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JULY 9, 1953
Offices: 49, Wellington Street, Strand, London, W.C.2

Single Copy, 9d. By Post 11d. Annual Subscription, Home 40/-, Abroad 45/- (Prepaid)

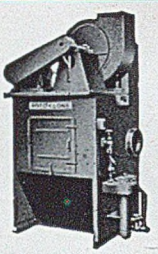
FOUNDRY DUST

Controlled by the ACI LTD ROTOCLONE*

DUST FROM

SHAKEOUTS, SAND HANDLING SYSTEMS, SWING FRAME, SNAGGING and PORTABLE GRINDERS, TUMBLERS, MULLERS, and ABRASIVE CLEANERS; SMOKE AND FUMES FROM ELECTRIC FURNACES

TYPE "D"



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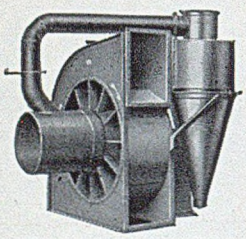

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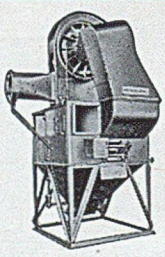


TYPE "W"

Write for details and Manual of Exhaust Hood Designs to:

AIR CONTROL INSTALLATIONS LTD

RUISLIP **MIDDX.**

'Phone: RUISLIP 4066 (8 lines)

'Grams: CONTROLAIR, RUISLIP

BIRMINGHAM · MANCHESTER · GLASGOW

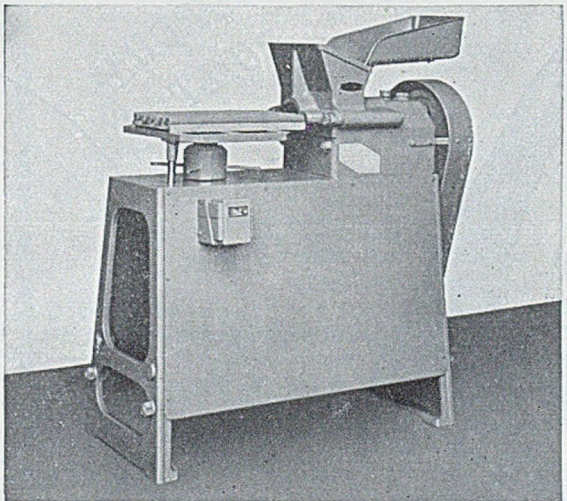
*ROTOCLONE is the trade mark (Reg. U.S. Pat. Off.) of the American Air Filter Company, Inc., for various dust collectors of the dynamic precipitator and hydrostatic precipitator type. AIR CONTROL INSTALLATIONS, LTD., are the sole licencees for the manufacture of these units in this country.

TWO FOUNDRY MACHINES OF EXCEPTIONAL MERIT

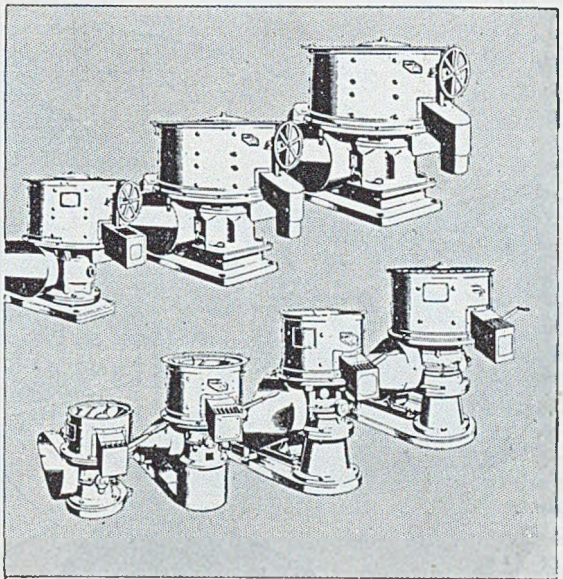
Sand/Binder Mixing without crushing

ACCURATE CORE EXTRUSION WITH ANY GRADE SANDS

The Fordath 'New Type' Mixer, in seven sizes with capacities from 20 lbs. to 1 ton, mixes foundry silica sands with core bonding compounds without crushing. It mixes and discharges in 2 to 3 minutes a well aerated homogeneous mix. Stiff compounds as low as 1% can be completely dispersed through the sand. Fordath Mixing Machines are hard at work, day after day, in foundries everywhere. It is therefore a simple matter to arrange to see one in operation.



The FORDATH MULTIPLUNGER CORE MACHINE *admirably exemplifies the success of equipment designed by foundrymen for foundrymen.*



FORDATH 'NEW TYPE' MIXING MACHINES *use the well known Fordath principle of rubbing and folding without crushing in each of the seven models in the range.*

The Fordath Multiplunger Core Machine takes the extrusion of accurate cores a substantial step forward. The positive thrust of the core-mix through the multiple die by plunger action produces dimensionally accurate cores when sands of poor quality have to be utilised; even facing sand or plain red moulding sand can be extruded satisfactorily. The appeal of this machine to costing-conscious foundrymen was immediate from the day of its introduction, and there have been many repeat orders.

Arrange to see these machines at work

Full details from :

GLYCO CORE BINDERS

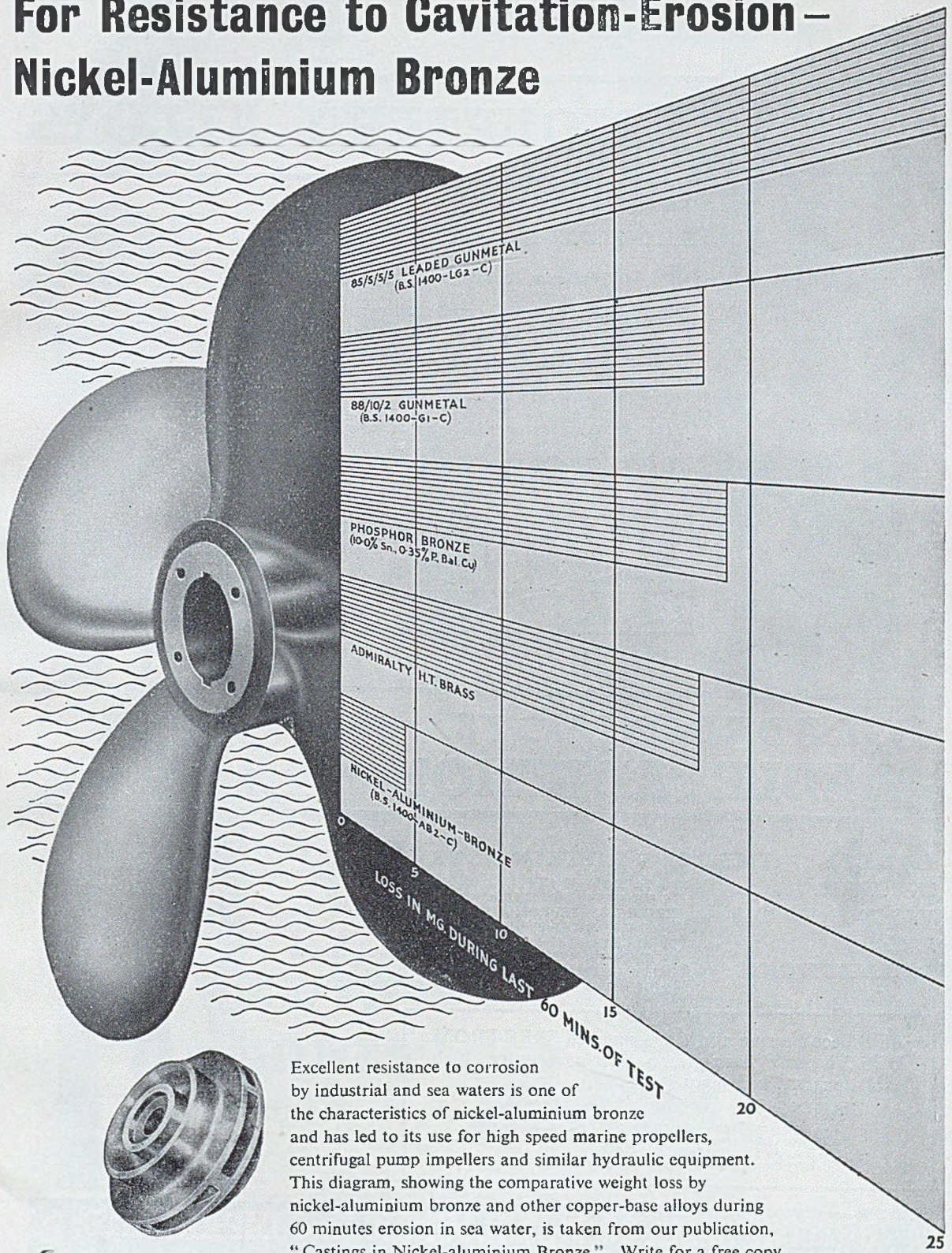
THE FORDATH ENGINEERING CO. LTD.

HAMBLET WORKS, WEST BROMWICH, STAFFS.

PHONE: West Bromwich 0549, 0540, 1692

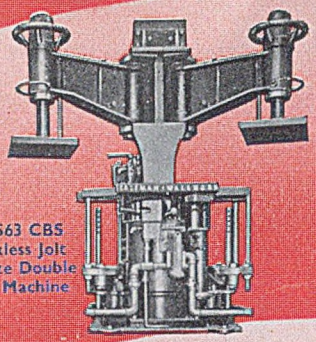
GRAMS: Metallical, West Bromwich

For Resistance to Cavitation-Erosion — Nickel-Aluminium Bronze

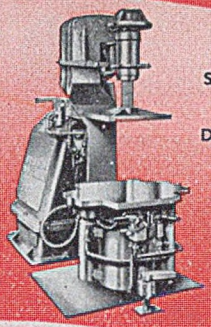


Excellent resistance to corrosion by industrial and sea waters is one of the characteristics of nickel-aluminium bronze and has led to its use for high speed marine propellers, centrifugal pump impellers and similar hydraulic equipment. This diagram, showing the comparative weight loss by nickel-aluminium bronze and other copper-base alloys during 60 minutes erosion in sea water, is taken from our publication, "Castings in Nickel-aluminium Bronze". Write for a free copy.

THE MOND NICKEL COMPANY LIMITED · SUNDERLAND HOUSE · CURZON ST · LONDON · W.1

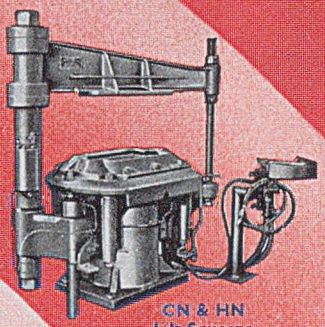


WT 563 CBS
Shockless Jolt
Squeeze Double
Head Machine

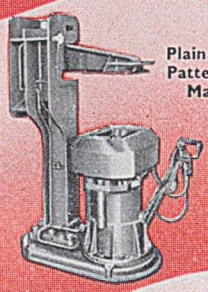


WT 562
Shockless Jolt
Squeeze
Turnover
Draw Machine
(5 sizes)

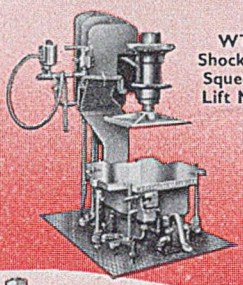
WT 563 CP
Shockless Jolt
Squeeze Pipe
Moulding
Machine



CN & HN
Jolt Squeeze
Pattern Draw
Machines



EH
Plain Squeeze
Pattern Draw
Machines

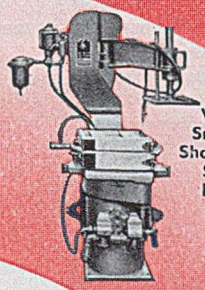


WT 563
Shockless Jolt
Squeeze Pin
Lift Machine

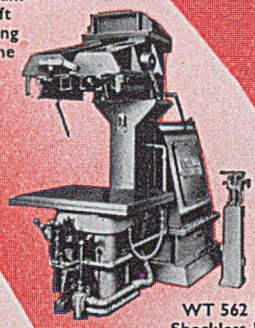
WT 571
Hand Ram
Pin Lift
Moulding
Machine

KH
Plain
Squeeze
Machine

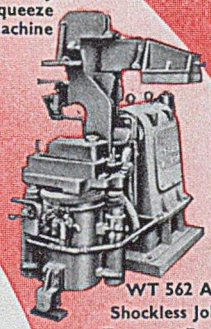
WT 568
Hand Squeeze
Pin Lift
Moulding
Machine



WT 547
Snap Flask
Shockless Jolt
Squeeze
Machine



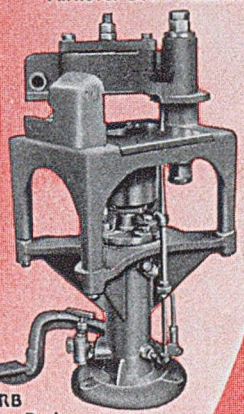
WT 562 D
Shockless Jolt
Squeeze Turnover
Draw Machines



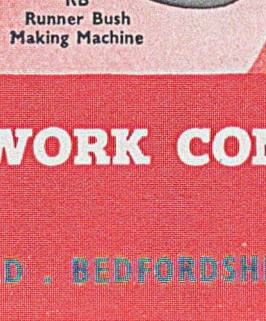
Here are just a few . . .

Some of the Machines illustrated here have been built to Clients' special requirements. Others are part of our standard range and are available in various sizes. We will gladly forward specifications on request to suit your own particular need.

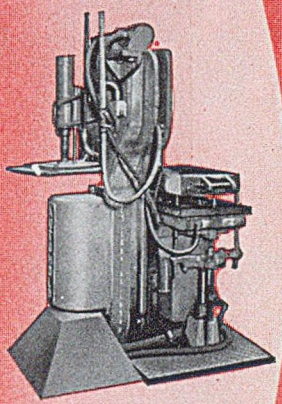
Precision-built MOULDING MACHINES by



WT 562 AY & AX
Shockless Jolt Squeeze
Turnover Draw Machine



RB
Runner Bush
Making Machine



A complete range of
'AUTOMOLD' AUTOMATIC
MOULDING MACHINES

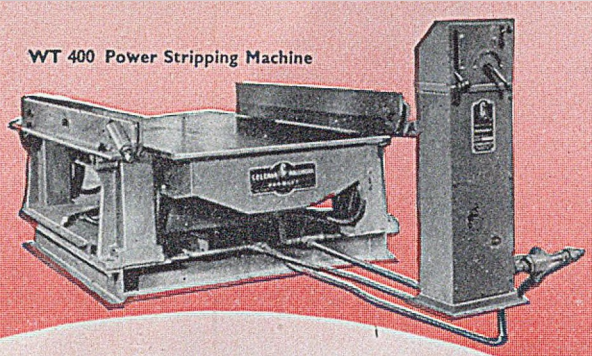
THE COLEMAN WALLWORK COMPANY, LTD.

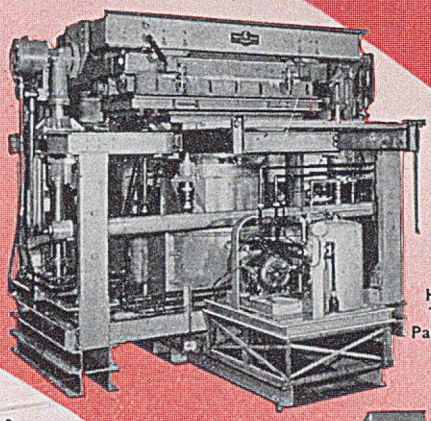
MEMBERS OF THE J. STONE GROUP

Registered Office & Works:-

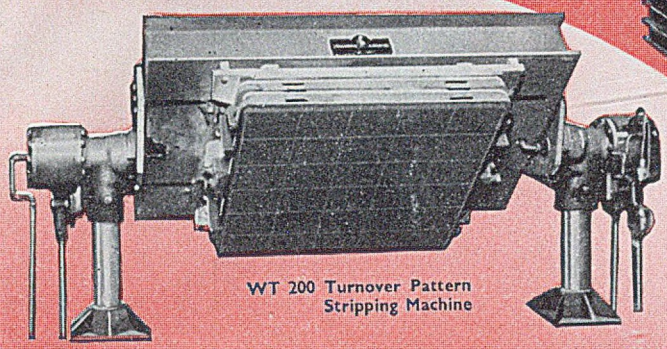
WINDSOR WORKS · STOTFOLD . BEDFORDSHIRE Tel: Stotfold 361-4

WT 400 Power Stripping Machine





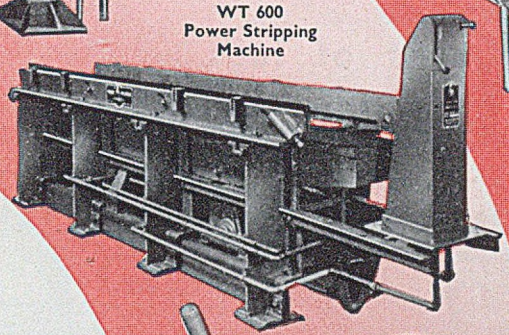
WT 250
Hydra-Jolt
Turnover
Pattern Draw
Machine



WT 200 Turnover Pattern
Stripping Machine

WT 590
Turnover Pattern
Stripping Machine

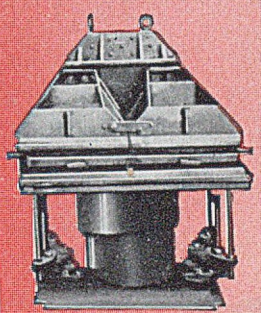
WT 600
Power Stripping
Machine



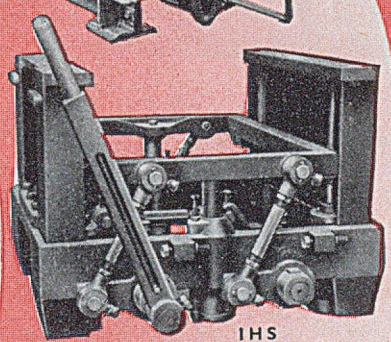
...here are a few more...

