is known to-day, which provided a new impetus.

Chemistry has, in fact, progressed since theory and practice were married in 700 A.D. has paused, when theories were laid aside, as in the search for gold, when a promise of quick riches seemed more important than the advancement of knowledge, and has leapt forward on each occasion when some new theory has successfully explained a set of hitherto puzzling facts.

The revolution in chemistry which took place with the turn of the century, however, was to have effects probably as far reaching as the French Revolution which had just preceded it. This is illustrated when it is realised that at the time of the publication of Dalton's atomic theory in 1807, the now famous chemists, Berthollet, Berzelius, Carlisle, Cavendish, Daniell, Humphrey Davey, Dumas, Michael Faraday, Gay-Lussac, Liebig, Nicholson, Priestley, Wollaston

* A Paper read before the Lancashire Branch of the Institute of British Foundrymen, Mr. A. Hopwood presiding.

and Avogadro, were all allies, chemistry made enormous strides during the 19th century, and this fact, together with the new spirit of freedom after the French Revolution, was to lead to a general forward surge in all the sciences.

What of the Foundryman?

It would appear that when chemistry finally broke away in the time of Islam, from the essentially practical Egyptian method to the union of theory and practice of Geber and his successors, the foundry craft remained untouched to any degree by the influx of theory and continued to be almost wholly practical. Further, this state of affairs appears to have lasted almost to the close of the last century. Thus in the late 1800's, the foundryman was still an essentially practical craftsman, his knowledge of his craft being the result of hard won experience gained by his predecessors over a period of some 6,000 years, and handed down from generation to generation.

This method does not, of course, preclude progress, as knowledge is slowly accumulated by a process of trial and error leading to the formulation of a vast number of impiracisms. It also leads to an additive knowledge of facts, through the observations of happenings occurring during the various processes of the trade made by countless numbers of craftsmen as the generations succeed one another. Many facts are observed, however, the significance of which is missed. Many things are learnt by one man, only to be lost at his death until someone later—perhaps very much later—re-discovers them. Many fallacies are handed down as facts, due to the impossibility of specifying all the necessary data required when information is carried from generation to generation and from workshop to workshop.

Limitations of Craftsmanship

In other words, what was found by trial and error to be the best or only way of producing a certain alloy or job satisfactorily under one particular set of conditions, may prove to be a certain way of producing bad material or rejects under another different set of conditions existing at a later date or in another workshop, yet having performed the job satisfactorily as in the first case the practical man is inclined to say, from experience, which is his guiding star "do so and so and all will be well."

For example, a foundryman might be in the habit of producing a gunmetal in a pit fire which runs with a slightly reducing atmosphere. One may suppose that gas pick-up is precluded, as he also uses a fire-refined brand of copper with a high oxide content. He may then perhaps reasonably say "melt the copper and lift the temperature to a point at which it will dissolve the mixings and still be at casting temperature, remove from the fire, deoxidise with phosphor copper, add the zinc and tin, stir, skim off and cast and all will be well!" But what will happen if this ruling is passed on to a colleague whose pit fire atmosphere is also reducing—perhaps decidedly so, and who uses, not a copper carrying a high oxide content, but an electro-copper carrying occluded hydrogen, or at least little or no oxygen—surely a gassed-up melt is a reasonable expectation.

Personally the Author has a great admiration for the degree of craftsmanship which was attained by the practical Egyptian, and a still greater admiration and respect for the foundry craftsman of more recent times. In fact, he cannot but marvel at the degree of skill acquired against such terrific odds. Many of the castings then produced remain to testify to his craftsmanship and to give pause to any man who would decry his efforts. Yet the Author must unhesitatingly state his belief that not along the road of the purely practical does real progress lie. Only when theory goes hand in hand with practice can practice be purged of its pitfalls and result in swift progress unhampered by such an infinity of apparent contradictions through which one dare only tread along very well-worn paths for fear of being swallowed in the bogs of uncertainty and disaster which lie off the beaten track.

The Re-entry of Theory

To return to the sketchy historical outline presented above, it would appear that in the last century there was a general upsurge in the application of the sciences, and that amongst other people affected by this impact were the family relations, the extraction metallurgists or smelters. It should be noted here that the metallurgical industries had, however, been continuously keeping more or less in step with the advances made in chemistry, with which their relationship had always remained of a closer nature than that existing between chemistry and the foundry owing to the very nature of the processes involved.

It was at the beginning of the last century, however, that Dalton set chemistry on the course along which it has since so rapidly advanced. It was at the beginning of the last century that it was first settled that steel possessed its unique properties of hardenability because of its carbon content. The conditions were arriving which made a reliable system of analytical chemistry assured and which foreshadowed the control to be adopted in the steel and iron producing industry as invention after invention followed throughout the century. Of these the Bessemer steel furnace in 1855 is typical, changing the steel output as it did from something like 51,000 tons per annum for the whole of Great Britain, at a price of about £50 per ton to something like 830,000 tons per annum in Sheffield alone at prices of from £4 to £10 per ton.

The analyst, of course, at first only assisted the pig-iron and steel producer to investigate his products in more detail, but slowly the steps in this process came to be more and more based on analytical data from the raw materials in the shape of ores, fluxes and fuels to the finished products as pig-irons, steels and slags, etc. Much pig-iron was an intermediate product in the process of steel making, and for this purpose analysis came to be the most important method of judging its suitability. Similar trends no doubt occurred, however, in the other metal producing industries.

With the pig-iron producers making most of their iron to analysis, pressure came to bear on the iron-foundries to buy their iron "to analysis" rather than by the old and trusted method of a number based on general properties and fracture such pressure, when accompanied by a general rise of interest in scientific method throughout industry, by the knowledge that the producing industry itself favoured this method and the fact that a complaint of off standard fracture could be answered by the retort that the analysis was all right, a fact that the founder himself could not verify, no doubt combined to cause a number of foundries to employ their own analysts to check incoming material and to see whether they could not employ similar methods of control in the remelting of their own irons for foundry use a process which was no doubt also coming into vogue in foundries attached to the works of the primary pig-iron manufacturers.

The Invasion had Begun!

This dramatic description is used here with intention—the advent of the laboratory as an addition to the foundry was to have two hall-marks of an invasion. It was to start the broader use of theory in the arts of founding and bring an infusion of new ideas. It was to be resisted and resented by the original sole occupiers of the territory. It is this latter fact which in the Author's opinion constitutes the most unfortunate factor in the whole of the story of the foundry since the turn of the century it has led to a false relationship beween the foundry and the laboratory which persists to-day in large sections of the industry and which must be removed before true and rapid progress can be achieved!

A question one could easily ask here is "Who was to blame for this state of affairs"—the analyst or the foundryman? To try and shoulder the blame on to either would no doubt be a fatal mistake—it would once again stir up the very antagonism, the last vestiges of which it is felt must be removed for the mutual benefit of the industry *per se*, and of the men who are to carry it through the future.

The causes of this obstinate antagonism, however, must be rooted out, both sides must face the truth and not leave remnants of bad feeling in their midst. That some of this antagonism does in fact still exist surely cannot be denied. A meeting of this Branch of the Institute must surely be said to represent a cross section of the more progressive members of the industry and yet—can it be denied that words have several times been heard when theorist and practical men have joined the fray in local discussions—words beyond the point at issue, seeking to discredit one or the others right to an opinion. (If such things can occur in the meetings of a body with aims such as those of this Institute, surely in the industry as a whole the situation is worse. It is as if cases of a plague were to occur in a disinfectant factory—either the situation outside is extremely bad or the disinfectant is not as effective as it should be.)

Returning to the conditions prevailing when the analyst entered the ironfoundry, a picture is obtained which may throw some light on this point. Whereas formerly the practical foundryman had placed his reliance on his wide experience of different grades and brands of pig-iron blended in certain ways, controlled largely by fracture and careful attention to his practice, and judged by his actual results, almost total reliance was placed by the newcomer on analysis.

The Analyst's Viewpoint

The analyst throughout the whole of his training had the emphasis laid on a particular way of thinking. The scientist is only a scientist when he used this way of thinking (at any other time he is just an ordinary mortal, the whole scientific method is built round organised knowledge and organised thought; known facts are examined, and their inter-relations are studied until a logical hypothesis can be put forward as to why they are so related; this hypothesis is then tested—it is re-examined to see whether some new conclusion can be reached by its application; whether it can be said, if this hypothesis is correct, then when under controlled conditions, such and such is done, so and so will always result. Only when under all the test conditions which can be applied to it does the new hypothesis predict the correct answer, can it be accepted as a theory on which to build.

When the analyst entered the field of grey iron control, he did so firmly believing that the theory that if two irons have similar analyses, they would have similar properties, was a correct theory, and that. therefore, in good faith, he entered the field riding on a fallacy, due to the lack of knowledge possessed by the men of that period concerning the factors we now class under the headings of "hereditary" effects in pig-iron and "innoculation," etc., and that he was further misled by the lack of knowledge that altered melting conditions could lead to profound structural differences as in irons carrying very small amounts of trace elements, such as titanium, of which his system of analysis did not take much account.

It is easy to be wise after the event, in the light of this later knowledge, but is it any wonder that any analyst trained as he was with faith in the theories of his time, faith in his own figures which were concrete and reproducible to a high degree of accuracy, was staunch in the defence of his position, when the foundryman, with his essentially practical background, declared the product to vary occasionally in a marked manner, not possessing the standard properties these new-fangled figures indicated—surely he must, being only human, have felt that the foundryman, who compared with his own precise methods, appeared to work almost entirely by rule of thumb, was the more likely to be causing these variations by unnoticed differences in his handling of the material in the foundry. Here he was lost! He could not argue with the foundryman about the latter's practice without being on unfamiliar and to him uncharted ground. He lacked the necessary experience possessed by the practical man; he was used to an entirely different

The Laboratory and the Foundry

method of approach from that used by the latter, and found it difficult even to accept his conclusions the fact that he, and his father before him, and his grandfather before him, had always done a thing that way, did not make that way right to a man trained to have a mass of reasoned and tried theories behind his methods.

If he did attempt to criticise in the foundryman's field, he was almost certain through lack of factual data to make mistakes which were easily perceived by the practical man, or to appear to make a lot of high sounding statements about something which to the foundryman "was nowt but what he'd known sin' he were a lad."