We hope that the above illustrations and those on a preceding page, have acted as a guide to help you to make your choice from our new and larger range of machines.

If you require a machine to do any particular foundry job, we can supply it. Illustrated particulars of any type of machine you see in our advertisements will be gladly sent to you on request.

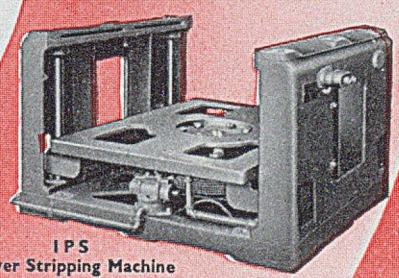


WT 563 D
Shockless Jolt
Squeeze Pin
Lift Machine



IHS
Hand Stripping Machine

Precision-built MOULDING MACHINES by



IPS
Power Stripping Machine

PJR
Plain Jolters
(3 sizes)

THE COLEMAN WALLWORK COMPANY, LTD.

MEMBERS OF THE J. STONE GROUP

Registered Office & Works :-

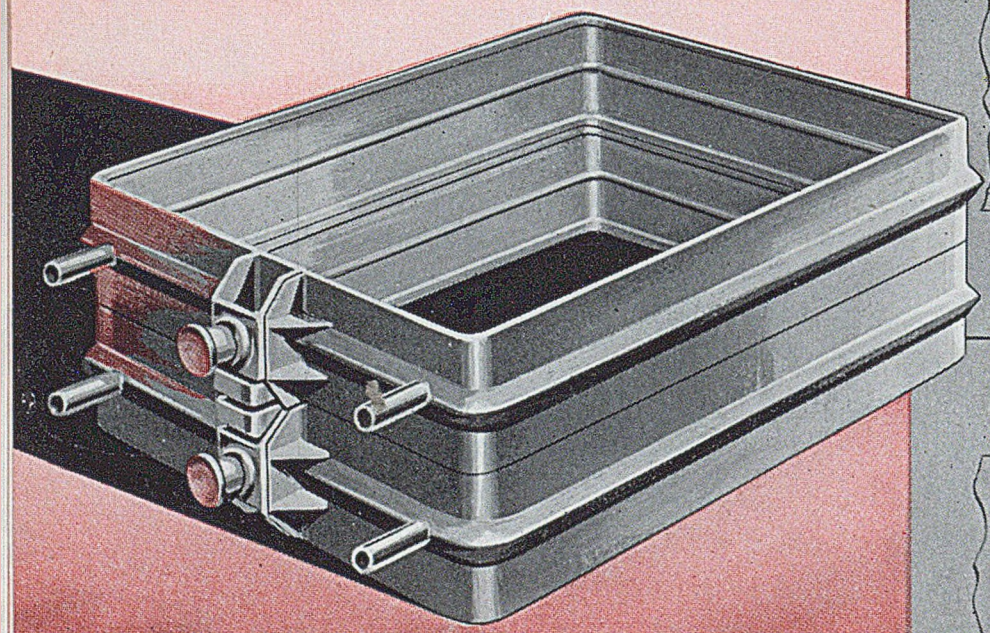
WINDSOR WORKS · STOTFOLD · BEDFORDSHIRE Tel: Stotfold 381-4

LESS SCRAP!

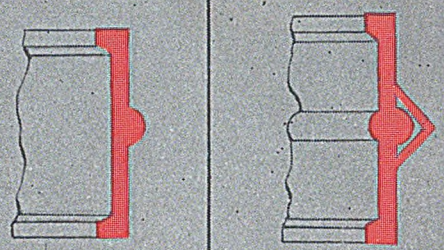
Sterling

standards of precision in box dimensions, accuracy and alignment of lugs and pins, are major contributions to the rapid production of

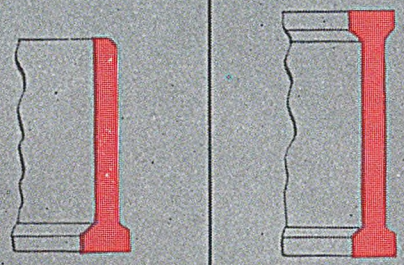
ACCURATE CASTINGS



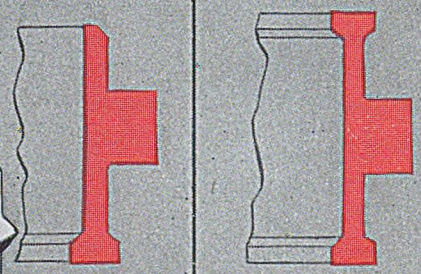
STERLING FOUNDRY SPECIALTIES LTD. BEDFORD



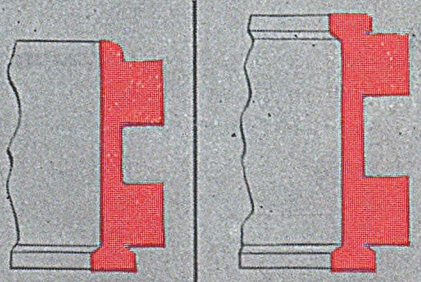
STANDARD



SECTIONS FOR



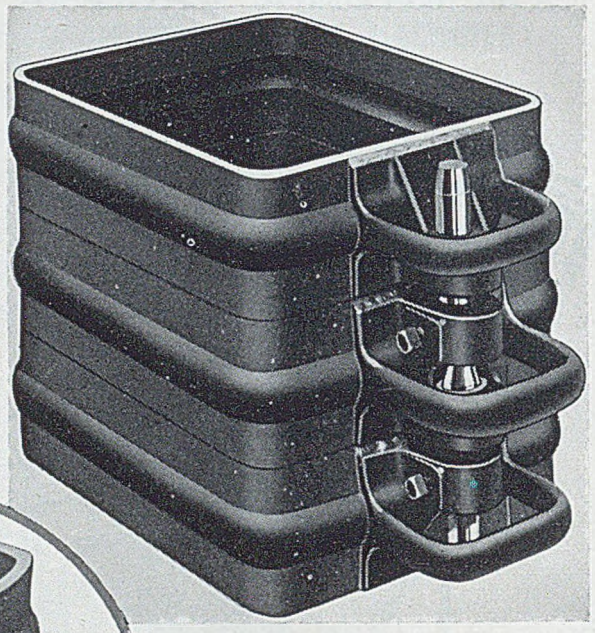
ALL FOUNDRY



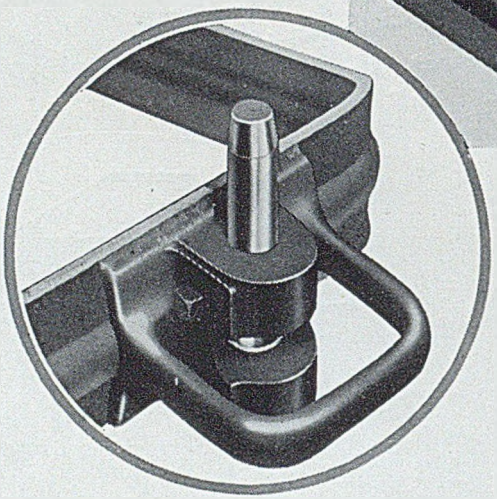
CONDITIONS

10 good reasons why TALBARD *Moulding Boxes*

are universally popular at home and overseas



Standard 3-part Set.
Type "O" Top and Bottom
Type "M" Middle Part.



TYPE "M" LUG

1 Cast malleable lugs and fittings
2 Accurately ground box faces
3 Precision ground pins adjustable for length
4 Full range of loose pin and multi-part boxes
5 Accurate pin centres and guaranteed interchangeability
6 Renewable steel bushes, round or elongated
7 Straight lifting handles optional
8 Special brassfounders boxes
9 Range of bars, clamps, etc., as required
10 Specially finished and packed for export

These Sections are intended for use with Type "O" Boxes to form 3-part Sets, or may be used in multiples for stacking. Type "M" Lugs are fitted and the Top Section carries a turned and ground pin held in place by a set screw. The Lug Bottom Section is drilled and bushed.

One Type "M" Box can be placed between the Drag and Cope halves of a pair of Type "O" Boxes. Several Type "M" Boxes can be built up to form multi-part sets.

E. TALLIS & SONS LIMITED

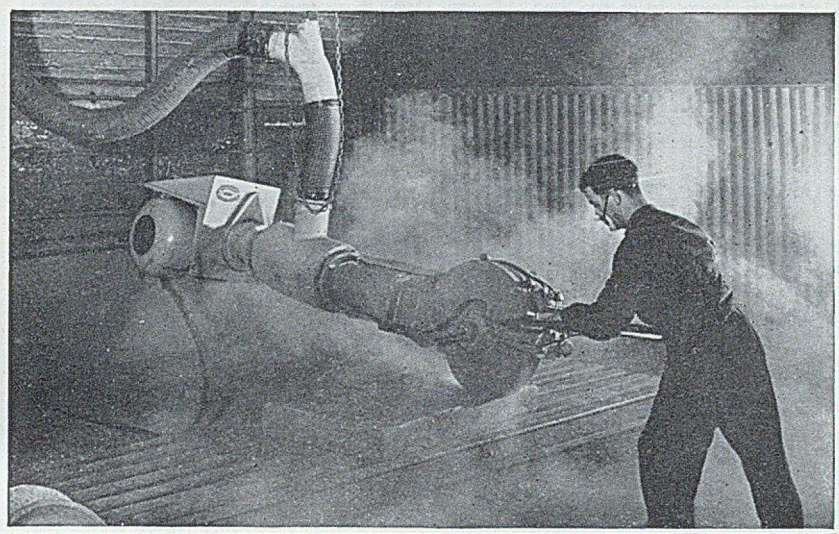
TALBARD WORKS, CHARLES HENRY STREET, BIRMINGHAM 12

(Phone: MIDland 4387 and VICtoria 2072)

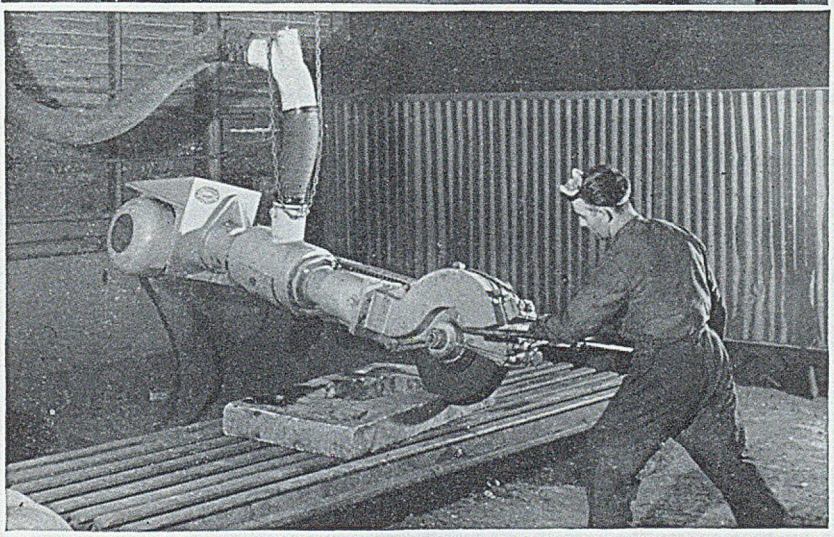
London Office: 47, WHITEHALL, S.W.1 *Phone:* WHITEHALL 7740

A NEW 20" SWING FRAME GRINDER

which completely solves one of the worst problems in the foundry



GRINDING WOOD WITH EXHAUST **OFF**



GRINDING WOOD WITH EXHAUST **ON**

This Grinder has been designed and built as a result of experiments over four years, and is the fifth model which has been built.

The photographs reproduced above were taken by The English Steel Corporation Ltd., Sheffield and show the machine grinding wood. (This material produces a large volume of smoke which can be photographed). It might be thought that the second photograph is a fake, but this is not so. In actual fact, owing to the direction of the wind the smoke discharged outside the shop was blown in through the roof ventilator in such volume that a number of people in the shop thought that a fire had been started.

The ESC Swing Grinder is built around an entirely new theory of dust extraction. There is a main duct immediately in front of the wheel and a secondary side duct which draws the fine dust away from the top of the wheel at right angles to the line of rotation.

EXHAUSTIVE TESTS WHICH HAVE BEEN FILMED PROVE THAT THIS MACHINE COMPLETELY SOLVES ONE OF THE WORST PROBLEMS IN THE CAMPAIGN AGAINST PNEUMOCONIOSIS.

In your own and your operators' interests write to us for full details.

LUKE & SPENCER LTD.

Viaduct Works, Broadheath, Altrincham, Cheshire

Phone: Altrincham 3281 Grams "Emery, Altrincham"

E

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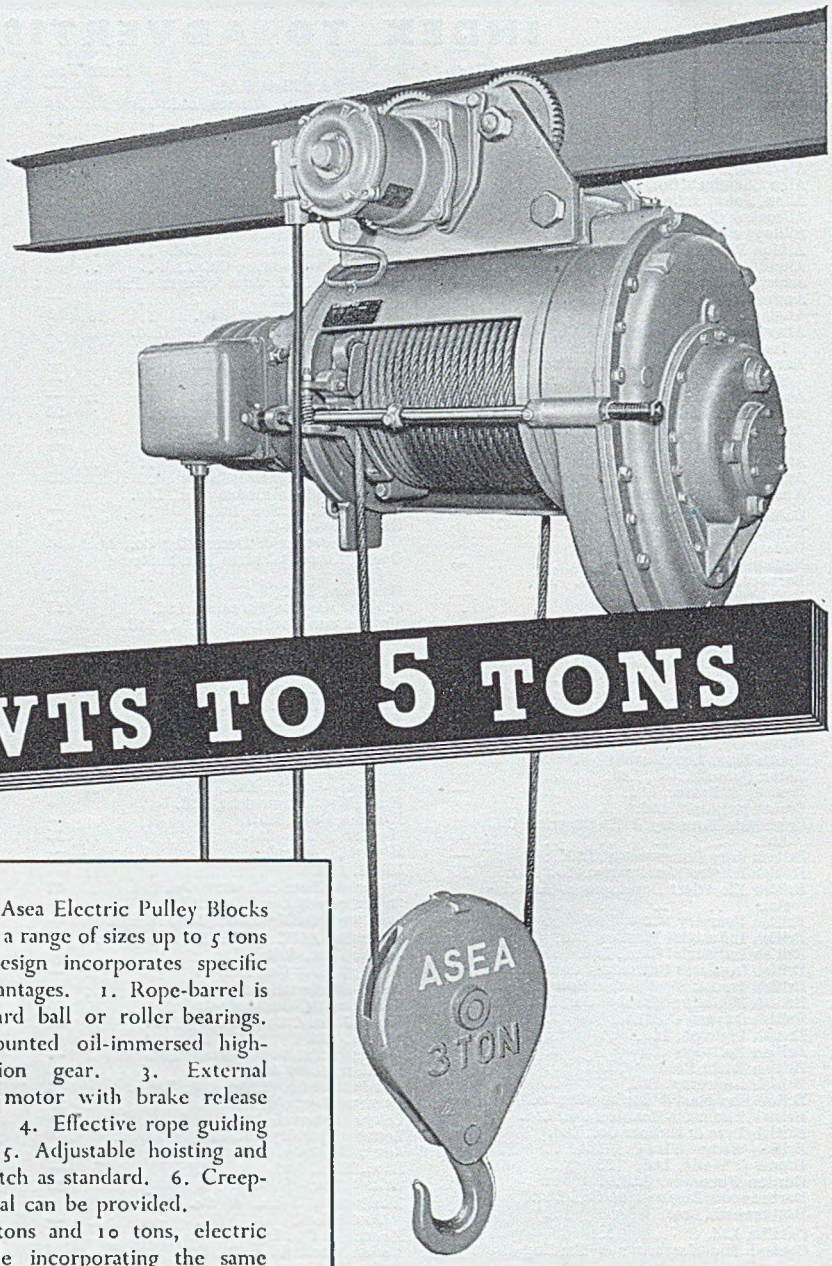

5 CWTS TO 5 TONS

The TBB series of Asea Electric Pulley Blocks is now available in a range of sizes up to 5 tons capacity. The design incorporates specific and important advantages. 1. Rope-barrel is mounted on standard ball or roller bearings. 2. Externally mounted oil-immersed high-efficiency reduction gear. 3. External efficiently cooled motor with brake release by tapered rotor. 4. Effective rope guiding and positioning. 5. Adjustable hoisting and lowering limit switch as standard. 6. Creeping speed $\frac{1}{10}$ normal can be provided.
For loads of $7\frac{1}{2}$ tons and 10 tons, electric crabs are available incorporating the same type of lifting device.

THESE PULLEY BLOCKS ARE DESIGNED TO OPERATE IN THE MOST SEVERE INDUSTRIAL CONDITIONS

WRITE FOR SPECIFICATIONS AND PRICES

ASEA ELECTRIC LTD. FULBOURNE ROAD, WALTHAMSTOW, LONDON, E.17.
Phone: LARkswood 2350 (10 lines) Grams: Autosyncro, Telex, London.

BRANCHES AT: BIRMINGHAM : GLASGOW : MANCHESTER : DUBLIN

FOUNDRY TRADE JOURNAL
Established 1902
WITH WHICH IS INCORPORATED THE IRON AND STEEL TRADES JOURNAL

The FOUNDRY TRADE JOURNAL is the Official Organ of the following :—

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Secretary : **T. Makemson, M.B.E.,** Saint John Street Chambers, Deansgate, Manchester, 3. 'Phone and 'Grams : Blackfriars 6178.

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PRINCIPAL CONTENTS

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Cure For Industrial Myopia

A booklet has just been issued by the Council of Ironfoundry Associations which gives an account, written by Dr. J. G. Pearce, of the work of the operational research team acting under the ægis of the British Cast Iron Research Association. This has now been functioning for two years, a period sufficiently long for conclusions to be drawn as to the value of the service, though it is obvious that its worth will much increase with added experience and accumulated data. We have had experience of this branch of industrial service and there is much more in it than the appraisal of current conditions and the enunciation of technical improvements. There are often psychological difficulties to be surmounted, needing infinite diplomacy. It cannot be unusual to find that some suggestion put forward by the team has also been in the mind of one of the foundry staff and has not met with the approbation of his colleagues !

Rightly, the team makes visits only on invitation from a foundry and its reports are obviously confidential to the hosts. The team must always be learning but no one need fear that such lessons when used elsewhere will be detrimental to their interests, as the output of the foundry industry is so diverse that, by and large, competition is of minor importance compared with the great value to be obtained from technical co-operation. We notice in Dr. Pearce's account, that help is also given on management. This is of supreme importance, for without good management, high technical efficiency will not make for ultimate success. It is a natural phenomenon that, where a foundry concern has been thoroughly modernized and re-equipped, the manager imagines for far too long that his shops represent the last word in efficiency in plant and methods. In other factories, there are broken windows, derelict plant, obvious obstructions, and so forth, which, because they have always been there, the management never notice, but which immediately catch the attention of a visitor. This we have christened "industrial myopia."

All foundry owners and executives should read this succinct account, and especially the letters of appreciation printed as an Appendix. These appreciations are outstanding, for generally speaking, a free service is all too often taken at face value. It should be stressed that there are no charges whatsoever by the Association to its members and as membership costs no more than the price of enrolment, the service is free to all the ironfounders of this country. Our considered advice to all ironfounders is to make application straightaway for a visit by the team. Naturally, there is a waiting list, but geographical location may bring about early acceptance, as, obviously, economy in travelling expenses has to be envisaged in planning programmes of visits.

International Foundry Congress

Provisional Programme

The office of the congress is located at La Maison de Fonderie, 2 Rue de Bassano, Paris 16. This is to be opened for the registration of participants on Saturday, September 19, from 10 a.m. to 6 p.m. From 5 to 8 p.m. there is to be a reception by the *Association Technique de Fonderie* in this building. On Sunday, there is to be an excursion to the Ile de France, which includes a garden party at the Château de Dampierre.

Detailed below is the programme as released by the hosts.

Monday, September 21, at 9.30. Opening ceremony in the Grand Hall of the Sorbonne. 12.30, communal luncheon; 2 to 5, presentation and discussion of papers on gases in metals (Room A); risering, malleable castings (Room B); and cast iron (Room C at the Sorbonne); 5.30, civic reception at the Hotel de Ville; 8.30 p.m., dinner and cabaret show.

Tuesday, September 22. 9 to 12, at Rue de Bassano—sessions devoted to technical training, exhibition, film shows and lectures; 12 noon, communal luncheon; 2.30 to 6, continuation of morning's work.

Wednesday, September 23. Morning—works visits; communal luncheon; 2 to 5.30 p.m., technical sessions (Rue de Bassano), spheroidal-graphite cast iron (Room A), furnaces and refractories work (Room B), and foundry defects (Room C). Evening free.

Thursday, September 24. Morning—works visits; communal luncheon. Technical sessions at Rue de Bassano, spheroidal-graphite cast iron (Room A); laboratory and chemical control (Room B); testing methods (Room C). 6 p.m., reception by the Paris Chamber of Commerce.

Friday, September 25. 9 a.m. to 12, technical sessions (Rue de Bassano), melting, enamelling and alloying cast iron (Room A), moulding, coremaking and sands (Room B); time and labour economy (Room C); communal luncheon. Afternoon visit to the laboratories of the *Centre Technique* at Sèvres; 5.30, reception by the *Centre Technique*. 9 p.m., visit to the floodlit galleries of the Louvre.

Saturday, September 26. 9 a.m. to noon, technical sessions (Rue de Bassano); safety and hygiene (Room A), non-ferrous foundrywork (Room B); non-destructive tests (Room C); communal luncheon. 3 p.m., closing session in Grand Hall of the Sorbonne. 8 p.m., dinner and dance (evening dress).

Ladies' programme.—Naturally, the ladies join in the social events listed for the men—the Sunday excursion, the receptions by the Paris Municipal Council, the Chamber of Commerce, and the *Centre Technique*, the opening and closing sessions at the Sorbonne, the luncheons, the dinner and the banquet. There are, however, other social events as follows:—Monday afternoon, tour of Paris; Tuesday afternoon, cruise on the Seine, tea at the Eiffel Tower; Wednesday, excursion and luncheon in the country near Paris, returning for dinner; Thursday morning, visit to luxury and art workshops; afternoon, mannequin parade. Friday morning, an excursion to the outskirts of Paris, returning in time for the reception at Sèvres.

Steel Industry's Appointed Day

When the Minister of Supply made the long-awaited announcement in the House of Commons recently of the date on which the steel industry would be loosed from the bonds of nationalization, he told members that the chairman of the Iron and Steel Board and the chairman of the Realization Agency had recommended two dates, July 6 and July 13. Out of regard for the views of the Opposition he had selected the later of those two dates. He rejected an Opposition suggestion that he should postpone the date until after the next General Election.

Thus, the Iron and Steel Board will be able to commence its work of supervising the industry's policy on July 13, and the Realization Agency will then take over all the iron and steel securities held by the State. Negotiations concerning offers to the public have already been going on for some time, but it is not likely that the first offer of ordinary shares will be made for about three months. The total operation of denationalization will take a long time to complete.

Simplifying Foundry Operations

A joint conference of the British Cast Iron Research Association and the Council of Ironfoundry Associations on the subject "Simplifying Foundry Operation," is to be held at Ashorne Hill, Leamington Spa, during November next. It will probably cover a period from mid-day on Wednesday, November 25, to mid-day on Friday, November 27. This advance notice will enable readers to note and reserve the dates, but no applications should be sent until the programme and other information are announced.

The programme is intended for principals, and it will form an extension of the conference held in 1952 on "Economy in the Foundry," which dealt in the main with economy in materials and their processing. The November conference will cover economy in effort, as distinct from materials, and will relate to materials handling, the simplifying of movement and operation, and production planning.

Contributions from member-firms to the conference, by way of talks (and even brief contributions can be grouped for discussion purposes) are warmly invited, as well as suggestions falling within this general field, offers of suitable films, etc.

Conference Proceedings

The British Cast Iron Research Association have now published bound volumes of the proceedings of two conferences held in 1949, one on "Fuel in the Foundry," and the second on "Foundry Sands." These have been collected and bound in this manner to meet requests received from member-firms and others who wish to have a permanent record of the papers presented and discussions which followed. They are available from the Association, Bordesley Hall, Alvechurch, Birmingham, price 15s. per volume to members and 18s. to non-members.

Economic Utilization of Copper-base Alloys*

Report of Sub-committee T.S. 38 of the I.B.F. Technical Council

Constitution of Sub-committee T.S. 38

F. C. Evans, F.I.M., chairman (John Miles & Partners (London), Limited), G. T. Callis, B.Sc. (Tech.), F.I.M. (Manganese Bronze & Brass Company, Limited), H. Capper, B.Sc., F.I.M., R.N.S.S., metallurgical adviser to the Engineer-in-Chief of the Fleet, G. Elston (R. & W. Hawthorn, Leslie & Company, Limited), A. R. French (J. Stone & Company (Charlton), Limited), G. H. Hannaford (Phosphor Bronze Company, Limited), P. Holligan, B.Sc. (Tech.), F.I.M. (Glacier Metal Company Limited), F. Hudson, F.I.M. (Mond Nickel Company, Limited), E. C. Mantle, M.Sc., A.I.M. (British Non-Ferrous Metals Research Association), W. G. Mochrie (representative of the British Bronze & Brass Ingot Manufacturers' Association), A. J. Nicol Smith (Ministry of Supply), W. H. Richardson, B.Sc., A.I.M. (Langley Alloys, Limited), A. P. Wright (T. M. Birkett & Sons, Limited), G. Lambert, secretary to the sub-committee (Institute of British Foundrymen).

Terms of Reference

Acute shortages of non-ferrous materials having emphasized the need to avoid waste of valuable raw materials, technical sub-committee T.S. 38 of the Technical Council was appointed in March, 1951, with terms of reference (after slight amendment) as follows:—

To investigate the properties obtainable in copper-base alloy castings, having regard to the economical utilization of metals.

INTRODUCTION

As consideration of the object proceeded, it became clear that with the economic utilization of metals as the important subject, the properties obtainable in castings constituted only part of the problem and other factors such as the standardization of alloys and methods of production were of equal importance. The terms of reference have, therefore, been interpreted in the broadest sense, with the emphasis on the economical utilization of metals. The properties of copper-base alloy castings are being investigated, but this work is not ready to be reported.

Metal Supplies and Resources

After the war, non-ferrous metals, apart from tin, were still controlled and there were severe shortages felt particularly with copper and zinc; the zinc situation eased but copper remained scarce. Under these conditions, professional bodies and trade associations gave profound thought to this problem. Professor Murphy in his presidential address to the Institute of Metals[1] in 1951 drew the attention of that body, usually associated with the more academic aspects of developments in the industry, to the realities of the metal position as it influenced those directly connected with production. This was followed by an Institute of Metals conference on Metal Economics[2] and the contributors included eminent economists, geologists and metallurgists. It was pointed out that with the increase in world population and the growing demand for improvements in standards of living, the need for additional supplies of metal would inevitably be permanently enlarged. Estimates of the world resources of metals were given, with alarmingly short durations forecast before the expiry of known ore deposits: such estimates had been made before but had to be revised because of the discovery of new deposits. It was clearly indicated, however, that there was urgent need for exploration for such new sources of ore and for the development of refineries. In the meantime, metals would remain scarce, and it could not be assumed because the situation had been aggravated by the rearmament programme that shortages would be over when this programme had been completed.

Productivity Team

The Anglo-American Council on Productivity sent to America a team comprising representatives from supervisory, technical and workshop grades of the bronze and brass foundry industry. A very full, well-illustrated and informative report[3] has been published covering the various aspects of output in the American industry as it is influenced by technical methods employed and by such factors as incentive and welfare schemes. There are many sections which have a bearing on the subject of this report and reference will be made to them in the appropriate place.

Report of the Lemon Committee

Among other literature already published there is the report[4] of the Committee for Standardization of Engineering Products, which has become known

* Submitted at the Blackpool Conference of the Institute of British Foundrymen.

after the name of its chairman as the Lemon Committee. It states that the "productivity efficiency of an organization is the ratio of the effective volume of output in a given time relative to the total effort and facilities employed." It draws attention to:—

(1) The excessive variety which exists arising from the long-established pattern of production based on methods in use before automatic machinery and bulk production methods were developed.

(2) The persistence of selling methods and ranges derived as under (1). Companies have often preferred to compete with each other by offering to meet the exact requirements of customers (each of whom may hold different views in detail) rather than offering standard articles at lower prices.

(3) Failure to appreciate the magnitude of the increase in productivity efficiency which can result from a reduction in variety allied with the adoption of the latest technical equipment and methods.

These statements in broad terms clearly apply to the foundrymen and to the users whom they supply. The recommendations which follow are intended to reduce wasteful variety by encouraging the use of standardized and simplified products. Manufacturers should pay due regard to the overall savings which accrue from such a policy; it should be possible to offer such standardized products on more favourable terms in comparison with those made only in limited quantities.

Economy for User and Foundryman

In considering the economic utilization of metals in the copper-alloy casting industry, there are essentially two directions of approach—the user's and from the foundryman's point of view. Broadly stated, the steps which the engineer can take are: to design his castings in consultation with the foundry technician, so that they are suitable for maximum output in production; to select a standard alloy compatible with both service and production requirements: to keep factors of safety to a minimum in order to conserve metals, and in those instances where it is reasonable to do so, to use alloys of higher strength to the same end. By taking these steps, the engineer user would be helping himself with regard to delivery, price, quality and metal available for the manufacture of his requirements. The foundryman, for his part, should take steps to improve his output and the quality of his castings so that the designer can safely use the lowest possible safety factors in his designs. This involves improvement in existing technique and the development of new techniques.

In connection with the reduction of safety factors, attention has been focussed on the scarcity of information on the subject of actual properties in copper-alloy castings: this of course is one of the main subjects for consideration and a survey has been made of existing knowledge. Attention has been drawn to the need for the selection of standard alloys; examination has been made of alloys currently in use and the question of standardization has been considered.

Present Report

The report therefore is divided into four main parts: the first two consider the steps which can be taken by the foundryman and the user respectively with advantage to both, the next deals with the properties obtainable in castings and the last with the standardization of alloys. These are followed by a statement of the conclusions reached. In most respects, the reference to the foundryman concerns both the die-casting and the sand casting sides of the foundry. Similarly, from the user's point of view, it is frequently economic for him to use die-castings rather than sand castings, and appropriate reference is made in the text of the report to the use of die-castings.

I—FOUNDRY MATTERS

The foundryman is already well aware of the shortage and high price of metals, a state of affairs which will continue. It will, therefore, be clear to him that it is in his interest to do all that he can to assist the designer in keeping casting sections to a minimum. For this to be reasonable, it is necessary for the foundryman to sell his castings per piece rather than by weight. In many foundries this is already being done, and it is clearly to the advantage of the other foundries to follow this course in order to be competitive. By the improvement of present casting methods and by the development of new techniques he must produce castings of regular high quality and he must increase his output by the use of improved methods and by attention to foundry layout. Another important factor is to reduce the number of alloys used in the foundry to a minimum. In this way supplies of metal can be made to go further and increased output can be obtained.

Progress in the Quality of Castings

For the designer to be confident in asking for castings of minimum section he must be assured that the castings he receives are of consistently high quality. It is therefore necessary that the foundryman should take steps to adopt the best techniques in his foundry by the use of up-to-date methods. Considerable work has been published and techniques are being developed by individual companies and by research associations so that more uniform results can be obtained. In the melting and casting of gunmetal, for example, the use and control of mould-metal reaction has been developed for pressure-tight castings to achieve continuous high-quality; reduction of scrap and increase of output necessarily follow.

Special Processes

In addition to the betterment of existing methods, many new techniques have been developed in recent years for improvement in casting quality and for more economic production. Usually these techniques have specific fields of application and although some of them require special plant or equipment others can be adopted in most foundries.

(*a*) *Centrifugal Casting.*—In the centrifugal cast-

ing field, extensive use was made, during the war, of stack-moulding methods for parts required in large quantities for war equipment, such as fighting vehicles. Phenomenal savings were shown annually in materials, man/hours and money. These methods are being applied to-day in this country, particularly by the tractor manufacturers.

(*b*) *Lost-wax and Semi-permanent-mould Processes.*—The lost-wax process previously used in statuary, dental and surgical casting, and in the jewellery trade, was applied during the war to investment casting of turbine blades. It is now being used on a large scale for the production of castings[5] in materials which are difficult to machine or fabricate, for intricate castings, for high standards of surface finish, and for dimensional accuracy. It is a specialized process requiring special plant. There has, however, been the development of the use of sillimanite and similar refractories bonded with silicon ester for the manufacture of semi-permanent moulds, and developments with partially-hydrolysed silicon esters in this country have contributed considerably in this field by the simplification of techniques. These moulds can be used for alloys which are not normally die-castable and for the die-casting of alloys where the quantities do not warrant the manufacture of expensive metal dies. High dimensional accuracy can be achieved when required. Much use can be made of plaster of Paris and plasters of the hydrocal type for moulds and cores where dimensional accuracy or quality of surface finish is desired. If any of these methods which save machining can be offered, metal is saved.