The Foundryman's Point of View

Perhaps this was his predominant feeling:—Here was a man, who thought himself a scholar, using high sounding phrases, quoting a lot of figures as if they settled the matter, when any practical man could tell he knew nothing of the foundry craft, set up in his laboratory fiddling with his balances and beakers, flasks and furnaces, and then coming down to the foundry saying that this or that had not been done properly, as the figures were not right, as if he had been there to see it, which he had not, or saying they must be right as the figures were right, when any proper foundryman could see that things were not right at all—a lot of bottled nonsense—making a job for himself in his white coat and clean clothes.

If many foundrymen thought this, surely they had much to justify them. It is possible to be a competent analyst and to know nothing of founding, also the foundryman with his practical judgment which, though it was not based on a set of beautifully stated theories, was nevertheless the result of much accumulated wisdom, was no doubt in many cases better equipped to produce suitable metal in those days when he was left to use this judgment in the light of his past experience.

Later, those men of the laboratory, who were the most truly scientific and perhaps also through the patience which the laboratory can breed, the more understanding of the emotions of the foundryman, were to collaborate with those foundrymen who stretched out a friendly hand to them, as it is not for a moment suggested that in all cases the professional disagreements bred antagonism or distrust, this collaboration was to lead to the laboratory man seeing that there was truth in the foundryman's assertions, it was to lead to him calling in the microscope to aid in the investigations of structures, as the steel men were using it to investigate structural changes in steels, and eventually his new data, and the foundryman's experience were to lead to the modified theories held to-day, the older theory of necessity being amplified once it was proved that it failed to pass the test of predicting the correct result in all circumstances.

An example from the ironfoundry has been chosen to illustrate what is believed to be the unfortunate result of an unwarranted stress being laid on analysis, but no doubt similar examples could have been cited from the non-ferrous foundry as, in personal experience, melting conditions sometimes found in the latter can exert a more profound influence on the test results obtained from, say, a gunmetal type bronze, for instance, than variation of a whole 1 per cent. in the tin or zinc content would exert were the melting conditions all that normal "good practice" requires.

Recapitulation

An attempt has been made to show that those who form the bulk of the personnel of the laboratories associated with foundries to-day, *i.e.*, the chemists and metallurgists, are in fact members of the same family as the foundrymen. In other words, they share with the practical man, as the latter shares with them, the same noble ancestry. Moreover, progress is made by the practical man alone, but that such progress is slow and restricted, whilst theory is merely a pipe-dream until it is based on and translated into practice. Not until theory and practice walk hand in hand can true progress be maintained.

The Author has further tried to show that the antagonism which arose between the foundry and the laboratory was largely due to a mass movement towards the extension of the sciences, which was symptomatic of the times, when so much had been, and was still being achieved to an enthusiasm which lead almost inevitably to an overstepping of the hard facts of the case, and to an attempt, in the case of the foundry, to make analytical figures into another philosopher's stone or cure-call, an attempt which, when it failed, was further complicated by the fact that the protagonists were each used to differing ways of thought.

One has to learn to walk before one tries to run—a trite saying but a true one—cannot it be agreed that had the introduction of scientific method into the foundry come about in a gradual way over a much longer period of time, there would not have been any antipathy towards the change which would have appeared to be merely normal growth and development?

Cannot it also be agreed that any debt which was owed to the foundryman by the laboratory as a redress for these early mistakes has been more than repaid, due to the fact that the introduction of scientific ways of thought which the laboratory brought with it has resulted in great advances in the foundry? The way of thought, the method of approach to a problem, the true use of theory as a stepping stone to further knowledge—these were the essential factors in the invasion of the foundry by the laboratory.

The Outcome of Invasions

At the present time, the word invasion no doubt conjures up pictures and ideas of a rather special kind. How have the invasions, about which one can be more calm in outlook, been dealt with, however? Firstly, the invader can be dealt a blow and ejected forthwith; secondly, after prolonged battle he can finally be ejected; thirdly, the invader can have a complete victory and make slaves of the conquered subjects; fourthly, the invaders can be conquered and made slaves of the original owners of the territory, and lastly, the invaders can be absorbed and made citizens of the country they invaded, intermarriage then serving to yield the best combination of the qualities of invader and invaded.

As a nation the British seem to deal in only two of these methods. It either ejects the invader before he has really started or it absorbs him to the benefit of the race. The latter it has done many times, and the results would surely indicate this to be a sound policy. This method is the method that should be used in the case of the laboratory and the foundry. Let us absorb this invader, neither allowing the foundry to become a slave of an alien laboratory, nor the laboratory to become a slave of the foundry—neither will yield true fruit in subjugation. Let us arrange a marriage, each partner keeping their own sex, as it were, and each contributing their own complementary talents. But, let us at the same time remember that, whilst a marriage should be a perfect example of wholehearted collaboration, a good wife does not tell her husband how to conduct his business, nor does a good husband interfere in the kitchen (and neither says of their children "I created this child, it is mine alone").

The Foundry Laboratory

When a woman marries, however, she takes her husband's name, and it is now proposed to reject the discussion of the laboratory and the foundry and speak of the foundry laboratory as it should be. What sort of person should control this department? The first absolute essential should be that he is a man whose major ideal is the advancement of the science of founding. A man not with a bias towards analysis as the main function of the laboratory, but a man who is concerned about the whole technical side of founding, who has no trace of the white coat complex so often associated with the analytical laboratory, but who will get down to the job on the plant and make a detailed study of his co-foundryman's problem, so that when he uses his technical resources and equipment and finally produces data, or a theory, to explain the happenings being investigated, he will be using true facts as a basis for his deductions, and his theory will be a working theory capable of being subjected to test on the plant in a practical manner which his colleague can judge and appreciate. He should deal not merely in theory, but in applied science.

He will need to possess a scientific mode of thought; a fund of patience, and a knowledge of analytical chemistry, metallography, physics, some knowledge of electrical and mechanical engineering, an acquaintance with the principles of costing, a gift for improvising when special apparatus is not available, and an understanding of men. These tools he will use in the service of, and as auxiliaries to, "The Science of the Founding," for first and foremost he will be a foundryman.

New Methods Available

The foundry laboratory will differ in many respects from that of the pure analyst, and will vary also with the particular field of the foundry concerned. No doubt the equipment will always include that necessary for the complete analysis of foundry materials by the old established chemical methods, but this will tend to be used more and more on investigational problems. There is in the field of routine metal control especially a pressing need for much faster simplified analytical methods. In this respect, the particular methods used will depend largely on the alloys in use and the financial resources available. The spectrograph offers an almost unique solution to the large firm dealing mainly in high purity metals or alloys with one constituent in large excess, and only small amounts of alloying elements each in general amounting to no more than 5 per cent. of the alloy and preferably less, although this limit figure is very dependent on the particular case.

An illustration of the use of this instrument is provided in the plant of the Campbell, Wyant and Cannon Foundry Company, of Muskigon, Michigan, U.S.A., where a process developed by Vincent, Sawyer and Simpson provides an analysis of cast iron for chromium over the range 0.01 to 1.50 per cent.; copper from 0.20 to 3.00; manganese, 0.30 to 1.25; molybdenum, 0.07 to 1.50; nickel, 0.15 to 2.00; and silicon, 0.5 to 4.00 per cent. in 7 min., this allowing drifts in furnace operations to be corrected and a rigid specification maintained.

This instrument, however, is too costly for the smaller organisations at the present time, and other methods of approach will have to be used. Much useful work has already been done in two directions which show promise. The first is that of polarography. This method is based on the interpretation of the current-voltage curves that are obtained when solutions of materials which can be electro-reduced or electro-oxidised are electrolysed in a cell in which one electrode consists of mercury falling dropwise from a fine bore capillary tube.

Briefly, the voltage across the cell is slowly increased, and the value of the current flowing through the cell determined continuously during this operation, a current-voltage curve is thus obtained in which there is a number of steps, each step corresponding to a particular element, the voltage at which each step occurs has, under properly standardised conditions a specific value for each element and thus serves to identify the elements present, and the height of each particular step above the preceeding one is a measure of the concentration of the element causing the step, thus enabling the amount present to be determined. Polarographs as these curves are called used to be carefully plotted from large numbers of measurements, and the process was lengthy, tedious, and little known. Work is now proceeding, however, with modern methods of measurement of step positions and values, using electronic indicating instruments and even cathode ray tubes to give instantaneous graphs or curves by electrical means, and polarography has

The Laboratory and the Foundry

already been applied to the rapid determination of zinc, iron, lead and nickel, in non-ferrous alloys, to the determination of copper, nickel, cobalt, manganese and chromium in steel, and to the determination of aluminium, zinc, manganese and lead in certain magnesium alloys.

Polarography again has limitations in the amounts of the various elements which can be dealt with whilst retaining a high accuracy, and perhaps the second alternative approach offers the most attractions to the average foundry laboratory, especially that linked with an iron or steel foundry. The method to which reference is made is that of using the photo-electric absorptrometer. Briefly, the substance being investigated is dissolved and a coloured solution formed by so treating the solution as to produce a coloured compound of the element which is to be estimated, the depth of colour being dependent on the percentage of this element which is present. Such methods have been known for many years, of course, but in most early colorimetric methods the solutions so produced were compared by eye with artificially produced standard solutions similarly treated and diluted to give the same depth of colour as that of the unknown solution, the amount of the element sought in the latter solution then being assumed to be the same as that in the known artificial solution. The necessity for preparing and treating such standard solutions and the difficulty of matching two coloured solutions accurately by eye without great experience and very good colour vision made such estimations of doubtful value and limited application, and many steps have been taken to overcome these difficulties.

These instruments measure the actual light absorption occuring when filtered light of a selected colour is passed through the coloured solution, and, after once determining the absorptions produced by a range of solutions of known strength and thus producing a calibration curve for a given estimation, no further use of standard solutions is necessary, and no reliance is at any time placed on visual comparison. In effect the sample is dissolved and various volumes of the solution treated chemically in standard, and in most cases quite simple ways to produce the various coloured solutions, which are then placed in the instrument in turn. A calibrated drum is rotated to produce a given meter-reading. In each case the drum figure obtained is referred to as a graph, and the percentage of the element is read off.

By such means manganese, molybdenum, chromium, vanadium, silicon, phosphorus and nickel can be estimated in steels, the longest method, *i.e.*, that for molybdenum, taking 20 min. Silicon, iron, copper, nickel, manganese and titanium can be estimated in aluminium alloys; phosphorus in phosphor-bronzes or gunmetals, etc., further methods still being developed, mainly by E. J. Vaughan, M.Sc., A.R.C.S., F.I.C., The Bragg Laboratory, Admiralty, Sheffield.