(*c*) *"C" Process.*—A new process developed in Germany before and during the war is now being widely experimented with in this country and overseas: it is the "C" process. This makes use of a shell mould made of sand bonded with a plastic. Many advantages are offered, particularly increased output and closer dimensional accuracy than is possible with normal sand-casting methods. This is probably the least-specialized of the processes mentioned, and a field into which more and more of the work currently made by sand casting will be directed. The basic principles of this process apply to sand-foundry production and could lead to very considerably improved foundry economy in the manufacture of castings of smaller sizes.

Planning and Control: Productivity Team's Report

To achieve maximum output, a foundryman should be constantly on the look-out for methods of improving his layout and for opportunities to introduce suitable mechanization. Proper technical control consistent with the size of the plant and the scope of its output is essential in the modern foundry. There is much of great value on these subjects in the British Productivity Team's report, "The Brassfoundry." There are chapters on planning, foundry layouts, aids and mechanization, patternmaking techniques, moulding, running and casting methods, the core-shop, melting methods and technical control. Probably one of the most important sections is that concerned with the use of matchplates: a method is given for the economic production of patternplate equipment for the machine moulding of relatively small batches of castings. Here is indicated the future development for economic pattern production and the need for standardization in foundry equipment such as moulding boxes and moulding machines. Foundrymen will be aware of the troubles which can arise from variations in sand, inconsistent melting practice, and pouring at the wrong temperatures: all these matters should be under proper technical supervision and constant control. With the reduction of scrap which follows, output is inevitably increased and metal saved. In the melting shop, metal losses should be watched and steps taken to reduce them. The recovery of metal from drosses and skimmings as well as from moulding sand in use and discarded is of great importance.

Die-castings

The die-casting foundry has been somewhat restricted in the production of copper-base alloys due to the high melting points of these alloys and the consequent wear of the dies. This has now been largely overcome by the introduction of die steels improved in their resistance to thermal shock. The most-commonly-used alloys for die-casting are the brasses covered by British Standard 1400 B4-C and B5-C, the high-tensile brass HTB 1-C and the aluminium bronzes AB1-C and AB2-C. The last named of the aluminium bronzes is used only when the properties of this alloy are especially required. Developments have included new die dressings to obviate the build-up of oxides on brass die-casting dies. Leaded brasses are being die-cast to facilitate machining and silicon brasses for prolonging die life.

Die design and running methods are important in order to keep down the weight of metal used in relation to the weight of useful castings made. There already exists in the die-casting field a close relationship between designer and foundryman because of the particular necessity for the design to suit the die-casting technique. There is still, however, the need for a study to be made of the actual strength of castings so that sections can be reduced to a minimum.

Strength of Castings

So that the designer may reduce sections, the foundrymen, both of sand and die-castings, must endeavour to learn as much as possible about the properties obtainable in castings: data should be collected and, where numbers off justify it and where proper collaboration with the designer can be established, castings should be sectioned for the preparation of test-pieces. This will enable suitable modifications to be made where necessary to the mutual benefit of the designer and the foundryman.

Standard Alloys

In years gone by, it has been the policy for the foundryman to sell alloys of his own composition, the formulæ of which have been closely-guarded secrets. This undoubtedly served its commercial purpose in times less enlightened than to-day. Alloys suitable for a specialized application fall within a small range of composition and in most instances foundries would supply a similar alloy whatever

name might be given to it: there might be slight variations in composition but without significant influence upon service performance. Commercial advantages are to be obtained, not by small variations in the composition of an alloy, but by skill and experience in the selection of the most suitable type of alloy for a specialized application and by the ability to achieve a high standard of quality with economic methods of manufacture. There is no justification for discouraging the use of standard alloys, as standardization would clearly be to the benefit of the foundry, bearing in mind that special alloys sometimes have to be used for particular applications. Undoubtedly, the smaller the number of alloys used in the foundry the greater the economy in both man/hours and materials. When standard alloys are used, ingots can be bought to specification ensuring consistency in composition—a particular aid to the smaller foundry.

II—USER MATTERS

Designer and Foundryman

It does not need to be emphasized that the availability of metals is a matter of importance to the user of the castings. It follows that he has a prime interest in economy in the use of metals for the main purpose of ensuring the supplies of his requirements. If, at the same time, the steps which he takes to economize improve delivery times and reduce prices, these are added incentives. By suitable design, and by correct choice of alloys, increase in output can be obtained in the foundry and a saving made in the amount of metal used. These advantages are best achieved by collaboration between the designer and the foundry technicians at an early stage.

Advantages of Economy in Design

In the aircraft industry it has always been necessary to obtain castings of the least possible weight yet strong enough to meet structural requirements. For this reason, it has been necessary to design components suitable for production as high-quality castings and there has followed the necessity of knowing the mechanical properties in important parts of castings. The aircraft designer, therefore, has long been aware of the need for consultation with the foundryman and metallurgist at an early stage of his design in order to achieve the desired results. This has been an influence in the light-alloy industry which has not obtained in the copper-alloy field. It is now necessary, however, to reduce to a minimum the amount of metal used in copper-alloy castings. With lighter castings, the cost would be lower and deliveries improved. For this, it is necessary, with a given design of casting in a selected suitable alloy, to know what properties can be expected in the various sections of the casting. For instance, it has been found possible for the Admiralty to re-design valve-box castings to take advantage of the greater strength and corrosion-resisting properties of aluminium bronze. After re-designing the valve box, weights were considerably reduced as shown in Table I. In order also to illustrate possible economies in cost, quotations for the production cost in B.S. 1400 LG2 (85/5/5/5), G1 (88/10/2) and AB2 (aluminium bronze) alloys were obtained from four firms and these, too, are detailed in Table I. It is readily apparent from the Table that the AB2 (aluminium bronze) castings are lighter and considerably cheaper than those in G1 (88/10/2). The figures for castings in LG2 (88/5/5/5) are included for comparison purposes.

Choice of Alloys

In the selection of an alloy, the first consideration must clearly be the service which it has to perform. If this permits a choice of alloys, then a proper balance must be struck between the economic use of materials and the facility with which the castings can be produced. If the selection of an alloy of high tensile strength permits a considerable reduction in section, and thereby a saving in material. this alloy should be used, unless for design reasons it is unsuitable for the economic production of the castings. The need for a proper understanding with the foundryman on this matter cannot be over-emphasized. For example, on many occasions, the choice by a designer of the wrong type of gunmetal for pressure-tight castings has caused considerable scrap in the foundry, delays in delivery and high prices. It is important that, whenever possible, a British Standard alloy should be used so as to reduce the number of alloys in use in the foundry to a minimum: it is clear that this would increase output with advantageous effect on price and delivery.

Use of Die-castings

When the quantities required of a particular design justify the expense of a die, and provided that an alloy suitable for the service requirements can be economically die-cast, then die-castings should be used. There are limitations, in that die-castings can only be made satisfactorily in aluminium-bronze, ordinary or high-tensile brass, and if over about 15 lb. they are not normally made in copper alloys, although castings of suitable design have been made of over 20 lb. in weight. The mechanical properties in die-castings are superior to those in sand castings and closer dimensional tolerances can be maintained with a consequent saving in machining. Collaboration between the designer and the die-caster is essential, so that the designs are suitable for manufacture in dies and so that the sections are suitable for the production of sound castings. Although it is preferable that quantities should be of the order of one to two thousand minimum, batches as low as five-hundred off are sometimes accepted. The gunmetals and tin bronzes do not lend themselves readily to die-casting, because of their hot-short characteristics, and can only be used when very simple forms are required. Aluminium-bronze, B.S. 1400 AB2, can be die-cast, but it causes rapid deterioration of the die and, unless the properties of this alloy particularly are required, it should not be specified; aluminium-bronze B.S. 1400 AB1 is very suitable for die-casting.

Economy in Inspection Procedures

This section is intended primarily for the designer

TABLE I.—*Production Cost* of Admiralty Valve Castings in Three Materials.*

B.S. 1400 Alloy.	Material.	Foundry No. 1.		Foundry No. 2.		Foundry No. 3.		Foundry No. 4.	
		Wt.	Price.	Wt.	Price.	Wt.	Price.	Wt.	Price.
		(a) 4-in. Valve Box at 300 lb. Pressure per sq. in.							
		lb.	£ s. d.	lb.	£ s. d.	lb.	£ s. d.	lb.	£ s. d.
LG 2	85/5/5/5	130	14 10 6	130	13 6 8	130	15 0 0	130	15 8 9
G 1	88/10/2	130	23 6 [illegible]	130	22 1 9	130	20 7 6	130	25 3 9
AB 2	Al. bronze	95	16 5 0	95	15 3 8	95	21 0 0†	95	16 12 6
		(b) 4-in. Valve Box at 155 lb. Pressure per sq. in.							
LG 2	85/5/5/5	110	12 9 6	110	11 6 2	110	13 0 0	110	13 7 10
G 1	88/10/2	110	19 18 6	110	18 15 0	110	17 12 6	110	21 15 5
AB 2	Al. bronze	87	15 1 0	87	13 18 3	87	19 10 0†	87	15 8 0
		(c) 3½-in. Valve Box at 155 lb. Pressure per sq. in.							
LG 2	85/5/5/5	66	7 14 9			66	8 10 0	66	8 1 0
G 1	88/10/2	66	12 4 0			66	12 17 6	66	13 1 3
AB 2	Al bronze	55	10 0 0			55	11 5 0†	55	9 12 6

The prices of material used in the calculation of the above costs were those prevailing on December 30, 1952, as follow :—B.S. 1400-LG (85/5/5/5), £197 per ton ; B.S. 1400-G 1 (88/10/2), £347 per ton ; and B.S. 1400-AB 2 (Al-bronze), £290 per ton.

* These figures give no indication of selling prices and are based on production costs of fettled castings.

† The high cost of aluminium-bronze is attributable to the fact that the foundry concerned is not suitably equipped for fettling this material

in the user's works, but it might be well to include a note concerning inspection. B.S. 1376 " A code of procedure for copper-base alloy castings," treats the inspection of castings rationally according to the services which they are required to perform. Unfortunately, there are many official inspecting bodies having special codes of procedure differing in requirements for similar products. This frequently involves small batches, and the casting of unnecessary numbers of test-pieces, generally adversely affecting economy in production effort. Every effort should be made to facilitate and co-ordinate inspection procedures in the foundry both by the private user and the larger public and national concerns.

III—STRENGTH OF CASTINGS

Factors Involved—the Test-bar

In the foregoing sections, the important reasons for keeping casting sections to a minimum have been given. In order to be able to design castings with minimum sections it is necessary that the designer should have knowledge of the properties which he can expect to obtain in the important parts of the castings. Reference to material specifications will indicate the properties which can be expected in separately-cast test-bars. It is important to make it clear that separately-cast test-bars are cast solely to prove the quality of the metal. They are cast under standardized conditions so that, from melt to melt, consistent results should be obtained. These conditions do not represent those obtaining in the various parts of the casting and it follows that the properties cannot be expected to be the same. Cast-on test-bars serve no useful purpose either to prove the quality of the metal—as they are not cast under standardized conditions—or to indicate properties of other parts of the castings. The properties in the various sections in the casting in a given alloy are affected by such factors as wall-thickness, changes in section, and the influence of chills, feeding heads and ingates. None of these local conditions is simulated in separately-cast or cast-on test-bars, and it follows that in order to find out the mechanical properties in a particular design of casting it is necessary to prepare test-bars from the important regions of prototype castings.

Need for Data

As has been explained in an earlier section, the preparation of test-pieces from castings for the purpose of investigating their strength with a view to the reduction of sections to a minimum is a procedure to which aircraft designers in particular, and light-alloy foundrymen have been accustomed. Unfortunately, little information available on the subject refers to copper-alloy castings. The technical committee of the Association of Bronze and Brass Founders conducted an investigation in this field, the results of which were published by the Institute of British Foundrymen in 1949.[6] A number of castings in phosphor-bronze (sand and chill-cast), gunmetals, aluminium-bronze and high-tensile brass in current production in various foundries were selected and sectioned, and complete data covering production conditions recorded. Tensile, hardness and impact tests were conducted on the prepared specimens, pressure tests being made on the castings where this was applicable. For economic reasons, that programme of work could be conducted only on a limited scale, and the results, therefore, serve only as an indication of what can be expected and to draw attention to the need for a more extensive survey.

To obtain general information of the type described and envisaged by this sub-committee is a prolonged process, and, for economic reasons and in the time available, results are not at present ready for publication. Opportunity should not be lost by all concerned in everyday practice to make such tests which would serve an immediately useful purpose to the designer and the foundryman. Data collected would become an important guide to the designer, but, for any specific casting which might be at all complicated, it would still be necessary to investigate that particular casting, made by the

Economic Utilization of Copper-base Alloys

TABLE II.—*Classification of Association of Bronze and Brass Founders' Members' Output, compiled from 80 returns—of which 58 were the average of six months output and 22 were for one month only (total tonnage represented 3,281 per month).*

B.S. 1400.	Per cent.
PB1, Phosphor bronze	11.86
PB2, Phosphor bronze	1.02
PB3, Phosphor bronze	1.72
LPB1, Leaded phosphor bronze	4.69
LB1, 76/9/0/15 Leaded bronze	0.78
LB2, 80/10/0/10 Leaded bronze	1.03
LB3, 85/10/0/5 Leaded bronze	0.26
G1, 88/10/2 Gunmetal	3.69
G2, 88/8/4 Gunmetal	0.32
LG1, 83/3/9/5 Leaded gunmetal	0.31
LG2, 85/5/5/5 Leaded gunmetal	18.42
LG3, 86/7/5/2 Leaded gunmetal	10.37
AB1, Aluminium-bronze	2.89
AB2, High-tensile aluminium-bronze	1.51
SB1, Silicon bronze	0.02
B1, Brass	2.03
B2, Brass	2.71
B3, Brass	1.33
B4, Brass	1.15
B5, Naval brass	0.28
HTB1, 30-ton High-tensile brass	16.18
HTB2, 38-ton-tensile Brass	0.44
HTB3, 48-ton-tensile Beta brass	0.25
	85.06
Other specifications.	
Aluminium-bronze	0.57
Brass	1.12
Brazing metals	0.49
Bronze	1.97
Phosphor-bronze	3.44
Gunmetal	4.16
Copper	0.67
Others	2.52
Total	100.00

TABLE III.—*British Bronze and Brass Ingot Manufacturers' Association Survey giving information submitted by Member Firms representing 85 per cent. of the Total Production of all Members of the Association. (for six months, January to June, 1951).*

B.S. 1400.	Per cent.	B.S. 1400	Per cent
PB1 inc. 2B3	7.82	SB1	0.06
PB2	1.12	B1	2.24
PB3	0.52	B2	2.05
LPB1	7.43	B3	5.24
LB1	0.57	B4	0.20
LB2	2.52	B5	0.17
LB3	0.15	HTB1	1.22
G1	3.00	HTB2	0.20
G2	1.16	HTB3	0.06
LG1	0.28		
LG2	25.30	Total	76.33
LG3	10.30	All other specifications	23.67
AB1	2.17		
AB2	1.86		100.00*

* Representing production of 7,181 tons per month.

technique intended for mass production, in order to learn about its properties. It is also in the interest of the designer to consider whether the alloy which is selected is suitable for the economic production of the castings. For example, B.S. 1400 G1 (88/10/2) gunmetal is frequently selected, as it is thought by the designer to have higher mechanical properties than B.S. 1400 LG2 (85/5/5/5) gunmetal. This is true in the case of separately-cast test-bars, but because of the founding characteristics it is doubtful whether the properties in a casting are significantly different. In the case of pressure-tight castings, in some instances it is found practically impossible to make them in 88/10/2, whilst they might be made easily in 85/5/5/5.

IV—STANDARDIZATION OF ALLOYS

Private Specifications

The sub-committee realized the large number of alloys which were being used in the foundry in-

TABLE IV.—*Application of Bronzes.*—(Continued also on facing page)

Alloy B.S. 1400.	Description.	Specified minimum mechanical properties: Sand cast. Separately-cast. U.T.S., tons per sq. in.	Separately-cast. Elong. per cent.	Cast-on. U.T.S., tons per sq. in.	Cast-on. Elong. per cent.	Chill cast. U.T.S., tons per sq. in.	Chill cast. Elong. per cent.	S = Suitable for. Sand castings.	Chill-cast sticks.	Gravity die-castings.	Centrifugal castings.
PB1-C	Phosphor-bronze	12	1.5	12	1.5	16	1.5	S‡	S	—	S
PB2-C	Phosphor-bronze	14	7	12§	3§	17	3	S	S	—	S
PB3-C	Phosphor-bronze	16	10	16	6	—	—	S	S	—	S
LPB1-C	Leaded phosphor-bronze	12	3	10	1.5	14	1.5	S	S	—	S
LB1-C	76/9/0/15 Leaded bronze	10	4	9	2	—	—	S	—	—	—
LB2-C	80/10/0/10 Leaded bronze	11	4	10	2	—	—	S	S	—	—
LB3-C	(NR) 85/10/0/5 Leaded bronze	12	5	11	3	—	—	—	—	—	—
G1-C	88/10/2 Gunmetal	16	12	16	8	16	—	S	—	—	S
G2-C	(NR) 88/8/4 Gunmetal	16	12	16	8	16	—	—	—	—	—
LG1-C	(NR) 83/3/9/5 Leaded gunmetal	11	12	11	8	11	—	—	—	—	—
LG2-C	85/5/5/5 Leaded gunmetal	12	12	12	8	12	—	S	S	—	S
LG3-C	86/7/5/2 Leaded gunmetal	14	12	14	8	14	—	S	S	—	S
AB1-C	Aluminium-bronze	32	20	32	20	32	20	S	—	S	S
AB2-C	High-tensile aluminium-bronze	40	12	40	12	40	12	S	—	—	S
SB1-C	(NR) Silicon-bronze	20	15	20	15	—	—	—	—	—	—
B1-C	Brass	11	12	—	—	—	—	S	—	—	S
B2-C	Brass	11	12	—	—	—	—	S	—	—	S
B3-C	Brass	12	12	—	—	—	—	S	—	—	S
B4-C	Brass gravity-die-castings	—	—	—	—	18	25	—	—	S	—
B5-C	Naval brass gravity-die-castings	—	—	—	—	20	20	—	—	S	—
HTB1-C	30-ton high-tensile brass	30	20	30	20	—	—	S	—	S	S
HTB2-C	38-ton high-tensile brass	38	15	38	15	—	—	S	—	—	S
HTB3-C	48-ton high-tensile beta brass	48	12	48	12	—	—	S	—	—	S

(NR) Not recommended ; x Sometimes used, but not generally recommended ; xx Suitable, when conditions are not particularly onerous xxx Notably suitable for this purpose ; * The alloys indicated are in use for this service but it is necessary to consider each specific application in detail.

dustry and the notable effect which this had on both production and metal economy. As the copper-alloy casting industry has developed, individual foundries have produced their special alloys with proprietary names, recommending them for specific applications. At the same time, large users have drawn up their own specifications for materials. The result has been a large number of alloys, many with similar basic compositions but differing sufficiently to demand special foundry charges and segregations in the stores, and the foundry has had to handle many times more alloys than necessary. The British Standards Institution have introduced standard specifications, but by no means the majority of users have adopted them; many foundrymen still sell their proprietary alloys, and users continue to demand alloys to their own specifications.

Survey of Alloys Used—Need for Standardization

The sub-committee has obtained a survey of the number of alloys used in the industry, through the Association of Bronze and Brass Founders and the British Bronze and Brass Ingot Manufacturers' Association, and the information returned by these bodies has been summarized in Tables II and III. It is interesting to note that the figures returned by the A.B.B.F. and B.B.B.I.M.A. are of the same order. Whilst it is a matter for some agreeable surprise that the respective figures for alloys used to British Standard Specifications are 85.1 per cent. and 76.3 per cent., the figures which are really important are the 14.9 per cent. and 23.7 per cent. for alloys other than to the British Standards. In the A.B.B.F. report, these have been broadly classified, but undoubtedly under each individual heading there are many specifications, and the necessity for the retention of these demands particular attention. Foundrymen should take all possible steps to encourage their customers to use equivalent British Standard alloys wherever they exist and users should always endeavour to find suitable standard alloys rather than select non-standard ones.

Reverting to the figures for the British Standard alloys used, in each case, LG2 (85/5/5/5) is shown to be used considerably more than any other; the high figure for HTB1 (high tensile brass) in the A.B.B.F. report is probably influenced by returns from marine propeller manufacturers. The low figures for some of the alloys in the British Standard range led to consideration as to whether these alloys could be completely dropped, with other B.S. 1400 specifications being recommended to replace them. The sub-committee considers that the attention of the British Standards Institution should be drawn to the following points:—

(1) There are five brass specifications in B.S. 1400, two of which are die-casting alloys, and three sand-casting alloys; three brasses are quite sufficient.

(2) There are three leaded bronzes, LB1 (76/9/0/15), LB2 (80/10/0/10) and LB3 (85/10/0/5); these could be condensed into one or two specifications.

(3) G2 (88/8/4) gunmetal and LG1 (83/3/9/5) leaded gunmetal are very little used, and more suitable alternatives are readily available; they could, therefore, be discarded.

(4) Silicon bronze, SB1, is very little used; it could easily be replaced with an alternative standard alloy, and it is difficult to handle in the

TABLE IV. *Application of Bronzes*—(continued).

Alloy B.S. 1400.	Application.									
		Bearings.					Steam up to 250 deg. C. (480 deg. F.)	Strength at elevated temperatures.	General castings.	
	Pressure-tight castings.	Wear-resistant bearing surfaces.	Backing castings.	Wear-resistance, general.	Gear-wheels.	Corrosion resistance.			Medium strength.	High strength.
PB1-C	x	xxx	x	xxx	xx	•	—	—	—	—
PB2-C	—	xx	—	xxx	xxx	—	—	—	—	—
PB3-C	xxx	xx	—	xx	xx	•	x	—	—	—
LPB1-C	x	xx	x	xx	—	—	—	—	—	—
LB1-C	—	xxx	x	xxx	—	—	—	—	—	—
LB2-C	—	xxx	xx	xxx	—	—	—	—	—	—
LB3-C	—	—	—	—	—	—	—	—	—	—
G1-C	x	xx	xx	xx	—	•	x	—	xx	—
G2-C	—	—	—	—	—	—	—	—	—	—
LG1-C	—	—	—	—	—	—	—	—	—	—
LG2-C	xxx	xx	xxx	xx	—	•	xx	—	xx	—
LG3-C	xxx	xx	xxx	xx	—	•	xxx	—	xx	—
AB1-C	xxx†	—	—	x	—	•	x	xx	—	xx
AB2-C	xxx†	—	—	xx	xx	•	x	xxx	—	xxx
SB1-C	—	—	—	—	—	—	—	—	—	—
B1-C	—	—	—	—	—	—	—	—	xx	—
B2-C	—	—	—	—	—	—	—	—	xx	—
B3-C	—	—	—	—	—	—	—	—	xx	—
B4-C	—	—	—	—	—	—	—	—	xx	—
B5-C	—	—	—	—	—	—	—	—	—	—
HTB1-C	xxx	—	xx	—	—	•	—	—	—	xx
HTB2-C	—	—	—	—	xx	—	—	—	—	xxx
HTB3-C	—	—	—	xx	xx	—	—	—	—	xxx

‡ Heavily chilled or small castings. † Provided that design is suitable for economic production. § Sample cut from peripheral zone of casting. The notes apply broadly and should not be interpreted as applicable without proper regard to the details or specific requirements.

foundry; in view of these points it should be omitted from the standard.

(5) The HTB3 high-tensile brass has well recognized limitations and is little used. On the other hand, an alloy of this type finds definite application, and consideration should be given as to whether it could be replaced by an alternative alloy.

This is a statement of a case for reducing the number of alloys in B.S. 1400 when it is reviewed in the near future.

Action by the Services

Her Majesty's Services have already realized the need for reducing the number of specifications in use, and a committee has been set up representing the various Service departments to prepare a schedule of specifications, co-ordinating those now in use with the equivalent British Standard specifications. The Institute's sub-committee has been privileged to examine the draft of this schedule and to offer comments. It is hoped that this work will be completed soon so that it may be properly taken into consideration in the review of the British Standard 1400 which is due in the near future.

Action by British Railways

British Railways Executive have already given consideration to the same question, and at about the time when this sub-committee was starting its work, notification was issued by the Railway Executive of five alloys which they specified as replacing the thirty-seven alloys previously used. The sub-committee feels that the reduction in the number of alloys has probably been overdone; for example, LG2 (85/5/5/5) has been completely omitted, the only leaded gunmetal being LG3 (86/7/5/2) which is to be specified in future for wagon bearing castings, replacing the original Railway Clearing House specification (82/3.5/11.5/4) which represents a very considerable proportion of the output of a number of large foundries; this does not appear to be an economic step. Three of the five alloys conform to B.S. 1400, and two do not; none is specified by B.S. 1400 references. It is thought that the brazing-metal specification will be brought into line with the British Standard specification B.6, in course of preparation. There is no equivalent to the B.R.E. alloy containing 5 per cent. of tin with 26 per cent. of lead and 1.5 per cent. of nickel; it would be helpful to consider whether the nearest British Standard LB1 (76/9/0/15) would serve the purpose equally well, or, alternatively, whether a new British Standard is required.

Service Application of Alloys

In order to illustrate the application of the B.S. 1400 alloys, Table IV has been prepared. From this it can be seen that certain alloys are well suited to a wide range of applications, and the conclusion that these would be expected to be widely used has been supported by the survey mentioned above. Furthermore, it is indicated that even though a shortened version of B.S. 1400 might be prepared, there would probably be a still shorter list of alloys from which the bulk of industrial requirements could be met. It is understood that the Association of Bronze and Brass Founders are giving thought to this problem and that a list of "preferred alloys" will be published, these alloys to be used whenever possible. This should be a big step towards encouraging the use of as few alloys as are necessary to meet industrial requirements, and it is hoped that it will be well supported.

CONCLUSIONS

There will be complete agreement that there should be economy in the use of metal and in production effort in the foundry in the interest of both the user and the foundryman.

The foundryman's attention has been directed to the following points:—

The use of special techniques—to improve quality, to reduce machining allowances, and save metal and machining time.

The use of British Standard alloys—to decrease stocks and increase the economic utilization of raw materials.

The need for knowledge of the properties obtainable in castings—to help the designer to achieve economy.

Foundry control—to improve quality and to reduce scrap.

The user's attention has been drawn to:—

The need for collaboration with the foundryman at the design stage—to improve quality of castings and to increase productivity.

The need for knowledge of the strength of castings—to save metal.

The need to use British Standard alloys—to reduce costs and to gain the other general advantages of standardization.

Need to reduce sections or use stronger alloys whenever possible—to economize in metal.

Desirability of using die-castings when suitable—to save machining and for economy in production.

Underlying most of these points is the need for knowledge of the properties obtainable in the castings and the choice of the most suitable alloy, having regard to the service requirements and economy in production. Sections of the report have been devoted to the consideration of these two fundamentals, and work is still in hand on properties in castings; the necessity has been emphasized for obtaining knowledge on the strength of castings by user and foundryman and for British Standards to be used as much as possible. The former is considered to be a matter for learning by broad experience and not a question which can be answered by any specific investigation.

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Industrial Recovery

Industrial production now appears to have recovered from the stagnation which set in last winter. Reports from all parts of the country, particularly the Midlands, indicate that industry has taken on a new lease of life. According to the "Bulletin for Industry," issued by the Treasury, industrial output in the first four months of the year was 1¼ per cent. up on the same period of 1952. It was, however, only just back to 1951 figures. The official industrial index for May is estimated at 119-120, compared with 117 in May, 1952, and 116 in May, 1951. This welcome revival in production undoubtedly owes a great deal to the renewed activity in the motor trade, where output in May was the greatest ever achieved. In the steel industry, too, output in May was the highest ever recorded in that month. However, with this recovery in industry, there is still one serious problem facing the country. Will there be enough coal to keep the wheels turning? Coal stocks this year are at present less than they were a year ago, and, if demand from industry rises with the expansion in general output, the situation might be critical by the winter.

The urgent need for an early increase in export earnings is stressed in the Treasury bulletin, and reference is made to the intensifying price competition that British exporters now have to face from other nations in consumer and capital goods. The two main elements in manufacturing costs are the price of raw materials and wages. Raw material prices, it is pointed out, have been falling since early 1951, but wages have continued to rise steadily, and this must affect Britain's competitive power if other leading exporting nations have not faced the same increase in wages. Moreover, higher production means higher imports, and, unless there is an expansion in exports, those higher imports are only achieved at the expense of a fall in gold and dollar reserves. Imports are rising more rapidly than exports, and, if the balance of payments position is to be maintained, there must be higher exports to pay for the imports. The bulletin asserts that there is still scope for improvement in dollar exports, and the Caribbean area is quoted as one with great possibilities.

Export prices in the first five months of the year were 1 per cent. lower than in the last quarter of 1952. Metal and engineering prices, for instance, averaged 1 per cent. lower after a 7 per cent. rise. Import prices are still falling, and the future course of export prices would, therefore, appear to depend largely on the trend of internal costs.

Technical Cinderellas

Sir Arthur Smout, in a speech at the conference of the Midland group of the British Association for Commercial and Industrial Education, said that technical colleges should lean less on the local educational authorities and more on industry and commerce. He was, he said, "profoundly disturbed" by the present state of technical education which was "the Cinderella of Curzon Street." Urging that technical education ought to come "off the rates," where it has to compete for funds with nursery schools, and all the machinery of elementary and secondary education, Sir Arthur said "We have not got away from the idea that our technical colleges are, in effect, merely renamed editions of night school, the Penny Readings and Mechanics Institutes of the mid-Victorian era. Our local authorities, aided and abetted by the Ministry of Education, still treat them as such."

Summerson's Appointments

Mr. A. F. Tosh, works manager of Summerson's Foundries, Limited, has been appointed a director. Mr. Tosh joined Summersons in 1942. He served his apprenticeship with the Furness Foundry & Engineering Company, Limited, and afterwards joined the British Griffin Chilled Iron & Steel Company, Limited, eventually being made works manager. He then joined Baldwins, Limited (now the Steel Company of Wales), and became manager of their Landore foundry. Mr. Tosh has been in the foundry industry for more than 50 yrs.

The Summerson Group of companies also announce the following new appointments:—Mr. Roland Winn is appointed a director of Thomas Summerson & Sons, Limited; he joined the company in 1905 and has been company secretary since 1933. Mr. C. Whitehouse, works manager of Summerson's Railway Workshops at Spennymoor has also been appointed a director of Copelaw Engineering Company, Limited (a light engineering subsidiary); Mr. Whitehouse joined Thomas Summerson & Sons, Limited, in 1920. Mr. George V. Newlands has joined the latter firm as works engineer, on the retirement of Mr. Walter Scott. Mr. Newlands, who served his apprenticeship with Cammell Laird & Company, Limited, has just resigned from T. & J. Brocklebank, with whom he has been serving as a senior sea-going engineer officer.

Planning Officer Returns to Industry

The appointment of Chief Planning Officer was created in April, 1947, to develop the long-term plan for the use of the country's man-power and resources. In that capacity Sir Edwin Plowden has served diligently for more than six years and in October is to retire and return to industry. Before accepting the post and that of chairman of the Economic Planning Board, Sir Edwin had been on the boards of Power Jets (Research & Development), Limited, C. Tennant, Sons & Company, Limited, the London steel agents, etc., and the British Aluminium Company, Limited, and on his retirement it is probable that he will return to the last two companies.

Although he is now only 46, Sir Edwin has held several important Civil Service posts, including, in 1945-46, that of Chief Executive of the Ministry of Aircraft Production, and he was a member of the Aircraft Supply Council. He is succeeded as chairman of the Economic Planning Board by Sir Bernard Gilbert, a Second Secretary in the Treasury.

Vickers' Changes

VICKERS, LIMITED, announce that, owing to continued ill-health, Major Sir Hew Kilner, M.C., has found it necessary to relinquish his seats on the board of the parent company and the subsidiaries, Vickers-Armstrongs, Limited, and Cooke, Troughton & Simms, Limited. Following this, the undermentioned changes in organization have been made:—MAJOR-GENERAL C. A. L. DUNPHIE, C.B., C.B.E., D.S.O., is appointed deputy chairman and managing director of Vickers-Armstrongs, Limited, as from July 1; MR. P. H. MUIRHEAD, C.B.E., is to be managing director, Engineering Division; MR. F. P. LAURENS, O.B.E., M.I.MECH.E., deputy managing director, Engineering Division, and MR. G. H. HOULDEN, M.B.E., managing director, Shipbuilding Division. It is noted that MR. LAURENS, as general manager of the Barrow Works, retains administrative control of Barrow shipyard. MR. R. P. H. YAPP has been appointed chairman of Cooke, Troughton & Simms, Limited.

Local Corporation object to New Foundry

Favourable Government Attitude

When representatives of Smethwick Corporation objected to features of a proposed £750,000 foundry in Dartmouth Road, the firm offered to fit two £5,000 smoke and dust eliminators to the cupolas to avoid nuisance to nearby houses. This was revealed at a public inquiry at the end of last month, when the firm—Midland Motor Cylinder Company, Limited, a subsidiary of the Birmid group—appealed against Smethwick Council's refusal to allow the new foundry to be built.