These lines of advance in analytical methods have been mentioned, not to replace the accent on analysis, but because it is felt that rapid and simple methods must be developed in or for the foundry laboratory so that metal analysis can be used as a tool and a control method, without the methods being so lengthy and complex as to dominate the work of the department by absorbing too much of the time of the available personnel.

The laboratory should also have facilities for the micro- and macro-examination of metals and other foundry materials, so that structures as well as compositions can be controlled. It should also possess or be in close touch with a mechanical testing department. Facilities for the testing of sands both for their properties in relation to the moulding process proper and their properties during the actual casting process are most important, and adequate provision of standard apparatus should be made for normal and high-temperature sand testing.

Control of Variables

The function of control is one of the most important services the foundry laboratory performs. The large number of variables with which the foundryman has to contend probably constitutes his greatest difficulty in producing a regular flow of satisfactory castings. These variables can broadly be split into three classes:—(*a*) variations in the properties of the materials being used in the various processes; (*b*) variations in the plant used in the various processes; and (*c*) variations in the way in which the materials and plant are used by the craftsmen performing the various processes.

For investigational work most of the apparatus will probably have to be improvised for each specific case, such items as a small melting unit, and accurate pyrometric equipment, however, can be said to be almost necessities.

New Fields for Co-operation

Science must be applied to the whole field of foundry work, not only to the control of metal composition, and to the control of sands as such control is commonly understood to-day. Much inquiry is still required into the actual reactions occurring during melting, for instance, between the metal and the crucible or furnace, the metal and the furnace atmosphere, the metal and moulding sand, mould coating, core compound or gases therefrom. Into the actual manner in which metals flow in moulds, to the relations between section thicknesses or section types and the cooling rates resulting with different moulding materials and the effect of these factors on the mode of freezing and the resultant metal structures in different alloys.

Much still requires to be answered as to the relationships between the cooling and strength/temperature curves and other properties of alloys and their foundry behaviour. Too much of what actually happens during the critical period between pouring the metal from the crucible and knocking the casting from the mould remains shrouded in mystery. Much work of this nature has been done in recent years and much is

(*Continued on page* 354, *col.* 2.)

STANDARD COSTING AND COST CONTROL

By A. N. WORMLEIGHTON

Standard costs answer fully the main basic purposes of costing

(*Continued from page* 336.)

How to Use the Information

The Accounting Copy (Fig. 16), which is similar to the document which is called the Pink (the name it obtained from being originally on paper of that colour), serves the purpose of notifying the office organisation that material has been despatched, and the quantity, weight and date are inserted by the Despatch Department. The rest of the information is pre-printed, and in effect is the copy of the customer's order in suitable form. On the reverse side of the Accounting Copy (Fig. 18) are columns arranged to take the necessary information, which, when calculated, will supply the cost of the particular casting. The Routing Sheet (Fig. 17) is a copy of the Foundry Cost Estimate Card, showing in addition the order number against which the routing has been used, the quantity ordered, and the date of the order.

Earlier réference was made to weight estimation, and now the weight of the casting appears on the routing. This weight has served the purpose on the initial order, of controlling the amount of metal called for by the foundry for melting purposes, when suitable allowances in accordance with the yield have been made, for heads, runners and risers. The accuracy of the weight would be sufficient for the purpose for which it is required. It will now be seen that with this arrangement the actual weight despatched can be used, if necessary, to make a correction for future issues of the routing. The despatched weight is now transferred on to the back of the accounting copy, being the equivalent number of pounds to the weight contained on the reverse side. The yield is stated above it. The routing indicates if the alloy agrees with the order.

Turning now to the metal at Market Table (Fig. 14), and read off its value, on the day the order was taken, and insert the amount in the space provided. Next from the standard loss table (Table I), read off the loss factor for the alloy. From this can be read off the yield table (Table II), the appropriate percentage addition which has to be made to the calculation of weight despatched, times the metal at market value. The figure is then extended across into the sterling columns provided. The number of articles despatched, multiplied by the allowed time, is entered into the appropriate panels on the accounting copy. The routing tells the cost compilor which overheads, and which wages factors to use. They are read off the table, and duly inserted into their appropriate places on the form. Simple multiplication gives the sterling equivalent extensions. The furnacing charge is obtained by the use of the yield factor. It is noted that the weight despatched represents "x" of the amount which is melted, and accordingly the amount of metal which had to be melted is a matter of simple calculation. Therefore, the furnacing charge can be distributed upon the amount of metal melted to produce the casting; again, this is a simple calculation of the amount multiplied by the standard furnacing charge per pound melted.

All the amounts are expressed in decimal of pound sterling per minute, or pound weight, this is done to make the calculating easy. There is no reason why it should not be expressed in any other factors which might be the more suitable to any particular business. Simple addition of the sterling amounts shown on the accounting copy divided by the weight despatched gives cost per pound of casting, or if it so be desired divided by the quantity despatched will give the cost per each. It will be noticed upon the accounting copy an impressed Rubber Stamp setting forth the standard cost obtained, and underneath there reads "administration." This is the commercial and selling expense which is calculated separately. The commercial and selling expense has been expressed as a percentage of the wages and overheads obtained in the panel above. A very easy calculation will reduce this figure so obtained, to a cost per pound. It is considered important to keep the administration and selling charges separate from the other costs, since it is by the nature of things a fixed charge, and therefore is profoundly affected by the volume of the turnover in any given period.

Having completed the calculations on the accounting copy, it only remains now to transfer the amounts on to the despatch copy, which is called the "pink." This document can now be transferred to the Invoicing Department where—if the particular job was the subject of a quotation—the price can be immediately inserted, and the extension carried out. If it was an open order then it will go before your Sales Manager or some other official charged with the duty of fixing a selling price in such cases. The selling price now will not be fixed blind, but in full knowledge of the cost. The completed despatch document when invoiced gives to the management a continuous survey of the margins obtained upon each and every despatch of material from the works. Suitably arranged codes can be used to divide the products sold into various classes, and if this code number is repeated upon the accounting copy and upon the invoice, one can now arrange the costs, and the sales into such groups, and obtain therefore the profit factor for each group of sales. Further, if the Customer's Account Number is also endorsed, as it is upon the documents, the analysis of cost compared with invoice value can be ascertained for each and every customer for periods suitable to the business. Thus there has been obtained: (1) The cost of an individual job, and

Standard Costing and Cost Control

invoice value giving margin on any particular job; (2) sales by group of products, and cost by group of products giving profits by group, and (3) sales value per customer, and cost per customer giving profit by customer.

The total of the accounting copy costs for any given period will give the cost of sales for the period, thus eliminating the necessity to wait over fairly lengthy periods to obtain monthly profit and loss figures. Obviously such profits or loss would be based upon standard values, but it is intended to show that the variances can be quickly ascertained, and the position thus fully revealed.

ACCOUNTING

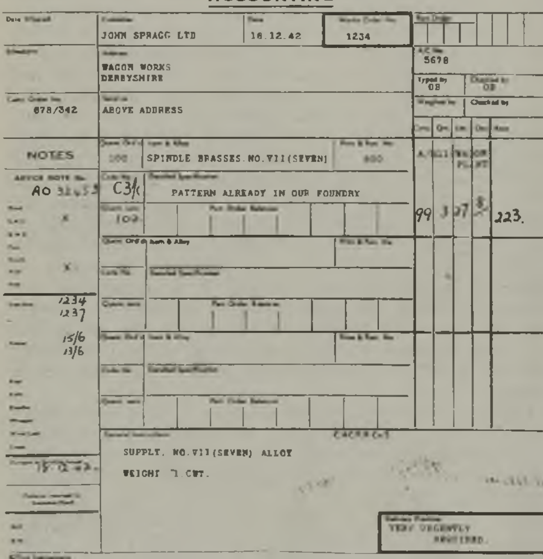

JOHN SPRAGG LTD
16.12.42
1234
WAGON WORKS
DERBYSHIRE
5678
08
08
678/342
ABOVE ADDRESS
NOTES
SPINDLE BRASSES NO.VII(SEVEN)
C3/c
PATTERN ALREADY IN OUR FOUNDRY
100
99
223.
1234
1237
15/6
13/6
SUPPLY. NO.VII(SEVEN) ALLOY
WEIGHT 1 CWT.
VERY URGENTLY REQUIRED.

FIG. 18.

The monthly expense report (Fig. 19) will show, when finally completed, the variation between the allowed expense and the actual expense. It is not suggested that such an analysis is necessary, or desirable at the commencement of operations, but it is necessary to break down the actual expense into suitable headings for control purposes. The standard expense for the department would be similarly broken down into the various items comprising the total expense. Subtraction of the actual expense from the recovered expense will give the gain or loss on standards, and that the itemising of expenses and standards gives control because the inefficiencies are tracked home immediately to their source, and any investigation necessary is shortened, needing only examination of the offending items. There is one further aspect of the expense card which needs a little more attention. The standard volume is, of course, the expected performance, the actual volume is the aggregated amounts of allowed time or weight which have been dealt with in the period under review, and this excludes any replacement and scrap remanufacture which may have been necessary.

As explained, such items of expense are part of the actual overhead expense, and do not form part of the productive wages account. Therefore, they are not to be included in the volume obtained, because replacement items if included in the actual volume give an over recovery of overhead which has not taken place. This is best illustrated by imagining the manufacture of one article in any given period. If the first effort is a failure then a replacement would have to be put in hand. There would, therefore, be apparently the manufacture of two in the period concerned, but in actual fact only one article would be obtained, and the time and expense incurred on the scrap casting would be an addition to the overhead expenses which one is endeavouring to control. The full affect of replacements is seen when the line on the Expense Report Card is examined. It deals with labour inefficiency and plant inefficiency, because having arranged to charge all the replacement castings against the department responsible for scrap, a true impact of replacement charges is obtained. For the other items on the Expense Report Card there seems little need for explanation. The items themselves give fully all the explanation needed.

Metal Loss Account

The test which will be applied to the efficient using of metals can be obtained by building up a simple statement which comprises opening stock plus purchases, and on the other side of the account closing stock plus the aggregated metal standard totals, which is really an addition of all the amounts shown against metal on the accounting copies for the period. The balance of the account will show the gain or loss on the use of metals, which gain or loss covers not only the using but also the correctness of the purchasing of metal. To test the physical position it is only necessary to aggregate the amount of the allowed metal to melt down on the accounting copy, and to compare this with the actual amount of metal sent to melt.