A senior executive officer of the iron and steel division of the Ministry of Supply, Mr. D. Runciman, told the inquiry that the Ministry took the view that it was essential in the national interest that the foundry should be erected in Dartmouth Road and not elsewhere. A petition, signed by 59 residents in the area, objecting to the proposal, was submitted by a local man, who said: "Many of them are employed by the firm. Their reaction is that it is bad enough to have to work in the atmosphere, let alone live in it." He alleged that dust from foundries in the area had penetrated through the walls of prefabricated bungalows, leaving "a dark seam" inside. Councillor Charles Kirkham asked with reference to the atmosphere of the area: "If it kills grass, what does it do to human beings? It is slow death." Councillor J. J. Randle said dust had penetrated bathrooms and pantries.

Local Realities

Cross-examined by Mr. Eric Blain (for the firm), Councillor Randle admitted that he would prefer the proposed foundry to the existing one, if it was to be fitted with dust and smoke suppressors. Mr. Blain said the new foundry would produce grey-iron castings for the automobile, agricultural traction and refrigeration industries. The land, 7.3 acres, was now used for storage. It had originally formed part of 11 acres bought by the company in 1918; the remainder was "very cheaply ceded" to Smethwick Corporation at the end of the war to help solve the town's desperately urgent housing problem. The site was zoned in the Development Plan now before the Ministry as "main industrial area," said Mr. Blain, so that any "non-conforming sporadic intrusion" was of a residential nature. It had been "shocking planning" to build houses there at all, but the Council's need was appreciated. Smethwick depended for its survival on industries of the sort proposed, he continued. In 1931, the population was 84,000, of whom 36,000 were employed—17,000 in the metals industry. In 1951, the population was 76,000, with 57,000 in employment, of whom 40,000 were in the metals industry.

Thus, in Smethwick, metals industries alone employed 70 per cent., whereas for the country as a whole the figure was from 15 to 16 per cent. In 1951, the company wrote to the regional controller of the Board of Trade, explaining that the North Works, which the new foundry was to replace, was constructed in 1926, and was now obsolescent. Most of the equipment was in need of immediate replacement. As the foundry was a vital part of the cycle of production of many great firms, it could not be closed down, stripped and re-equipped. The only alternative was a new factory, which would be the most modern of its type, and would be able to keep pace with the ever-increasing capacity of customers. Its erection would take two years. In a memorandum to the Ministry of Supply in 1932, said Mr. Blain, the company warned about the dangerous consequences which were inevitable if the aged plant at North works continued to operate.

Ministries' Backing

It was pointed out that to move to another place, such as South Wales, would create difficulties, of which the first was that people around Smethwick had "grown up" in the foundries. They had foundrywork in their blood. Removal would create redundancies among men whose roots were so deep and whose stubbornness of character was such that it might lead them to unemployment rather than change. Both the Board of Trade and the Ministry of Supply had backed the scheme, said Mr. Blain. The latter had recommended it to the Ministry of Housing and Local Government, it was regarded as so important for the nation. "We shall protect the amenities of the area," he continued. "We intend to fit an American-type suppressor which has not yet been used in this country."

The new cupola house, said Mr. Blain, would be some 300 ft. from the nearest permanent house, and 210 ft. from the nearest temporary prefab. Sand for moulds would be packed by "slinger" action, and not by the "bumper" method, which caused a lot of noise. Floor gratings would suck in dust from the factory, and the cupolas would be fitted with the new American dust suppressors.

Opposing the appeal on behalf of the Corporation, Mr. S. C. Redhead (deputy Town Clerk) said the Council's reason for refusing the firm's plan was that the site adjoined a residential area and was near to other such area, and the foundry would be detrimental to the amenities of the areas. The proposed building would be only 30 yds. from the boundary of the residential area on the north-west, and only 11 yds. from the boundary on the south-west. "Clearly it is desirable that industrial areas which are in close proximity to residential areas should be used for light industrial purposes," said Mr. Redhead.

The Council had received numerous complaints from residents in the northern part of the borough with regard to the dust, grit and fumes produced by the Birmid group of industries. They considered an additional foundry would be most undesirable. "It is appreciated that the company are prepared to instal a wet-type of spark arrester with the object of reducing the nuisance of the cupolas, but it is not known how effective it would be in practice, or what probability there would be of breakdown or failures in the human element, causing nuisance to occur.

"I suggest that the company should try the effect of installing this type of spark arrester on their existing cupolas so that the Council could have an opportunity of finding out the degree of their efficiency."

Referring to Mr. Redhead's suggestion of a trial for the suppressors, Mr. Blain said to fit them to the four existing cupolas would require the factory to be closed down for three months. They would cost a total of £20,000.

He asked the inspector of the Ministry of Housing and Local Government, Mr. R. A. Hudson, who conducted the enquiry, to ask for a decision as early as possible, for production reasons.

After closing the enquiry, Mr. Hudson inspected the site. The Ministry's decision will be made known.

Foundry Practice at Fraser & Chalmers

*By A. W. Bartlett, M.I.B.F.**

Fraser & Chalmers Engineering Works of the General Electric Company Limited have at their Erith Factory one of the largest jobbing iron foundries in south-east England. It is required to deal, as a matter of normal routine, with castings ranging from 30 tons down to 5 or 6 lb. in weight, covering a very wide range of equipment and producing on an average approximately 2,200 tons of castings per annum.

Occupying today the site of its original construction where the first casting was poured in 1893, the foundry building covers an area of 55,632 sq. ft. and is divided into two main bays, comprising a heavy and a medium section, each being serviced by three electric overhead travelling cranes. The heavy section has one crane of 10 tons and two of 30 tons capacity, while the medium section has one of 5 tons and two of 10 tons. Along the division of the bays are four, 5-ton hydraulic overhead jib cranes the main function of which is to relieve the overhead cranes from the task of coring-up moulds. The drying of moulds is carried out by the re-circulation system in five drying ovens constructed of 14-inch stock-brick walls faced with firebrick. Each oven is 24 by 18 by 14 ft. high.

Metal and Melting

Metal for pouring is melted in three, balanced-blast cupolas with inside diameters of 3 ft., 4ft. 6 in., and 5 ft. 6 in. respectively. These are found to be quite adequate to meet the requirements for the normal production. The materials used in the foundry are brought in by rail on lines which run into the building, while scrap metal and pig-iron for the cupolas are unloaded by magnet crane direct to the foot of the furnace platform.

The types of iron used generally are classified into the following:—hard cylinder; medium cylinder; soft cylinder; large casing; small casing; and ordinary iron. A general mixture for normal everyday use of ordinary iron consists of 40 per cent. bought scrap, 30 per cent. return scrap and 30 per cent. virgin pig-iron. This produces iron yielding a tensile strength of between 10 and 12 tons per sq. in. and is used for the manufacture of such items as conveyor pulleys, vibrating-screen bodies, side frames, floor plates, bearing pedestals and angle brackets.

Internal Co-operation

Adjacent to the foundry is a patternshop employing over 40 patternmakers and labourers. Patterns are made within the shop for castings in brass and steel as well as those for iron castings. Of necessity the relationship between the patternshop and the foundry is a close one, and there is complete co-ordination of these departments. With the larger and more involved items to be cast, a conference is held between foundry and patternshop managers immediately upon receipt of the blueprints at the patternshop, and the procedure to be adopted for the specific casting is thoroughly detailed.

In all the larger castings core-making is of vital importance. A preliminary conference between the coremaker and moulder is held to determine the positioning of staples and lifting tackle; the question of grids and their reinforcing and the bolting of the cores to the mould. For the many cores necessary in these castings, oil-sand is used wherever possible. Although this is, of course, much cleaner and easier to work than the old-fashioned method of using loam, it results in a great deal more money being spent on the manufacture of core-boxes. However, the policy of obtaining cores repetitively from coreboxes makes it, conversely, more economical in the long run, as it is found that by using oil-sand the coreboxes last longer.

A further point in this connection is that space in the drying oven is released far more quickly than it is with loam cores, and when the cores are dried it is necessary only for the coremaker to touch them up here and there and black them: whereas when using loam, several days are needed

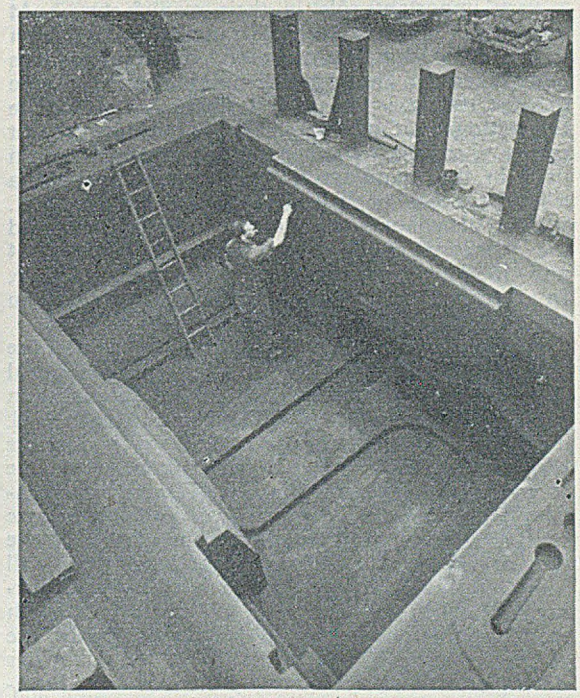


FIG. 1.—*Completing a Mould for a Bottom-half Exhaust Casting for 60,000 kw. Turbine at Fraser & Chalmers Engineering Works.*

* The Author is foundry manager, Fraser & Chalmers Engineering Works of the G.E.C.

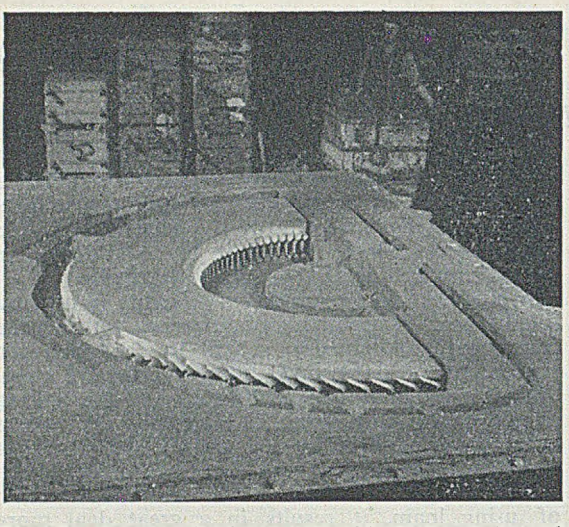


FIG. 2.—*Turbine-diaphragm Mould* (10-*ft. dia.*), *with its Core in position, ready for Pouring.*

to evaporate the moisture and produce a smooth finish for blacking by the application of rubbing stone and card wire.

Turbine Castings

Of the larger and more intricate castings poured at the Erith foundry, the main runs are turbine-exhaust casings and winding-engine drum cheeks and cones. Over 3,000 parts go into the assembly of a modern steam turbine, and the foundry plays a very important rôle in their manufacture. At Fraser & Chalmers, turbines ranging in size from 155 to 60,000 kw. are made and the main castings undertaken are the top and bottom halves of the exhaust casing. The largest single run would be the bottom half of the 60,000 kw.-turbine exhaust casing, a casting weighing some 26 tons. The iron used in the manufacture of these casings has a silicon content of between 1.7 and 1.8 per cent. with a phosphorus content of 0.7 per cent., and the tensile strength of the casing is between 14 and 16 tons, varying slightly according to size. In all turbine casing runs, a set of test-bars is taken and broken in transverse and tensile.

All these castings are made in pits from loose patterns and ash beds are laid for the withdrawal of gases during pouring. On top of the ashes, a sand bed is rammed on which the pattern is laid. The drying of the moulds is done by a portable drier and takes between 8 to 10 days, when the moulds are ready for coring up (Fig .1), an operation taking a further four to five days. There are normally 20 to 25 cores in any one of these large moulds. When all the cores are in position, all joints are sealed and the mould is closed for pouring. The box is weighted and bolted down with cross members, and runner and riser boxes are placed in position. With these large moulds it has been found beneficial to run by three or four down-gates, generally leading into the bottom, in order to eliminate turbulence and spattering.

In addition to the exhaust casings for which the casting procedure is as detailed in the previous paragraph, castings are also made for turbo-blowers and air compressors, the former being used for blast furnaces. In either of these categories, the largest single piece would weigh approximately five tons. As before, all cores are made of oil-sand and the pouring procedure is to run the inlet and outlet sections first and then the intermediates. Governor bearing-pedestal castings and turbine diaphragms are also cast. The governor bearing-pedestals are subjected to very extensive hydraulic and hot-oil testing and in consequence have to be constructed to close specifications.

Diaphragms

The making of turbine diaphragms is among the more involved of foundry tasks and exact core-making is of the utmost importance. These diaphragms control the steam flow within the turbine casing. The blades, which are of stainless steel, are cut from solid bar and are machined, ground and clipped before arriving in sets in the foundry. Each individual blade is built into the core with the ends exposed for insertion in the mould. The diaphragm (Fig. 2) is cast in special iron having a silicon content of 1.9 per cent., phosphorus content 0.9 per cent., and is poured at a temperature of 1,250 deg. C. plus or minus 10 deg. C. For each casting, the temperature is recorded by thermo-couple as it is poured.

Winding-engine Castings

Fraser & Chalmers electric winding engines are in use by the National Coal Board in collieries throughout the British Isles, and in mines in all parts of the world. The construction of moulds and cores for these is similar to that detailed in the section covering turbines. The foundry's main responsibility in the manufacture of winding engines is the casting of the winding-engine drum-cheeks, in appearance not unlike huge flywheels. These are made for drums from 12 ft. to 16 ft. 6 in. dia. The largest drum-cheeks weigh approximately

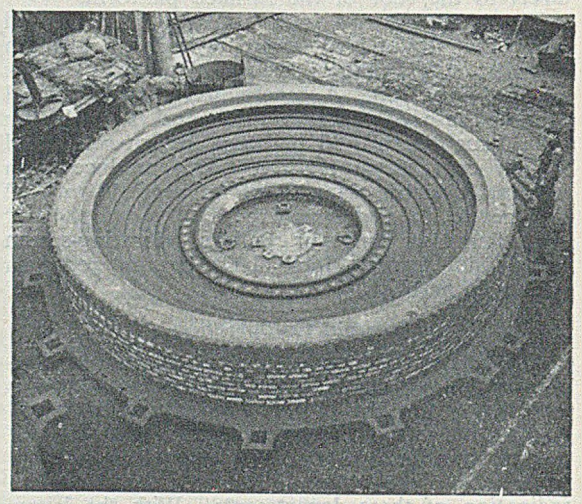


FIG. 3.—*Electric Winding-engine Drum Mould,* 18 *ft. dia., ready for receiving the Spiral-cone Cores.*

(*Continued on page* 64)

Survey of the Shell-moulding Method of Casting Production*

By Bernard N. Ames

(*Continued from page* 14)

Dimensional Tolerance

The shell-moulding process can be considered a "precision" casting process. It is generally thought of as being midway between sand casting and the "lost-wax" technique. However, it is believed that if castings approaching the size of those commonly made in shell moulds were manufactured by the "lost-wax" process, no greater degree of tolerance would be obtained. Tolerances of ±0.003 to ±0.005 inch per inch are considered commercially feasible in aluminium alloys, tin bronzes and grey iron. On alloys which may require heat treatment such as ductile and malleable iron, steel and some aluminium alloys, consideration should be given to the effect of growth and the control of distortion on critical casting dimensions. Generally, a more liberal tolerance requirement is necessary on the larger castings in these alloys.

The parting-line dimension will usually present the greatest difficulty in reproducing close tolerances and will generally require a wider tolerance than indicated above. Hence, all master pattern-plates should be designed carefully with this in mind and wherever possible single-draw patterns should be utilized. The manner in which mould halves are closed and backed up will also affect parting-line tolerance considerably. Extremely close tolerances may be obtained with internal cores in all alloys and in castings produced in the aluminium alloys. An ordnance cover casting illustrated in Fig. 13 and cast in aluminium-silicon alloy (Alcoa 43) was held to ±0.015 inch on the overall length and width and to ±0.005 inch in the width and depth of the gasket groove.

Shell moulding, however, has one basic limitation insofar as maintaining close dimensional tolerances are concerned, and that appears to be the inability to achieve o.d. concentricity on a vertically-parted cylinder with silica-sand shell moulds. The o.d. dimension of a shell mould along the parting line, which is held by some mechanical arrangement or by pasting and acts essentially as a stiffening rib, will frequently produce castings up to 0.035 inch smaller in diameter than the o.d. dimension, 90 deg. from the parting line. In some instances, an actual flat along the parting line can be detected in the casting. "Faking" the master pattern, *i.e.*, making a proper allowance for this condition will overcome this deficiency in part. To avoid excessive o.d. eccentricity on vertically-parted cylinders, it is essential that close control of resin/sand mixtures, cycling, shell thickness, and method of backing up be exercised. The use of moulding materials with high hot strength and flexural strength will also serve to eliminate this deficiency found with silica sands.

The apparent stability of shell moulds and cores

* Official Exchange Paper from the American Foundrymen's Society presented to the Annual Conference of the Institute of British Foundrymen and published with permission of the U.S. Navy Department. The Author is supervising physical metallurgist, Material Laboratory, New York Naval Shipyard. The opinions or assertions contained herein are those of the Author, and are not to be construed as official, or necessarily reflecting the views of the Navy Department.