The third test is to build up from the stores control figures a metal loss account which will be the key to the accuracy of the standard losses on which you are working. Reverting to the accounting copy (Fig. 15) and consider, item by item, how the accuracy of the information contained therein has been tested. The metal from the sterling point of view has been explained, and it is known whether there is a sterling gain or loss. The aggregation of the allowed amount of metal to melt compared with the actual sent to melt is a test on the accuracy of the yield figures, and a critical examination of the performances achieved in manufacture. The monthly expense reports will reveal item by item the accuracy of the standard figure set, and also the degree of efficiency of performances achieved. Any balance which shows a series of inefficiencies or apparent super-efficiency requires investigation to decide which is wrong, the standard or the actual, but after the first few statements have been examined in this manner the correctness of the standard once established, means, with any future statements the explanation, for variances, that one will have to look to the "actual." Thus this cost control system is a living organism, giving not only the much wanted costs, but the vital controlling factors to maintain and keep the works efficiency.

Accounting Machinery

All the work indicated will require organisation, and in some cases the use of office machinery. The control of the labour, both from the point of view of the quantities manufactured and the quality of the labour to be used, together with the price or time to be paid for each operation, can be best done by the Ormig Simplex methods, which is a method of selective duplication. It has been suggested that any business employing more than 70 to 100 operatives can profitably instal such a system. The pre-printing of labour routing tickets, and other documents necessary, by a method of duplication, obviously saves enormously in the quantity of labour required, and also makes for accuracy, since errors in copying are avoided.

The next problem which will confront the business installing standard costs is the tabulating, and arranging of information into its suitable groups. A very good method of recording and analysing such information is by use of the Hollerith equipment, and the British Tabulating Machine Company's punched card method of accounting is the most suitable means of carrying any appreciable load of tabulating work. In such cases where the size of the installation would not justify its existence, the British Tabulating Machine Company, Limited, are willing to undertake work on a service basis, and this—in times of restricted labour supply—is a very useful service to all who are commencing costing operations for the first time. Finally it will be necessary for some form of calculating equipment to be available for quickly resolving the various calculations needed, and the London Computator, Limited, supply a calculating machine which is excellent for the purpose.

This machinery is all used by the Author's company with the utmost success, and for that reason he feels that having indicated the problems, and their solution associated with standard costs, that he should acknowledge what has been, in his case, found to be so successful.

An accounting mechanism of some kind is obviously demanded by whatever system is used, and here it may be stated that it is not necessary in the case of small organisations to use machinery as an intrical part of the system, but quite obviously larger concerns will consider mechanical means of carrying out the functions, as the best method of labour economy and speed of operation. Quite recently the Author demonstrated how a cost scheme could be installed in an organisation not associated with the foundry industry, but in an organisation in which every job was different. The company was not large enough to justify the installation of machinery, but the whole scheme was accomplished by hand methods. An estimate was prepared for every job, and this estimate was worked upon definite lines, and each operation called for upon the estimate had suitable controls arranged to cover it during performance. The sales day book had additional columns appended, and the amounts shown under operation, and in overhead classes were analysed out in this book. Similarly, the ordinary financial books of the company were analysed into the same groups. Having made adjustments for stock and work in progress, the contract between the actual performance, as represented by the analysed financial books, contrasted with the allowed amounts for the month's sales, gave the efficiency figures so urgently required.

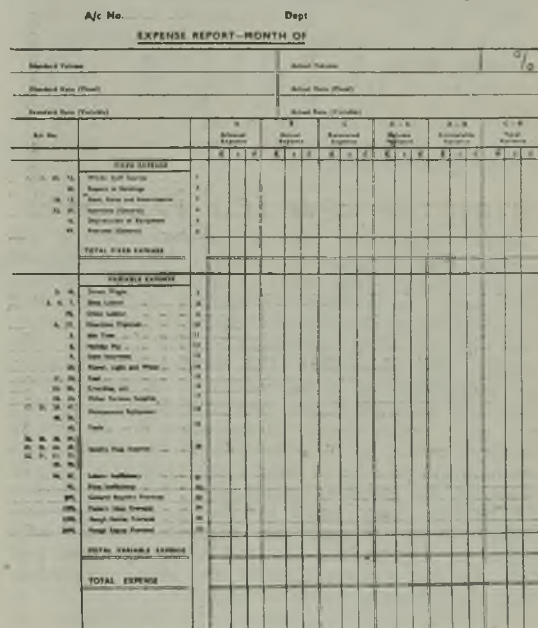


FIG. 19.

Methods which can be used to operate the standard cost system in large and medium-sized organisations will demand some machinery, and in the small organisations where no machinery is required, are intended to be indicative and offer a solution to the accounting mechanism which must be built up to meet the problem.

Costing has been a subject which showed very little progress until the idea of standard costs was evolved. Analyses of past performances are not sufficient because not only is the method slow, but it also buries any inefficiency, and the only check which can be made is to compare the one period with another. This, of

(*Continued overleaf, col.* 1.)

HIGHER TECHNOLOGICAL EDUCATION

The terms of reference have been announced by the President of the Board of Education of a departmental committee to report on future collaboration between universities and technical colleges on higher technological education in relation to the needs of industry. The terms of reference are:—"Having regard to the requirements of industry, to consider the needs of higher technological education in England and Wales and the respective contributions to be made thereto by universities and technical colleges, and to make recommendations, among other things, as to the means for maintaining appropriate collaboration between universities and technical colleges in this field."

The members of the committee will be:—Lord Eustace Percy (chairman), Dr. D. S. Anderson, Sir Lawrence Bragg, Mr. W. H. S. Chance, Sir Charles Darwin, Dr. E. V. Evans, Mr. Mouat Jones, Mr. S. C. Laws, Dr. H. Lowery, Mr. H. S. Magnay, Sir George Nelson, Mr. J. F. Rees, Dr. R. V. Southwell, Mr. H. Fitzherbert Wright, with Mr. Maxwell-Hyslop, Board of Education, as secretary.

SITING OF NEW I.C.I. FACTORIES

From the point of view of national safety it was essential that the areas on which it had been shown that the country's war effort so largely depended must never again be allowed to become depressed, said Lord McGowan, chairman of Imperial Chemical Industries, Limited, when addressing Cardiff Business Club recently. He added that I.C.I. were contemplating a vast programme of reconstruction. With regard to areas such as South Wales, they intended to be guided by a spirit which would set less store on the strictly economic aspect, so that they should be able to erect new factories on sites in those areas even at a reduced return on the proposed investment. Lord McGowan said he had been asked by the Scottish Advisory Council if he, through his company, would help further to industrialise Scotland when the war was over. He had met the Council, and made suggestions which they thought would be useful.

STANDARD COSTING AND COST CONTROL

(*Continued from previous page.*)

course, is futile; whereas under the standard cost conditions one compares the predetermined cost as expressed by performance factors with the performance which has been obtained. These performance factors are converted into money and become standard costs. The idea is essentially simple, its efficiency so well testified that undoubtedly it is the only method which will be adopted in the future. Standard costs thoroughly absorbed into the organisation built up in the organisation not only the periodical examination of the cold facts—often called by the abused word "System," but a spirit and outlook which is a very profitable achievement.

THE LABORATORY AND THE FOUNDRY

(*Continued from page* 350.)

being done by enthusiasts from both the laboratory and the foundry, by the various research organisations and by technical committees and their sub-committees, such as those of the Institute; much, however, remains to be done.

Furthermore, it is felt that much that has been done is not being translated into action in the foundry because it is not readily available to the ordinary foundryman in a suitable form. He is a busy man, surrounded by many pressing matters to which he must attend apart from those of searching through the reports of the different organisations and deciphering technical language. This is a further duty of the foundry laboratory, which can then forward to the practical foundryman in terms of his own products and plant the results of any relevant discovery or investigation.

Again, most organisations which are conducting investigations into foundry problems are severely limited in means and have only limited staffs; progress cannot, therefore, be as swift as it would be were there numbers of foundry laboratories with foundry-minded technicians in control, all attacking foundry problems. Many minor problems would not need to be referred to the larger research organisations, who would thus be freed to face the more complex problems. The past also shows that the most far-reaching discoveries and advances do not always come from such organisations, but more often from the individual worker, and this is again a reason for increasing the spread of technical workers throughout the industry.

The warning tocsins are sounding. The demands on the foundry are becoming greater with every day that passes; specifications are becoming more stringent, both in respect of material compositions and mechanical properties and in respect of intrinsic soundness and dimensional accuracy. New materials are bringing new problems. The industry is facing competition from fabricated work; stampings and forgings; powder-metallurgy; plastics, etc., and to all this must be added the fact that foundry craftsmen, for reasons which are outside the scope of this Paper, are not being replaced from the younger generations at a sufficient rate and are dying out and taking much of their knowledge with them. This knowledge, too. must be preserved, organised and formulated into fundamental principles before it is too late.

(*To be continued.*)

The Gray Iron Founders' Society—the American counterpart to the Council of Ironfoundry Associations—is conducting a man-power situation survey. This has become urgent because the industry is experiencing an acute shortage of both skilled and unskilled labour. The position is that the 1,155 ironfoundries need 16,500 additional workers, including 644 women. In the Ohio area, where normally 17,600 men are employed, there is now a pressing need for nearly 3,000 workers. Apparently, the industry has not been treated too well in the sphere of preferments.

CONTROL IN THE MAGNESIUM FOUNDRY*

By G. DEAN LEACH

The main steps of the operation and some of the control methods used are considered

The term "control" in the magnesium foundry has a much broader meaning than the completion of chemical, mechanical, and radiological tests from which the foundryman and metallurgist are supposed to be able to isolate and correct all troubles. The term actually implies controlled conditions at every step. It is proposed to consider the main steps of the operation and some of the control methods used.

Since sand is the medium used actually to form the casting, core and moulding sands should be taken as control point number one. Base sands are of two types, *i.e.*, natural or bank sands, and washed and dried silica sands. Since most American foundries use the latter, the mixtures to be considered will be built around this type. The AFA fineness number for core sands may vary from 45 to 75, but for the general run of cores a fineness number of from 65 to 70 is recommended with 80 per cent. retained on three adjacent screens. This permits maximum permeability while attaining a very smooth finish. The coarser sands are used on pipe cores and in special applications where very high permeability is essential.

Core Sand Control

It is common practice to use cereal binders in conjunction with both oil and resin binders. There is the dextrine cereal which has a very high water solubility, and when used in conjunction with high moisture becomes migratory, and the lower solubility cereals such as Mogul, Ceres, and Ajax. The first, whilst contributing toward that ideal condition of a soft centre and hard surface, contributes little or nothing toward green strength and good workability in the corebox. The three last, on the other hand, tend to increase green strength and help to make possible a smooth, clean, draw. Since a majority of coremakers available to-day are far from being experts, it is advisable to design mixtures which are easy to work. This can be accomplished without too much sacrifice of other desirable properties.

A typical resin sand mixture having good workability and adequate physical characteristics plus good shake-out properties is:—Washed and dried silica sand 70 AFA fineness number; Urea formaldehyde resin, 0.75 per cent.; Mogul (or equal) cereal binder, 0.75 per cent.; sulphur, 0.75 to 1.0 per cent.; boric acid, 0.50 per cent.; moisture, 3 to 6 per cent.

Baking temperature, 150 to 175 deg. C.; baking time, approximately 70 per cent. of time required for an oil-bonded core of same thickness.

Typical physical properties are as follow:—Green permeability, 90; green compression, 1.2; dry permeability, 110; dry tensile, 180; transverse strength, 30, and scratch hardness, 75.

A typical oil sand mixture having comparable properties to the above, but presenting more difficulty in shake-out: Washed and dried silica sand, 70 AFA fineness number; Mogul (or equal) cereal binder, 0.65 per cent.; sulphur, 0.75 to 1.0 per cent.; boric acid, 0.50 per cent.; core oil, 0.50 per cent. (by weight); moisture, 3 to 6 per cent.

Standard test cores of 2-in. thickness are thoroughly baked in 1½ hrs. at 200 deg. C.

Typical physical properties are as follow:—Green permeability, 85; green compression, 0.8; dry permeability, 105; dry tensile, 170; transverse strength, 30, and scratch hardness, 70.

Occasionally fly ash is added to resin mixtures and kerosene added to oil mixtures to promote clean draws from the corebox.

The control required to maintain cores at a certain quality level is considerable. First, the base sand must be tested when received from the supplier to find out if the grain size and type and fineness number and distribution meets the specification. Secondly, the actual production mixtures must be checked occasionally to see that formulæ and set procedures are followed. Thirdly, the production baking practices must be checked by frequent reference to the oven recorders. Then there are always special problems arising which come under the realm of core-sand control, such as a tendency toward burning in certain sections of intricate castings which may require additional protection. It may become necessary to apply a fluoride spray to these cores. Some foundries make a practice of spraying all cores, but if proper control is exercised, this practice can be held to a minimum.

Moulding Sand Control

Moulding sand may be finer than core sand, typical sands running from 60 to 110 A.F.A. grain fineness number. Here, too, it is well to specify approximately 80 per cent. held on three adjacent screens. It is possible to standardise one base sand for both cores and moulding at a fineness number from 70 to 75. This may be a questionable practice in some minds, but it has been done successfully. The advantages in using a common sand are, first, that it facilitates storage, and, secondly, that any contamination of the moulding sand with core sand in shake-out will not result in a change in fineness number or grain distribution.

There are two basic types of moulding sand in common use in American foundries to-day, namely, the sulphur-boric acid-fluoride type and the sulphur-boric

* A Paper presented on behalf of the Metropolitan Chapter of the American Foundrymen's Association to the London Branch of the Institute of British Foundrymen.

Control in the Magnesium Foundry

acid-diethyline glycol type. There is a variation of the latter type which produces boric acid in the mixing operation by the reaction between sulphur acid and borax, with sodium sulphate as a by-product. The nominal mixture for this sand is:—Bentonite clay, 3 to 4 per cent.; sulphur, 1 per cent.; borax, 3 per cent. (containing 10 mols. H_2O); sulphuric acid, 1.3 per cent.; diethyline glycol, 1.6 per cent.; water, 0.7 per cent.

This sand will contain approximately 2 per cent. moisture when mixing is complete.

The control of this sand requires periodic checks for water soluble, carbon disulphide soluble, glycol, boric acid, sodium sulphate, and free sulphuric acid. The moisture is, of course, checked several times an hour.

The sand mixture which is more widely used is:—Bentonite, 3 to 4 per cent.; sulphur, 1 per cent.; boric acid, 1 per cent.; ammonium silico-fluoride, 3.5 to 4.5 per cent.; water, 2.5 to 4 per cent.; glycol, 0.2 per cent.

On this type of mixture the only control other than routine moisture tests is a check for water soluble and sulphur, which should be taken about twice a week. The use of the glycol is optional. The advantages of glycol are, first, it helps to prevent drying out, giving the sand a longer workable life before retempering is necessary, and, secondly, it contributes to some degree to the inhibitive properties.

Melting Control

Control of melting practice entails no more than close supervision to see that the proper procedures are followed, and that close temperature control is maintained. However, this simple statement covers a large assignment, for at this point the basic properties of the casting material are established. Some of the more important phases of melting practice where close adherence to set rules is necessary are itemised below:—

(1) Where premelting in large tilting furnace is practised, the proper use of the proper flux is one of the prime considerations. The flux used (Dow 230) is quite liquid, and should not be used in excess of the necessary amount. However, in foundries using perforated steel screens in gating, the gates containing the screens may be melted in the tilting furnace in regular production heats by the use of an additional amount of flux. This will prevent burning around the screens, as the crucible is being emptied, and will enable the operator to remove the screens from the pot bottom without excessive burning. In this case, it is necessary to exercise care not to use metal too near the bottom because of the danger of getting a large percentage of molten flux in the small pot. The furnace may be operated at about 745 deg. C., so that when the metal is transferred to the superheating furnace, it will be at a temperature suitable for the cleaning or "puddling" operation.

(2) The puddling operation is probably the most important single part of the melting of magnesium. As soon as the refining flux (Dow 310) which has been sprinkled over the melt has started to flow, the melt is stirred with an iron bar using a rotary motion for two to three minutes, or until flux has disappeared. It is well to repeat this operation, using about half of the original amount of flux the second time. The metal is then skimmed, sprinkled with a mixture of sulphur and boric acid, and covered with a thin layer of the same refining flux, and superheated. In this operation control consists of proper supervision.

(3) Temperature control can be handled efficiently by the use of automatic multi-point recorders which run continuously, checking the furnaces to which it is attached at the rate of one every few seconds. This gives a check on each furnace every few minutes, and enables the man charged with the duties of control to check the melting history of any heat by simply referring to the recorder chart. Pouring temperatures are controlled at a separate checking station.

Grain Size

It is common knowledge that fine-grained castings are strong and are easily machined. The ultimate grain size of metal in a casting may be affected by conditions starting with the grain size of the ingot used, through melting practice, pouring temperature, cooling rate, and to the gating, risering, and chilling used in the mould. The reason this is mentioned is that there are some buyers of magnesium alloy castings who are beginning to insist upon a maximum grain size. It does not form a part of the specification, but rather an "off the record" agreement. However, it might be well for all foundrymen to give some consideration of this new control problem, which may some day be added to the others.

Gating control can be established by close co-operation of the moulding, pattern, and metallurgical departments. A gating committee, with a representative from each of these departments, working in conjunction with an experimental mould department, can establish sound gating practice for all jobs. In this set-up, the metallurgical department furnishes radiographs as well as photographs of the castings with gating attached. When X-ray approval is given, a card carrying a complete description of the gating is filed with the photograph of the gated casting. This file serves as a standard practice instruction for each job for the production department to follow. Radiographic checks are made of a definite percentage of production to ensure adherence to good foundry practice.

Proper control of heat-treating temperatures and conditions is one of the most critical functions in the production of high-quality castings. Choice of proper equipment is of prime importance. In order to ensure the maintenance of close temperature control (plus or minus 2 deg. C.), it is necessary to have a tight recirculating furnace. Electric furnaces are most commonly used for this application. Controlling instruments are chosen both for accuracy and safety. The

Control in the Magnesium Foundry

main controller should be of the recording type which charts the temperature throughout the entire cycle. This may be used in conjunction with an input controller, either the type which controls the percentage of time for 100 per cent. input, or one which proportions the actual power input with the contactors always closed. For a safety device, a gas bulb type indicating controller can be placed between the main switch and the main controller. This instrument is set a few degrees above the set operating temperature so that, in the event of a failure of the controller, the power would be shut off by the safety instrument.

Maintaining a furnace atmosphere containing sulphur dioxide is not an absolute essential in the heat-treatment of the 6 per cent. aluminium, 3 per cent. zinc alloy, although some foundries use a concentration of about 0.3 per cent. as a precautionary measure. However, it is considered necessary with alloys requiring higher heat-treating temperatures. For example, about 0.5 to 0.8 per cent. concentration is recommended for the 9 per cent. aluminium, 2 per cent. zinc alloy. Automatic analysing controllers are built to maintain these concentrations. However, a manometer may be utilised. This is, of course, a much cheaper installation than the automatic device, but requires manual analyses to maintain constant conditions. Tanks containing liquid sulphur dioxide are connected in series to supply the gas for the furnace atmosphere. The number of inches of pressure shown by the manometer can be correlated with the analysis of the furnace atmosphere, thus furnishing a method of control.

Micrographs are used extensively to check whether or not heat-treatment is complete. Micrographic specimens may be placed at various points in the furnace to check uniformity of results. Thermocouples may be placed at each point near the micro samples, and microstructure of sample can be correlated with temperature history. Increasing demands for the highest possible quality in magnesium castings is due in part to the increased trend toward these alloys in air-borne equipment. As knowledge is increased, the demands for the application of this knowledge keeps pace. Therefore, strict control is an absolute essential in establishing a successful operation in the production of magnesium castings.

USING A PATTERN AS COREBOX

By W. G.

A glance at the casting, shown in Fig. 1, suggests three methods of moulding. One is to bed the pattern in the sand at floor level with the large flange down and using a middle-part box to be hoisted away when the top part has been rammed up and removed.

The advantage gained by this would be that the pattern would leave its own core, which then could be easily tooled and finished. The second method of moulding is to make the casting as indicated in the sketch, that is with the large flange uppermost, ramming the core up so that it could be lifted away with the top part. This operation could be accomplished by the use of a prodded grid which is bolted securely to the top-part. The third method which the writer was instructed to employ was similar to the second one, except a dry sand core was used and set separately in the mould, the pattern being used to make the core.