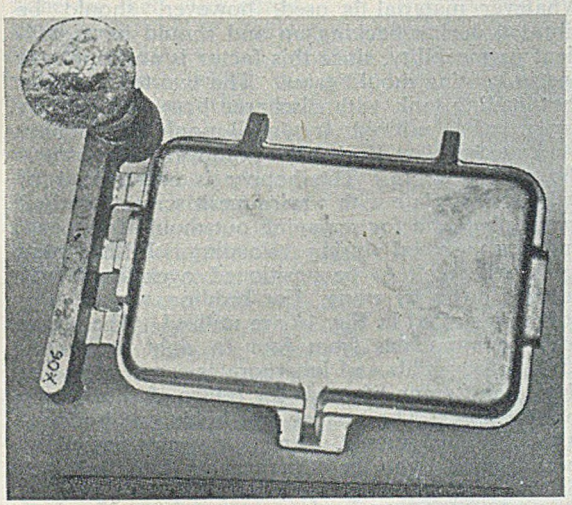


FIG. 13.—*Ordnance Cover in 5 per cent. Silicon/Aluminium Alloy, As-cast.*

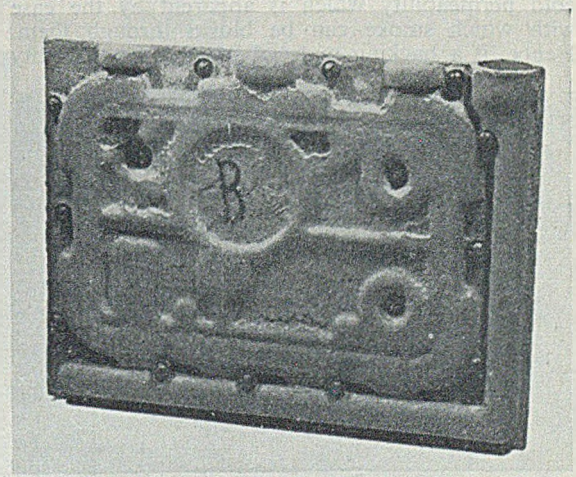


FIG. 14.—*Assembled Mould for a Mounting Panel.*

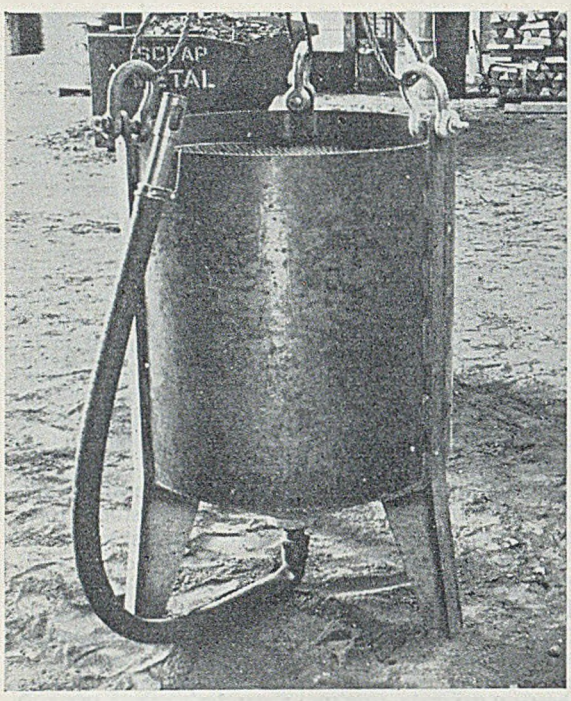


FIG. 15.—*Shot-loading Tank and Valving Hose.*

with regard to resistance to deterioration and moisture absorption, coupled with their structural strength and lack of dimensional change, make them particularly suitable for storage over indefinite periods. Shell moulds may be despatched to various plants of a company for pouring, thus reducing duplication of master pattern equipment. There is at least one shell-moulding installation in America where shell moulds may be procured for casting by a conventional sand foundry.

Shell moulds generally have a high degree of cold permeability which is apparent by the ease with which smoke can be blown through them. Hence, if a backing material of high permeability

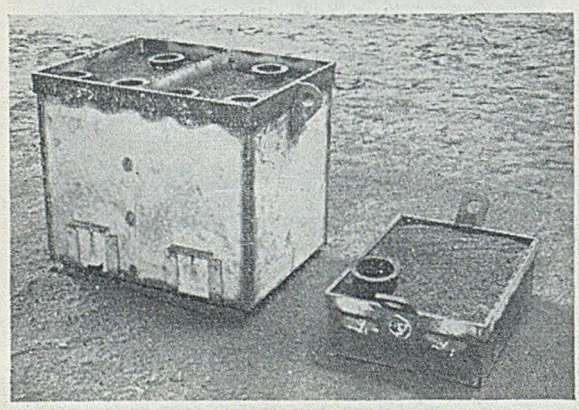


FIG. 16.—*Bedding Boxes, with Moulds prepared for Casting.*

is utilized, the gases generated from the decomposing organic binder are adequately vented with very little back pressure. This, coupled with low frictional losses due to the smooth mould face, permits the running of sections which normally would be a problem in conventional sand moulds.

Mould Closing

Shell moulds may be closed in a variety of ways. Clamping the outside edges with spring wire, bolting, utilizing a heat-setting resin and sealing tape are all practised. The choice of method will depend primarily on the amount of finning which can be permitted and the degree of tolerance required. It has been found that bolting the moulds closely about the casting cavities will yield the best results. Bolting is a practice employed extensively at the New York Naval Shipyard Foundry. A torque-controlled electric nut runner is utilized and while bolting itself is accomplished expeditiously, the reclamation or cost of the bolts probably makes this the most expensive of all the techniques. However, the results obtained or the requirements for the casting frequently necessitate this method of mould assembly. A mould closed by bolting is illustrated in Fig. 14.

In some instances, no mechanical clamping device is utilized, and the moulds are held together closely by the vibrated steel-shot back-up material. It has been the general practice to back up moulds with steel shot. The prime purpose of the back-up material is to resist deformation of the mould wall under the hydrostatic head of metal pressure. Other materials such as sand and a proprietary angular blasting grit have been used successfully. The use of metal shot, however, represents a critical material-handling problem. Such difficulties as shot overheating, removal of fines from the shot, shot loss due to metal spillage, and the safety hazards involved when loose shot is on the floor in the pouring area, have not been fully resolved. Whatever material is used, however, should be vibrated during backing up and should have sufficient permeability, since this factor is an important one in venting mould gases. The two-ton capacity shot-loading tank with discharge hose and valving arrangement utilized for shell-moulding jobbing work at the New York Naval Shipyard Foundry is shown in Fig. 15. The hopper is constructed of welded steel plate with a wire mesh screen attached to the open end for screening out mould fragments and tramp metal during reloading. Lifting pads permit the tank to be positioned over the mould bedding boxes by crane. For bedding, welded steel boxes illustrated in Fig. 16 are utilized. The larger box accommodates from four to eight vertically-positioned moulds and incorporates a gate-type discharge and crane lift pads for return of shot to the loading tank. The smaller box holds one horizontally-positioned mould. Practically any degree of mechanization can be incorporated into the shot loading and bedding operation, depending upon the volume and different sizes of moulds which are processed on a daily basis.

In some instances, when the total weight of the

castings poured into shell moulds is small, no back-up material is required. Moulds of this type may be racked vertically or positioned horizontally for pouring. Shell moulds have also been stacked horizontally and poured, or in some instances positioned vertically and clamped together by pneumatic pressure. In order to obtain bearing surfaces on irregular contours, at the high points, moulds are either "struck off" prior to curing or are ground after curing.

Cores

The technology of blowing shell cores of free-flowing resin-sand mixtures has not advanced as rapidly as mould-making techniques. At the present time no commercial equipment is available to industry for the production of shell cores. All development work in core-blowing is being accomplished with equipment designed or adapted by the foundry involved. The principal difficulties experienced in core-blowing have been resin segregation, vents clogged with cured resin/sand mixtures and core-box wear. The resin segregation problem can be resolved satisfactorily by the use of wetting agents. Further development of a suitable procedure for coating sand grains with a resin film will undoubtedly eliminate segregation as a problem in itself. However, the problems of venting and core-box wear have not been completely resolved. Fig. 17 illustrates a shell core which was produced experimentally by blowing. The investment was blown upwards and into a heated book-type core-box at 30 lb. pressure. The core-box was positioned and clamped with one open end over the blowhole, and the other resting over a slotted air vent in a heat-resisting pad. The blow was of approximately 12 sec. duration after which the loose centre portion of the core unaffected by the heat, was "slushed" out, allowing a shell $\frac{1}{8}$-in. thick to adhere to the internal cavity. The box and adhering shell were cured in an oven at 600 deg. F. (315 deg. C.) for 1 minute, as in ordinary practice, after which the box was opened and the shell core stripped out. The cores produced by this technique, although tedious and obviously uneconomical because of the nature of the equipment employed, were uniformly thin, smooth and accurately sized and in no case did the core produce casting defects through premature collapse, excessive hardness, or gas emission in gunmetal bronze, beryllium copper, manganese bronze, grey cast iron or medium carbon steel.

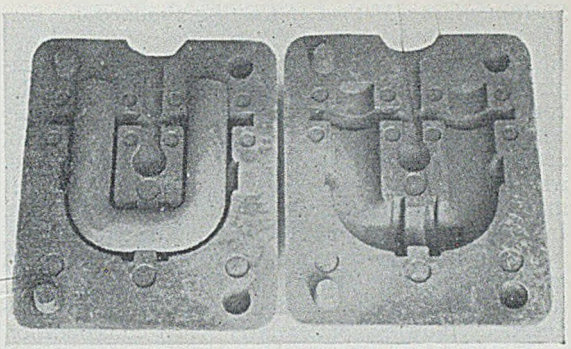
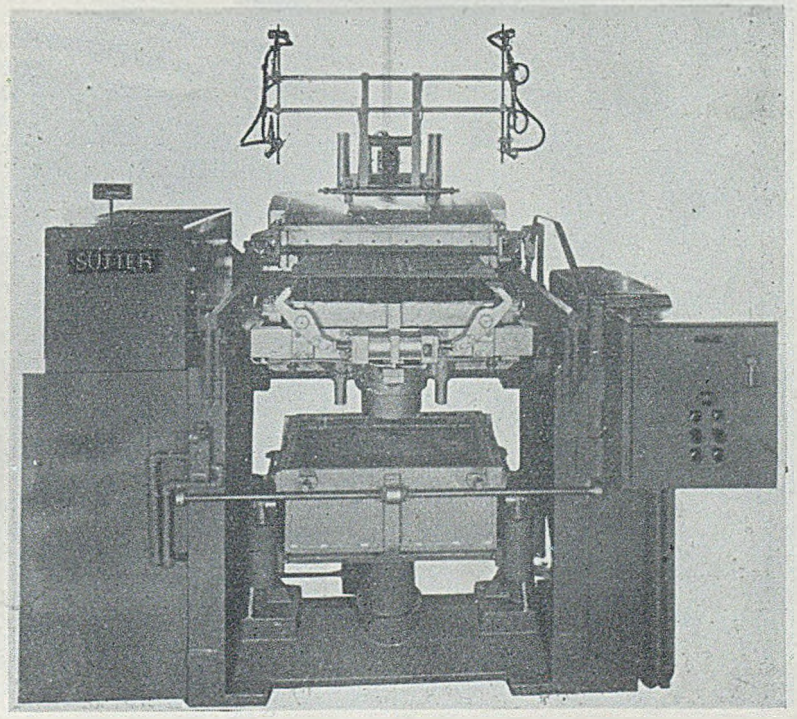


FIG. 17.—*Cope and Drag Halves, with Core, of a Mould for a By-pass Casting.*

At the present stage of development of the process core "dumping" practices appear to be more successful and more economical. Shell cores which have been made by the "dumping" technique have produced excellent internal surface finishes to close dimensional tolerances in non-ferrous alloys, and in grey, ductile and malleable iron compositions. The principle difficulty with the simple "dumping" technique is that a uniform dense core surface cannot be obtained whenever a sharp radius or an intricate core design is encountered. Whenever an open surface structure on a core, or for that matter a mould, is obtained, it will result in a metal penetration or burn-in defect on the casting and may necessitate a core wash for the high-melting-point alloys such as medium carbon steel unless this condition can be corrected by a change in procedure. It has been reported recently in the literature that



[*Courtesy Sutter Products Company*

FIG. 18.—*Single-stage Automatic Shell-moulding Machine.*

vibration techniques have been successfully employed in producing a smooth, dense surface on shell cores. Shell cores may be employed satisfactorily with green-sand moulds, particularly where smooth, accurate internal surfaces are required and the o.d. will be finished by machining. Conversely, shell moulds may also be employed with dry sand cores. In the United States foundry industry, to-day, simple shell cores are being manufactured for both malleable grey iron and ductile iron on a competitive basis with conventional dry sand cores produced by blowing, particularly when consideration is given to the indirect cost savings such as driers, expensive baking ovens and space requirements.

Mechanization

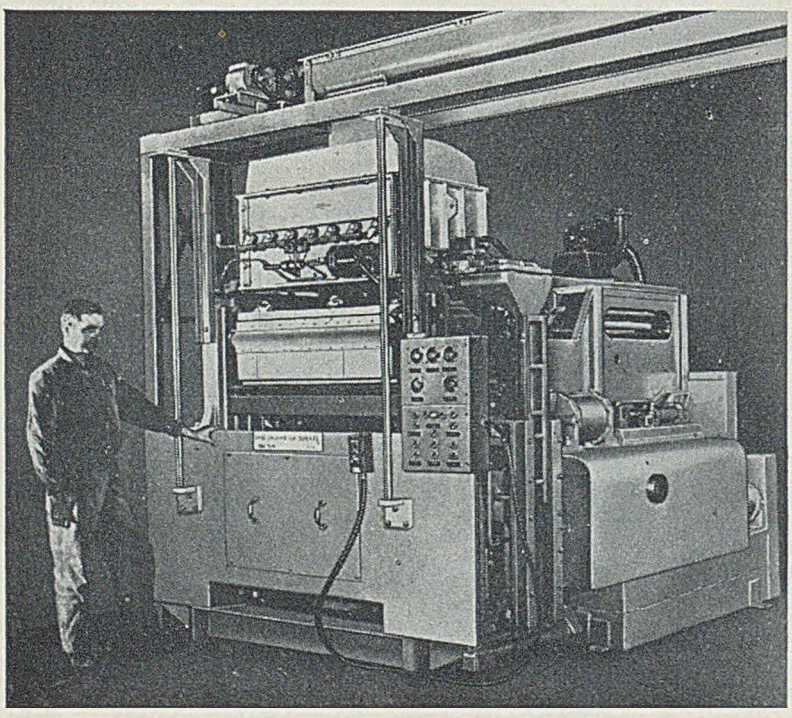
When the required volume of casting production is high, favourable opportunities exist for a complete mechanization of the shell-moulding system. One of the outstanding advantages of the process is the fact that lower grade skills may be utilized and that various degrees of mechanization can be be incorporated into a system depending upon the economics of the situation.

Industrial equipment currently being designed or recently placed on the commercial market are generally of two basic types, one in which the stations or operations are incorporated in a single, automatic moulding machine, and the other a typical loop with separate stations for moulding-making, curing, stripping, coating the pattern and preheating. In the single-stage equipment one patternplate is utilized and the rate of production is determined by the complete moulding cycle. Hence, every effort is being exerted in the utilization of this equipment to employ resins with extremely fast cure rates and anti-distortion properties and to maintain a sufficiently high temperature head on the patternplate to permit continuous operation. One basic early difficulty in connection with the development of single-stage equipment was the inability to maintain the proper operating temperature on the patternplate, necessitating reheating. To manufacture several different castings simultaneously with single-stage equipment, it would obviously be necessary to utilize more than one machine.

In the multi-stage machine, several patternplates are required for continuous production. These patternplates may represent several different castings. In the multi-stage operation the "dwell" time will determine the rate of production. One serious disadvantage of the loop system is that in the event of a serious mechanical breakdown the whole line must be shut down.