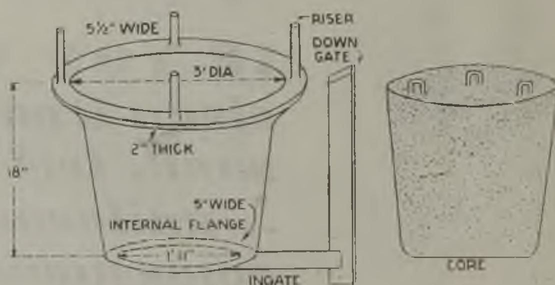


FIG. 1.

The pattern was bedded in the floor and the ingate set so as to allow the metal to enter at the bottom of the mould by way of the internal flange. The mould near the ingate was close-sprigged to prevent scabbing. Careful ramming is necessary so that the rammer will not strike the pattern and cause a rammer-scab as is so liable to happen with a pattern of this design. When the top is reached the inside of the pattern is filled with sand rammed solid and strickled off level. The top part is then rammed up and the sand dug out of the pattern.

Before withdrawing the pattern the flange is well vented to prevent the possibility of scabbing, for if this should happen the casting would fail to pass inspection. A dry sand core forms the opening in the internal flange, this also acting as a firm seating when setting the large core. When this is set in the mould a straight-edge is placed across it and the joint for the purpose of correcting any discrepancy in depth of core. When the top part is tried on it is important that the core and joint register a close touch. Four or five risers on the casting help to prevent sponginess where the fillet forms.

(*Continued at foot of previous column.*)

(*Continued from next column.*)

The mould was made in green sand and poured with steel mix at an extremely high temperature, as top and bottom flanges are machined and must be entirely free from blow-holes. This method of moulding proved successful, as twenty-four of these castings, each weighing 8 cwts., passed a fairly strict inspection. The steel mix was fed in the cupola in the form of re-melts.

NEWS IN BRIEF

By March 18 last the railings campaign in Great Britain had yielded 577,427 tons of scrap.

In a survey of non-enemy fires compiled for the National Campaign Against Fire Wastage, figures showed that in the London region alone last year there were 10,406 outbreaks to which the N.F.S. was called. Out of these, 4,182 occurred on industrial premises, This works out at approximately one fire in every two hours. The other 6,224 were of domestic origin.

The West Riding Branch of the Institute of British Foundrymen have established a fund for commemorating the work of the late Mr. G. W. Wise, who was its honorary secretary for twenty years. An appeal is being made for £200, and the interest will be used for the award of a local prize. Cheques should be sent to Mr. H. F. Forrest Lockhard. Woodhall Park, Mount Stanningley, near Leeds.

At the meeting of the Enfield Cable Works, Limited, last week, Lord Verulam, the chairman, announced that the board had concluded negotiations for the purchase of a light engineering factory and plant as a going concern. The transfer of contracts and staff had been satisfactorily completed. A further development had been the purchase of the share capital and assets of Cosway (Sales), Limited, a small company specialising in the design, production and sale of cable boxes and mains accessories.

At a meeting of the Manchester Association of Engineers to-morrow (Friday), at the Engineers' Club, Albert Square, Manchester, at 6.30 p.m., a Paper on "Inspection and Maintenance of Lifting Machines and Tackle" will be presented by Mr. W. Duckworth. The Constantine Prize for the session 1942-43 has been awarded to Professor G. F. Mucklow, D.Sc., M.I.Mech.E., for his Paper on "Exhaust Pipe Phenomena." The presentation will be made to-morrow. No award of the Butterworth Prize has been made for the session 1942-43.

Eight local authorities on South Teesside and in Cleveland decided at a conference at Middlesbrough last week to support Middlesbrough in its protests to the Prime Minister and the President of the Board of Trade against the exclusion of the area on the South bank of the Tees from the North-East Development Scheme. It was decided that a resolution should be sent to local Members of Parliament, and that the Premier and the President of the Board of Trade should have their attention drawn to the economic link existing between South Teesside and the other North-East areas.

The Ministry of Supply has made the Control of Containers and Packaging (No. 1) (General) Order, 1944 (S.R. & 0.1944, No. 404), price 2d., which came into force on April 18. This Order revokes and remakes in consolidated and rearranged form with amendments the Control of Tins, Cans, Kegs, Drums and Packaging Pails (Nos. 5-10) Orders, 1940-43; the Control of Packaging (Nos. 1 and 3) Orders, 1942; and the Control of Metal Collapsible Tubes (No. 1) Order, 1942. The Order regulates the manufacture of certain types of containers and the marking of all types of containers. It also regulates the packaging for distribution or disposal on the home trade of all articles and commodities listed in the Packaging Index Schedule issued by the British Standards Institution.

Mr. A. Callaghan, general secretary of the National Union of Blast-furnacemen, Ore Miners, Coke Workers and Kindred Trades, in his report to the half-yearly meeting of the delegate board, stated that "a large measure of common agreement" has been reached on the all-important subject of a uniform post-war policy for the iron and steel industry, and issued a warning against attempts at sectional revision of works' agreements without any change in working conditions which would justify alterations being sought. Agreements, he said, were made by district officers with the advice and assistance of lodge delegates, and any attempt to weaken their authority would recoil on the members. "The Union insists on employers observing existing works' agreements unless a change in conditions can be proved, and the rule applies both ways."

PERSONAL

Mr. A. McArthur has been appointed local director for Birmingham of the Electric Furnace Company, Limited.

Sir Summers Hunter has been elected president of the North-East Coast Institution of Engineers and Shipbuilders.

Mr. J. L. Rowbotham has been elected a director of Switchgear & Cowans, Limited. He is general manager of the company.

Mr. Michael Dewar, chairman of British Timken, Limited, and Fischer Bearings Company, Limited, and a director of a number of electrical companies, has been chosen as High Sheriff of Hertfordshire for the current year.

Mr. George B. Bailey, chairman and managing director of C. H. Bailey, Limited, ship repairers and iron and brass founders, etc., of Newport, has recently been appointed Deputy Lieutenant for the county of Monmouthshire.

The many friends of Mr. Charles Monseur, of Liège, who is well known in international foundry circles, will be pleased to learn that he has arrived in this country and is staying at Bayley's Hotel, Gloucester Road, London. He will be pleased to discuss with manufacturers of steel and foundry plant post-war problems from the Belgian angle.

A presentation was made to Miss May K. Shanks, supervisor of the ambulance at Cruikshank & Company, Limited, Denny Iron Works, Denny, and daughter of the managing director, Mr. James K. Shanks, M.B.E., D.L., J.P., on the occasion of her recent marriage to Captain A. Horsley, M.N., M.C. The presentation was made by Mr. John Dyer, the oldest employee, who has been with the firm for 62 years.

COMPANY RESULTS

(Figures for previous year in brackets)

Lake & Elliot—Interim dividend of 5% on the ordinary shares.

Murex—Interim dividend of 7½% (same) on the ordinary stock.

Breedon and Cloud Hill Lime Works—Final dividend of 20% (17½%), making 27½% (25%).

William Gray—Net profit for 1943, £35,069; dividend of 2%; to reserve, £5,000; forward, £10,147 (£10,078).

Follsain Metals—Net profit for 1943, subject to E.P.T., if any, £6,571 (£5.013); debit forward, £7,498 (£14,069).

John Thompson Engineering—Final dividend on the ordinary shares of 12½% (same) and a bonus of 5% (same), making 22½% (same).

Metal Agencies—Profit to February 28 last, £48,977 (£58,274); final dividend of 21¼% (same), making 25% (same) on the ordinary shares.

Craven Bros. (Manchester)—Net profit for 1943, after E.P.T. and income-tax, £69,235 (£68,070); final dividend of 15%, making 20% (same).

James H. Lamont—Final dividend on the ordinary shares of 17½%, making 25% (same), and a participating preference dividend of 2%, making 8% (same).

John Shaw & Sons, Wolverhampton—Net profit to June 30 last, £13,977 (£13,235); to contingencies, £5,000 (same); dividend of 7½%, £6,149 (same); forward, £16,507 (£13,679).

Churchill Machine Tool—Net profit for 1943, after making provision for depreciation, income-tax, E.P.T., war damage contribution, fees and reserves, £57,649 (£58,066); dividend on the ordinary stock of 30% (same); to war contingencies reserve, £20,000; forward, £34,920 (£40,403).

Thos. Goldsworthy & Sons—Net profit for the year to June 30 last, after providing for depreciation and N.D.C., £37,907 (£33,681); preference dividend, £11 250; dividend of 5% on the ordinary shares (same); to reserve for taxation, £12,000; to general reserve, £7,500; forward, £1,000 (£1,343).

A. Reyrolle & Company—Net profit for 1943, after providing for depreciation, renewals and taxation, £117,532 (£125,908); to general reserve, £40,000 (same): to development expenditure account, £25,000 (£35,000): dividend of 7%, less tax, on the preference stock, £3,588 (same); final dividend of 7½% on the ordinary stock, making 12½%, £51.044 (same); forward, £134,597 (£139,197).

Cargo Fleet Iron Company—Profit for the year to September 30 last, after providing for deferred repairs, £204,528 (£202,626); interest on 4% debenture stock, £37,988; staff pensions, £5,919; sinking fund for 4% first mortgage debenture stock, £11,188; taxation, £75,000 (£70,000); war damage, £7,007; depreciation, £65,000 (same); forward, £99,233 (£98,569). No ordinary dividend.

Imperial Chemical Industries—Net income for 1943, after providing for taxation and £2,500,000 (same) for the central obsolescence and depreciation fund, £6,685,345 (£6,499,859); to war contingency reserve, £774,210 (£601,595); final dividend on the ordinary shares of 5% (same), making 8% for 1943 (same); to war personnel reserve, £100,000 (same); preference dividend, £1,682,468 (£1,666,104); forward, £1,062,018 (£965,499).

South Durham Steel & Iron—Profit for the year to September 30 last, after providing for deferred repairs, £482,080 (£409,672); interest on 4½% perpetual debenture stock, £13,500; interest on 4% debenture stock, £29,033; staff pensions and life assurance scheme, £4,015; dividend on 6% cumulative preference shares, £18,000; sinking fund for 4% mortgage debenture stock, £8,134; taxation, £155,000 (£180,000); contingencies, £100,000 (nil); war damage, £7,508; depreciation, £100,000 (same); dividend of 6% on the ordinary shares, £21,000; additional dividend of 2½% on the ordinary shares, making 8½% (same), £8,750; dividend of 2½% (same) on the "B" ordinary shares, £14,695; forward, £124,182 (£123,586).

OBITUARY

COL. J. F. LISTER, deputy-chairman of Spencer (Melksham). Limited, died recently.

MR. ROBERT EDWARD PALMER, for many years technical adviser to the Rio Tinto Company, died on April 6, in his 79th year.

MR. ALFRED HITCHON, late chairman of Howard & Bullough, Limited, textile machinery makers, Accrington, died on April 16, in his 97th year.

MR. JOSEPH MCHATTIE, co-founder of and late partner in the Carntyne Steel Castings Company, Limited, Renfrew, died on April 14, at Ardrossan.

MR. MARK BARNSLEY, of Gartcosh, who was widely known as an iron and steel trade representative in Scotland, died recently. He had been associated with Smith & McLean, Limited, sheet and bar rollers, throughout his business career. He was 55 years of age.

MR. G. A. CROSSLAND, who was well known in the Sheffield foundry trade, died recently, aged 64. In his younger days, Mr. Crossland worked for Ibbotson Bros. & Company, Limited, Globe Steelworks, Sheffield, and later gained knowledge of the foundry trade with Hadfields, Limited, at their East Hecla Works. In 1918, he joined Cammell, Laird & Company, Limited, as chief sales clerk, and since the formation of the English Steel Corporation, Limited, in 1929, has specialised in the foundry sales section.

WE REGRET TO ANNOUNCE the death of Mr. Samuel Russell, the son of the founder of the well-known Leicester firm of iron and non-ferrous castings manufacturers, S. Russell & Sons, Limited. He was the senior past-president of the Leicester and District Engineering and Allied Employers' Association, a prominent archæologist, and a life-long supporter of the Congregational Church. He was 85 years old, and was at the foundry only a day or two before his death. Four of his five sons are actively engaged in the family business. Mr. S. H. Russell, the eldest, is a past-president and treasurer of the Institute of British Foundrymen.


LININGS
for all Types of
FURNACES
GR

Raw Material Markets

IRON AND STEEL

Plans for the distribution of pig-iron during the next few months have been more clearly defined. Consumers now know precisely the extent of their allocations and also the limit of the stocks which they will be permitted to hold in reserve. These are not unreasonably low and employment at the foundries will only be on a slightly reduced scale. Blast-furnace capacity is, of course, still ample for all essential needs and licence holders have no difficulty in obtaining their permitted tonnages. In the case of hematite, releases are very restricted, but there is no scarcity of other grades, and the tonnages of low- and medium-phosphorus iron consumed in the engineering and allied foundries are still substantial.

During the past few weeks there has been a shrinkage in the deliveries of home-produced billets, and although defectives are now being extensively used by the re-rollers, it has also been necessary to make inroads into reserve stocks. The sheet mills, on the other hand, although they are all working to capacity, appear to be well supplied with sheet bars. At all events, the demand for defective bars is very limited and there are still large quantities on offer. For all classes of light re-rolled products demand is still at peak levels. Outputs of light sections are booked for months ahead and the sheet-makers are now indicating July and August as the earliest delivery dates.

Every plate mill in the country is fully employed, and so urgent is the demand that some of the re-rolling mills are also engaged on this class of work. Distribution has, however, been regularised and essential industries, such as shipbuilding, engineering and boiler making, are not kept waiting. Mills engaged on light and medium sections are much more favourably situated than those on heavy joists, channels, etc. Rails and chairs are heavily specified and collieries, now back to normal working, are pressing for maximum quota tonnages of roofing bars, arches, props, etc.

NON-FERROUS METALS

There have been no outstanding developments in the non-ferrous metal market of late. In some instances, manufacturers are finding the position rather difficult in that, after stepping up production to a remarkable level since the outbreak of war, they are now being called upon to reverse the process. Outputs have been built up to a high peak and a considerable reserve of munitions accumulated. Now that the war situation no longer absorbs the weight of material that was demanded at the peak period of consumption, it has been found necessary to slacken off in certain directions. The Control have not yet found it advisable to allow fabricators to undertake any large-scale domestic work and are refusing applications to acquire raw material for any purposes not directly connected with the war effort.

The general trend is clearly reflected by the position in the non-ferrous scrap market, where trading is very dull. After the intense activity of the last year or two, consumers are no longer taking up such large amounts either of scrap or of primary metal. Copper is still being called for on a substantial scale by priority consumers, but large reserves are in hand, and even when the effects of the Rhodesian cut make themselves felt, the position will not be changed to any great extent. Even tin is available in quite large quantities, and all essential needs are covered, apparently without straining our reserves and, although there are no indications of a large surplus of this metal, the situation seems to be satisfactory.

Zinc is in good supply and consumption appears to be still on the decline, as far as this country is concerned. There is no cause for any anxiety regarding lead supplies, although military camp construction is absorbing a fairly large tonnage. This metal is likely to be in very heavy demand for use in the post-war housing schemes, and any accumulated stocks will quickly be disposed of.

NEW COMPANIES

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

Clayton (Brassfounders), 21, Longmore Road, Sutton Coldfield—£500. W. H. Clayton and W. C. Windy.

William Moseley (Engineers), Bedfont Road, Feltham, Middlesex—£4,500. C. W. Serjeant, W. Moseley, and A. Parker.

M. Lee & Son, Akraqual Works, Bates Hill, Redditch—Constructional engineers. £4,000. J. and K. J. Lee and J. E. Earl.

Thomas Lake & Company, Alexandra Works, Alexandra Road, Barnstaple—Ironfounders. £4,000. J. Huxtable and A. E. Lake.

Raine Bros. (Leeds)—Metal founders and spinners, engineers, etc. £10,000. W. Hildreth, 80, North Park Avenue, Leeds, 8, subscriber.

Newport Smelting Company, Abbey Works, Adelaide Street, Newport, Mon.—£1,000. C. H. Matthews, H. L. Bailey, and R. J. Allen.

Eastern Foundry Company, 106a, South Birkbeck Road, Leytonstone, London, E.—£2,500. F. H. Evans, A. H. C. Taylor, and E. M. Phillips.

REFINED FERRO-MANGANESE

The Iron and Steel Control have reduced the price of 0.50 per cent. maximum carbon grade refined ferro-manganese, despatched from producers' works or stock in the United Kingdom, to £77 10s. per ton, basis 78 per cent. Mn, scale 20s., delivered to buyer in minimum 5-ton lots. For smaller lots extra carriage over the 5-ton rate may be charged by producers.

CURRENT PRICES OF IRON, STEEL AND NON-FERROUS METALS

(Delivered, unless otherwise stated)

Wednesday, April 26, 1944

PIG-IRON

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

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

Hematite.—No. 1 (S & P 0.03 to 0.05 per cent.): Scotland, N.-E. Coast and West Coast of England, 138s. 6d.; Sheffield, 144s.: Birmingham, 150s.; Wales (Welsh iron), 134s. East Coast No. 3 at Birmingham, 149s.

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

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

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

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

Cold Blast.—South Staffs, 227s. 6d.

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

FERRO-ALLOYS

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

Ferro-silicon (5-ton lots).—25 per cent., £21 5s.; 45/50 per cent., £27 10s.; 75/80 per cent., £43. Briquettes, £30 per ton.

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

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

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

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

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

Ferro-chrome.—4/6 per cent. C, £59; max. 2 per cent. C, 1s. 6d. lb.; max. 1 per cent. C, 1s. 6½d. lb.; max. 0.5 per cent. C, 1s. 6¾d. lb.

Cobalt.—98/99 per cent., 8s. 9d. lb.

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

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

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

SEMI-FINISHED STEEL

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

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

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

FINISHED STEEL

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

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

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

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

NON-FERROUS METALS

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

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

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

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

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

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

Brass.—Solid-drawn tubes, 14d. per lb.; brazed tubes, 16d.; rods, drawn, 11⅝d.; rods, extruded or rolled, 9d.; sheets to 10 w.g., 10⅞d.; wire, 10⅝d.; rolled metal, 10¼d.; yellow metal rods, 9d.

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

Phosphor Bronze.—Strip, 14d. per lb.; sheets to 10 w.g., 15d.; wire, 16¼d.; rods, 16¼d.; tubes, 21½d.; castings, 20d., delivery 3 cwt. free. 10 per cent. phos. cop. £35 above B.S.; 15 per cent. phos. cop. £43 above B.S.; phosphor tin (5 per cent.) £40 above price of English ingots. (C. CLIFFORD & SON, LIMITED.)

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

NON-FERROUS SCRAP

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

Returned Process Scrap.—(Issued by the N.F.M.C. as the basis of settlement for returned process scrap, week ended Apr. 22, where buyer and seller have not mutually agreed a price; net, per ton, ex-sellers' works, suitably packed):—

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

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

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

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

IRON AND STEEL SCRAP

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

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

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

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

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

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

SITUATIONS

FOUNDRY MANAGER or Assistant; position required by Foreman with considerable experience in modern methods of foundry practice, machine moulding; experienced especially in light engineering and builders' castings; technically trained.—Box 456, FOUNDRY TRADE JOURNAL, 3, Amersham Road, High Wycombe.

FOUNDRY FOREMAN; practical and technical; 25 years' experience all types iron castings; take complete charge; City and Guilds certificate; A.M.I.B.F.—Box 454, FOUNDRY TRADE JOURNAL, 3, Amersham Road, High Wycombe.

FOUNDRY GENERAL MANAGER, M.I.Brit.F., Inter. B.Sc. (Eng.), etc.; age 39; ex-Service; metallurgist; repetition expert; grey and malleable castings; practical foundryman; patternmaker; take entire charge all foundry departments; sound engineer and maintenance; accustomed organisation layout, rate fixing, costs, production control, sales; keen, energetic; excellent record; available short notice to progressive firm; war and post-war developments; moderate commencing salary pending results; Midlands essential; principals only.—Box 460, FOUNDRY TRADE JOURNAL, 3, Amersham Road, High Wycombe.

FOUNDRY MANAGER required; preferably with experience in steel and bronze founding; degree or higher national certificate essential; age not over 35 years; managerial abilities and sound practical knowledge—condition; applicants to supply full particulars as regards education, positions occupied, and salary required, Box 458, FOUNDRY TRADE JOURNAL, 3, Amersham Road, High Wycombe.

FOUNDRY MANAGER required by large well-known firm of engineers in Midlands, with foundry capacity 150 tons per week. Applicants must possess up-to-date knowledge of modern foundry practice in respect of methods, planning and organisation. Experience of the production of a wide variety of heavy iron castings in various alloys is essential. The appointment is an important and permanent one, and is superannuable under the Company's own scheme. Salary £500/£750 per annum, plus current war bonuses, according to qualifications and experience. Only men of proved record should apply.—Send for Company's form of application to Box 446, FOUNDRY TRADE JOURNAL, 3, Amersham Road, High Wycombe.

MANAGER wanted by an old-established firm for Foundry producing general engineering castings up to 5 tons, large engine cylinders, and high-duty alloys; good laboratory and metallurgical control already available; practical foundry experience essential; early engagement or post-war considered; a salary of four figures will be paid to first-class man.—Box 438, FOUNDRY TRADE JOURNAL, 3, Amersham Road, High Wycombe.

REPRESENTATIVE wanted by Midland Steel Foundry producing Light Castings (1 lb. to 56 lbs.) in both Carbon and Alloy Steels.—Apply in first instance by writing GABRIEL & Co., LTD., Birmingham.

GENERAL MANAGER. — Medium general jobbing Steel Foundry requires General Manager; it is essential that applicants must be experienced in economic production of a wide range of highest quality castings.—Full particulars to Box 440, FOUNDRY TRADE JOURNAL, 3, Amersham Road, High Wycombe.

WORKS MANAGER, for a large Agriculture Machinery Manufacturing concern, seeks position; specialist in mechanised implements for tractor cultivation, and a wide organising experience in foundry, machine shop, forge and assembly shops.—Box 434, FOUNDRY TRADE JOURNAL, 3, Amersham Road, High Wycombe.

HEAD FOUNDRY FOREMAN required for Iron Foundry in Midlands, making Machine Tool Castings, Diesel and Internal Combustion Engine Castings; must be fully experienced in machine repetition work and jobbing castings; good disciplinarian and capable of fixing economical piecework prices; this position has post-war prospects for the right man; foundry has output of 60/70 tons per week; weight of castings up to 6 tons.—Apply, stating full particulars of experience, age, salary required (applications not submitting these particulars will not be considered), Box 450, FOUNDRY TRADE JOURNAL, 3, Amersham Road, High Wycombe, Bucks.

MACHINERY

WANTED.—1 to 2 cwts. "Titan," or equal, Core-Sand Mixing Machine.—Box 442, FOUNDRY TRADE JOURNAL, 3, Amersham Road, High Wycombe.

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

THOS. W. WARD LTD.

BABCOCK WATER-TUBE BOILER; evaporation 10,000 lbs.; working pressure 180 lbs.

LANCASHIRE BOILER; 30 ft. by 7 ft. 6 in. by 180 lbs. w.p.

LANCASHIRE BOILER; 30 ft. by 8 ft. by 120 lbs. w.p.

Two LANCASHIRE BOILERS; 30 ft. by 8 ft. by 160 lbs. w.p.

Two LANCASHIRE BOILERS; 30 ft. by 9 ft. by 160 lbs. w.p.

VERTICAL MULTI - TUBULAR BOILER; 16 ft. 6 in. by 6 ft. 6 in. by 100 lbs. w.p.

NEW PRESSED STEEL SECTIONAL TANKS; plates 4-ft. square.

LARGE AND VARIED STOCK GOOD SECONDHAND ROLLED STEEL JOISTS, ANGLES, CHANNELS, ROOF PRINCIPALS, ETC.

LOW PRICES. QUICK DELIVERY.

Good secondhand STEEL-FRAMED STRUCTURE; about 125 ft. long by 60 ft. wide by 30/40 ft. high; further details and price on application.

Write for "Albion" Catalogue

ALBION WORKS, SHEFFIELD.

'Grams: "Forward." 'Phone: 26311 (15 lines)

280 FT. CENTRES HORIZONTAL M.S. TRAY TYPE CONVEYOR; 18 in. wide; new 1940; complete with framework; elevated discharge; worm reduction gear and motor; ideal for handling swarf.—NEWMAN INDUSTRIES, LTD. Yate, Bristol.

Broadbent Brick Crusher Jaws 8 in deep.

Greens "Emergency" Cupolette 5-10 Cwts.

Herbert's "Cloudburst" Hardness Testing Machine, by Massey; 3/50/550 volts; 1,430 r.p.m.

Morgan Type "S" Oil-fired Tilting Furnace; 400-440 lbs. capacity.

Portable Mortar Mill; 4 ft. pan.

Jackman Foundry Sand Riddle.

Silkysand Disintegrator.

Sand Mills; 5 ft., 4 ft. 6 in., and 5 ft. 6 in.

S. C. BILBBY, Crosswells Road, Langley, Birmingham.

CLIMAX 12/20 Fan; 1,900 cub. ft. per min.; 4 in. w.g.; driven by 2½ h.p. English electric motor, T.E., C.R., S.I., 1,440/480 r.p.m.; 440 volts, 3-phase, 50 cycles; almost brand new.—Offers to Box 452, FOUNDRY TRADE JOURNAL, 3, Amersham Road, High Wycombe.

MISCELLANEOUS

NON-FERROUS FOUNDRY, capacity available, including sand blasting; competitive prices quoted.—ALBUTT, SON & JACKSON, Valve Makers and Brass Founders, Greenmount Works, Halifax.

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

CAPACITY AVAILABLE.—Machine-Cut Spur Gears up to 5 ft. dia.; 10 in. face by 2 in. C.P.; can supply in all materials, and can offer very good deliveries in Cast-Iron Gears.—WARWILL, LTD., Abertillery.

LARGE Midland Iron Foundry invites enquiries for Castings up to 20 tons each, to any specification, in High-Duty and Alloy Irons; we can also undertake to make the necessary patterns; prompt deliveries.—Box 448, FOUNDRY TRADE JOURNAL, 3, Amersham Road, High Wycombe.

"GO TO WARWILL, LTD. ABERTILLERY, MON., FOR NON-FERROUS CASTINGS UP TO 1 CWT; GOOD DELIVERIES.

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

'Phone: 22877 SLOUGH

NEW SHOT BLAST CABINET PLANTS with motor driven Exhaust Fans, complete, all sizes; air compressors to suit in stock, also motors if required.

Britannia large size plain jolt and pattern draw moulding machine, 8" diameter cylinder, table 4' x 3', reconditioned.

Pneulec Royer Sand Thrower.

Coleman Prosama Sand Thrower.

Jackman taper roll Sand Mill.

New 600 lb. oil or gas-fired centre axis tilting furnace complete with bar burner and equipment, £220.

Alex. Hammond, *Foundry Machinery Merchant.*

14 AUSTRALIA Rd. SLOUGH

BUY FROM ME AND SAVE MONEY

THE "PORTWAY"

PORTABLE CORE OVENS

FOR GAS OR FUEL.

TESTIMONIAL.

The Letchworth Casting Co. Ltd.,
Birds Hill, LETCHWORTH, Herts.
15th May, 1939.

Dear Sirs,

With reference to the Portway Core Stove installed for us in 1937, we are pleased to state that this is very efficient and satisfactory in every way. The consumption of fuel is very low and consequently the stove is an economical unit.

We shall always be happy to recommend its use to our friends.

Yours faithfully, Signed . . . H. G. Barrett,
LETCHWORTH CASTING CO. LTD.

Makers—**C. PORTWAY & SON, LTD.** Tortoise Stove & Portway Portable Oven Works, **HALSTEAD, ESSEX**

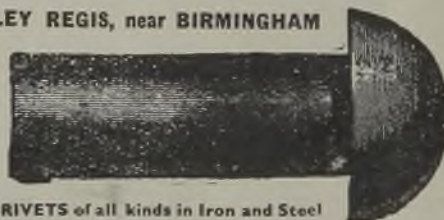
VITREOUS ENAMELLED CASTINGS

ARE EASILY CLEANED, UNAFFECTED BY HEAT, AND ADD TO THE BEAUTY OF THE HOME

THE RUSTLESS IRON Co., Ltd.,
Trico Works - - - Keighley

THOS. GADD, ROSS BOLT, NUT and RIVET WORKS,

ROWLEY REGIS, near BIRMINGHAM

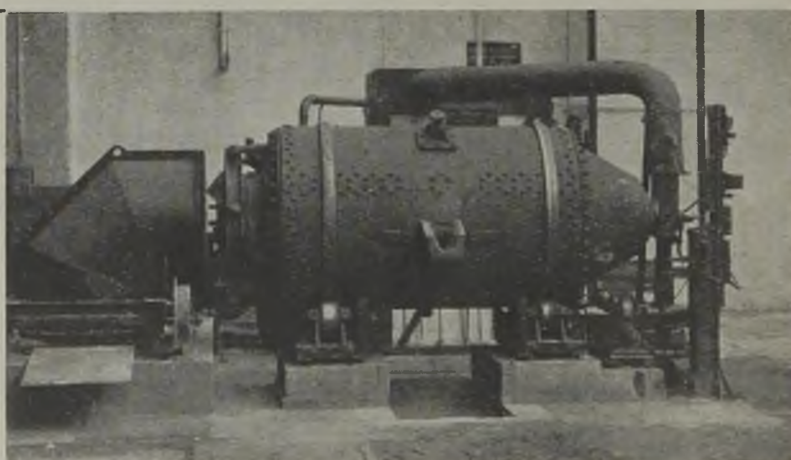


RIVETS of all kinds in Iron and Steel

Telegrams: "Thos. Gadd, Rowley Rise."
Telephone: Blackheath 1020. Established 1830

ROTARY FURNACES

FIRED BY
FUEL OIL
TOWNS GAS
"PULVERITE"
OR
CREOSOTE
PITCH
MIXTURE



STEIN & ATKINSON LTD.

47, WOLSEY ROAD,
EAST MOLESEY, SURREY.

TELEPHONES:
MOLESEY 3111-2

Telegrams:
METASTEINA, PHONE, LONDON

Published by the Proprietors, INDUSTRIAL NEWSPAPERS, LIMITED, 49, Wellington Street, Strand, London, W.C.2, and Printed in Great Britain by HARRISON & SONS, LTD., 44/47, St. Martin's Lane, London, W.C.2.

FOUNDRY TRADE JOURNAL

EST. 1902

WITH WHICH IS INCORPORATED THE IRON AND STEEL TRADES JOURNAL

VOL. 72. No. 1445. APRIL 27, 1944

Registered at the G.P.O. as a Newspaper.

Offices: 49, Wellington Street, Strand, London, W.C.2.

[Single Copy 6d. By Post 8d. Annual Subscription, Home and Overseas, 21/- (Prepaid)]