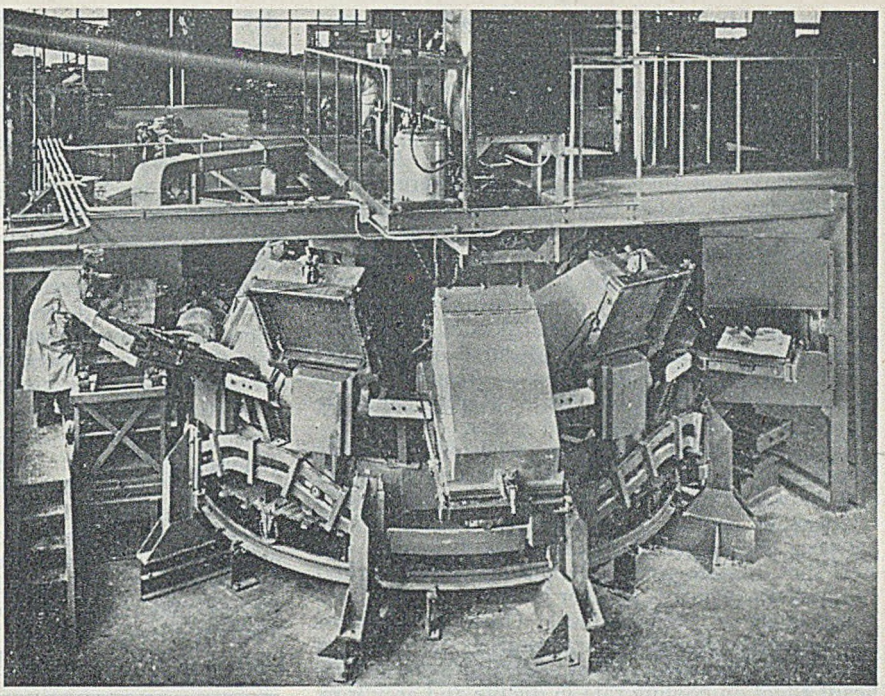
The single stage and loop systems as a general rule will employ "dutch-type" ovens either electrically or gas heated, with automatic temperature control. In the multi-stage loop system variable belt speeds through the curing and preheating ovens can be maintained as desired. Some loop systems use an overhead investment dispenser, while others use the conventional mould inversion technique.

At the present time there are approximately fifteen companies offering industrial shell-moulding equipment to the foundry industry. Figs. 18 and 19 illustrate two types of automatic single-stage machines which are currently available in production on a variety of automotive and miscellaneous castings in grey iron, malleable and stainless steel. The machine shown in Fig. 18 accommodates two sizes of patternplates, 26 by 41 in. and 20 by 30 in. According to the manufacturer, shells are produced on a basic cycle of 45 to 60 shells per hour on patterns with a maximum height of 8 and 6 in. respectively. The curing ovens for the machine can be either gas-fired or electrically-heated and the floor space requirement for the larger unit is 10 by 10 ft. The machine illustrated in Fig. 19 will produce approximately a 26 by 41 in. shell with a 7 in. maximum draw at an approximate rate of 40 shells per hour. The curing oven is gas-fired. An example of a multi-stage rotary unit is illustrated in Figs 20 and 21. This machine has 12 pattern stations, and according to the manufac-



[Courtesy Shell Mould & Machine Company

FIG. 19.—*Another Design of Single-stage Automatic Shell-moulding Machine.*



[Courtesy Mechanical Handling Systems Inc.

FIG. 20.—*Rotary Shell-moulding Machine.*

ture is capable of producing 500 shells per hour with one man. The pattern size utilized by this particular machine is 22 by 28 in. to a maximum draw of 8 to 9 inches. The unit has a self-contained sand and resin blending unit that feeds both resin and sand in the correct mixture continuously to the twelve sand boxes attached to each of the twelve pattern stations. This unit has not as yet been installed or operated in a production foundry and is still undergoing tests by the manufacturer.

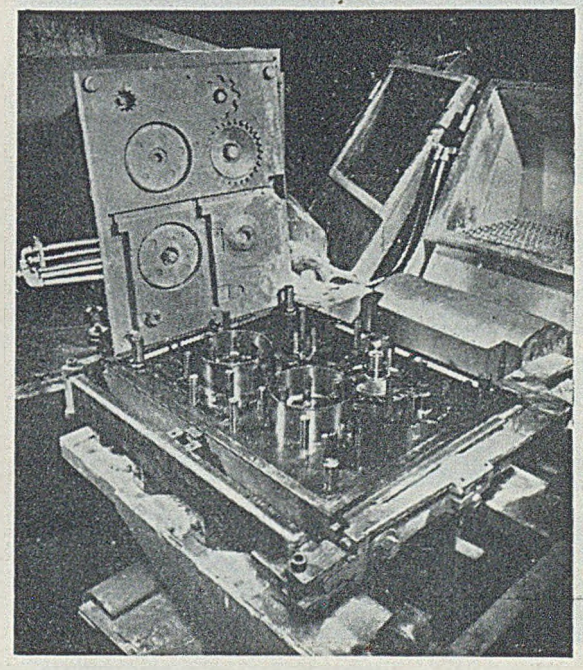
By suitable masking of the master pattern, it is possible to produce one or more complete moulds from each shell made by all the machines described. Obviously this would necessitate very accurate machining and mounting of the multiple patterns so that each of the shells may be utilized interchangeably.

Plant Safety

The pulverized and fine silica sands frequently used in the shell-moulding process may constitute a respiratory hazard. In addition the use of relatively high resin percentages increases the possibility of contact dermatitis particularly with phenolic resins containing hexamethylenetetramine. As part of an industrial health survey of the shell-moulding installation at the New York Naval Shipyard conducted by the Shipyard's Industrial Health Department, it was determined that in a conventional resin-sand mixture under agitation there was an inversion in the concentration of sand and resin from a 91:9 mixture, so that at normal working distances, employees are exposed to concentration of approximately 90 per cent. resin and 10 per cent. sand. Part of the basic recommendations of this survey, included the ventilation of the moulding and curing areas and the mulling or mixing of sand-resin mixtures with a dust-proof cover. In highly-mechanized installations where large tonnages of sand and resin are processed on a daily basis, consideration should be given to the possibility of dust explosions.

METALLURGY

There had been some claims in connection with the shell-moulding process, that castings produced in shell moulds backed with steel shot are subject to a greater skin chill than those poured in conventional green-sand or in "unbacked" shell moulds. The work conducted at the laboratory with which the Author is associated, on a bronze alloy, did not confirm this concept. To investigate this claim



[Courtesy of Mechanical Handling Systems Inc.

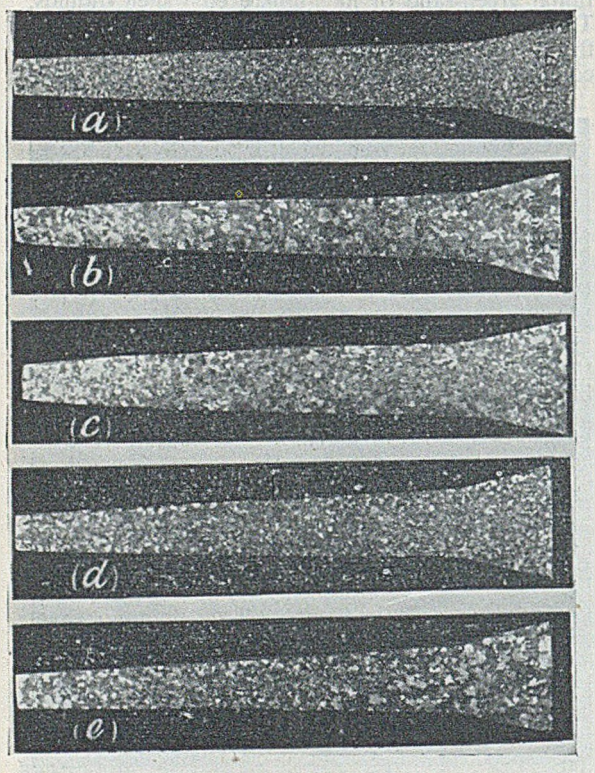
FIG. 21.—*Patternplate and Mould designed for Rotary Shell-moulding Machine.*

qualitatively, a simple wedge casting was poured in shell moulds which were backed up with various kinds of materials such as rammed green-sand, steel-blasting grit, medium steel shot, and copper shot along with a green-sand control casting. All shell moulds were $\frac{1}{8}$ in. thick and all moulds were poured at 2,050 deg. F. (1,120 deg. C.). Fig. 22 illustrates photomacrographs of longitudinally etched sections through these wedge castings. It will be noted that the grain-size pattern in the green-sand control casting is smaller than in any of the castings poured in plastic-bonded shell moulds regardless of the type of back-up employed. This is indicative of a greater rate of cooling on solidification in green-sand than in plastic-bonded shell moulds, or a greater insulating effect of the plastic-bonded sands.

The same effect has been reported by other investigators in steel. It will also be noted in Fig. 22 that there does not appear to be any appreciable differences in cooling rate, reflected by grain size, between the copper-shot backed shell mould and steel shot, despite great differences in their thermal conductivity, which is another indication of the insulating effect of shell moulds. Other investigators have reported that back-up materials for some of the higher temperature alloys seem to have a significant effect on cooling rate in ductile and grey iron. Some producers have backed-up shell moulds in a dry silica sand in an effort to produce maximum as-cast ductility in spheroidal-graphite iron.

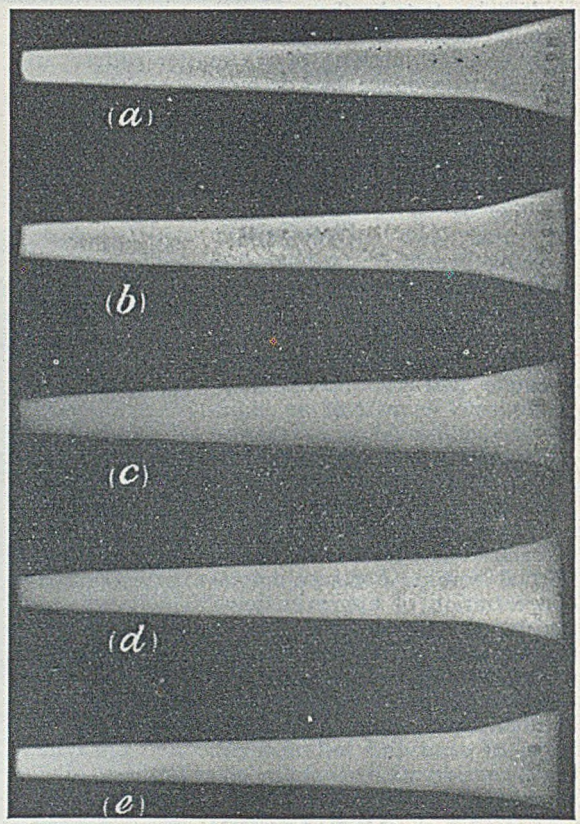
The effect of shell-mould back-up on the internal soundness of bronze castings as compared with green-sand castings in the same alloy is shown in Fig. 23 which represents positive prints of exographs of $\frac{1}{8}$ inch thick slices of the specimens shown in Fig. 22. The greater degree of internal soundness of the shell-moulded castings as opposed to the green-sand control will be noted. The green-sand control casting, however, showed a greater amount of skin-effect. In the shell moulds, the specimens backed with steel and copper shot appeared to have a greater degree of internal soundness than the green-sand and grit-backed specimens, probably due to the higher permeability of the shot in venting mould gases.

Further investigations of the effect of back-up material on macrostructure and soundness utilizing other alloys and other backing materials were pursued. Standardized $\frac{1}{8}$-in. shell wedge-moulds were prepared in the usual manner and two each were bedded in fine zircon sand, steel grit, medium steel shot, rammed green sand, and copper shot representing materials of widely varying thermal conductivity, together with two green-sand moulded control wedges. Four test series were run, one each



(*a*) Control; (*b*) Rammed Green-sand; (*c*) Steel-blasting Grit; (*d*) Medium Steel Shot; (*e*) Copper Snot.

FIG. 22.—*Effect of varying Back-up Material on the Macrostructure of Shell-cast "G" Bronze Test Plates.*



(*a*) Control; (*b*) Rammed Green-sand; (*c*) Steel-blasting Grit; (*d*) Medium Steel Shot; (*e*) Copper Shot.

FIG. 23.—*X-ray Photographs of Thin Slices to show the Effect of varying Back-up Material on the Soundness of Shell-cast "G" Bronze Test Plates.*

in an aluminium alloy (5 per cent. silicon) poured at 1,250 deg. F., (675 deg. C. 88/8/4 bronze at 2,050 deg. F., (1,120 deg. C.) grey iron at 2,750 deg. F., (1,510 deg. C.) and Navy class " B " steel at 2,960 deg. F. (1,625 deg. C.). Thin slices ($\frac{1}{8}$ in.) were taken from all wedges 2 in. from the side opposite the gate for X-ray radiography, while the adjacent slices were polished and etched for macro-examination on the bronze and aluminium slices.

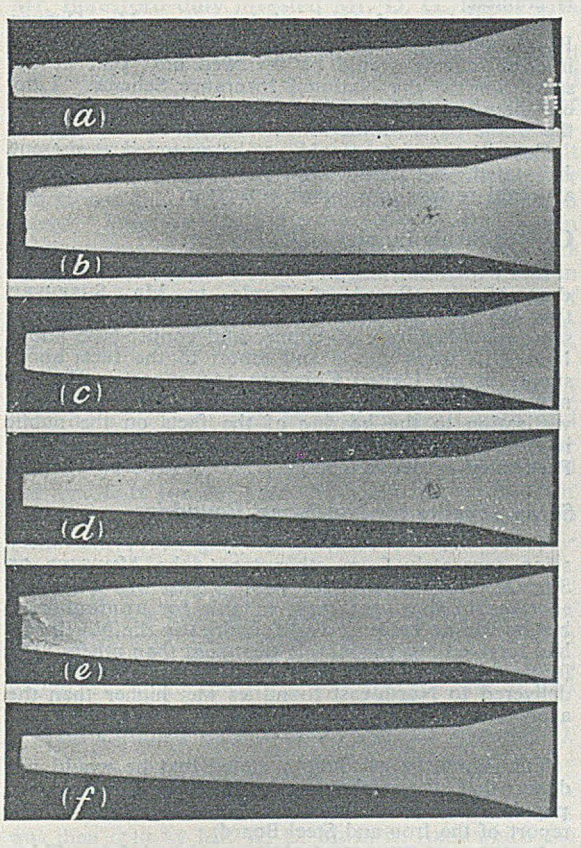
An inspection of the macro-etched aluminium slices showed no marked differences in degree of chill between the sand-cast and shell-cast wedge specimens. X-ray photographs of thin slices indicated some slight porosity on all specimens, with little difference in internal unsoundness.

As noted previously, the bronze sand-cast macro-structure displayed a small, equiaxed grain pattern with evidences of skin chill, while all shell-cast specimens showed large equiaxed grains, without skin chill. The lighter backing materials allowed some swelling of the mould, yielding oversized specimens. This would indicate that on heavier castings requiring close dimensional tolerances the use of a common foundry sand back-up should be explored carefully before being utilized in production. Thin-slice radiographs further illustrated the skin chill condition in the green-sand control and confirmed the greater degree of soundness in the shot-backed castings.

The grey iron shell-cast slices shown in Fig. 24 displayed no significant differences on X-ray examination insofar as gas porosity was concerned. Slight shrinkage was present under the sinkhead on the zircon and steel-shot-backed specimens. As in the gunmetal bronze series, the zircon and green-sand-backed specimens showed swelling indicative of mould deflection. The green-sand control exhibited some surface roughness due to the gating technique employed.

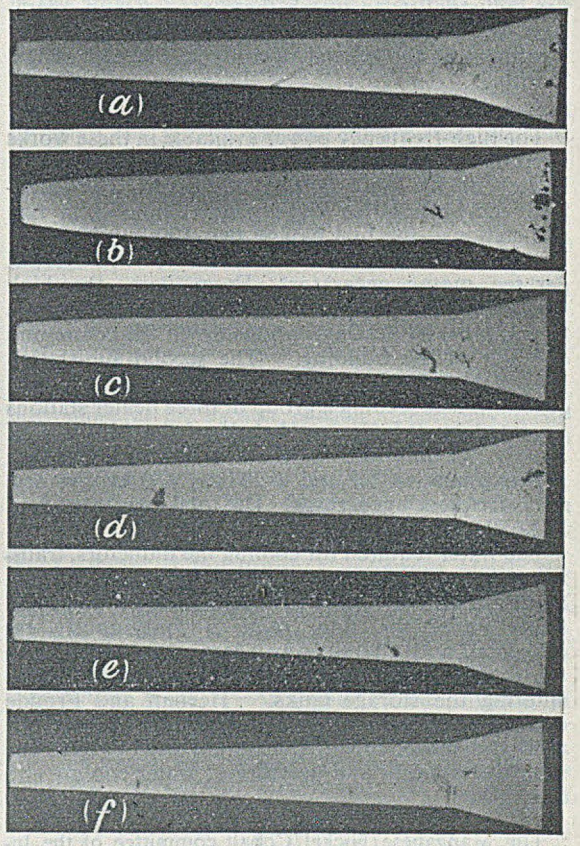
A reversal in the general soundness trend of the three alloys was apparent from the examination of the class " B " steel thin-slice radiographs in this series shown in Fig. 25. The control showed less unsoundness due to gas than any of the shell-cast specimens, although some expected shrinkage due to gating design was present in all. Little difference was noted in the shell-cast series. Modification of the basic investment which was utilized in production with this alloy eliminated this tendency and produced radiographically sound castings.

(To be continued)



(*a*) Control; (*b*) Zircon Sand; (*c*) Steel Grit; (*d*) Steel Shot; (*e*) Rammed Green-sand; (*f*) Copper Shot.

FIG. 24.—*X-ray Photographs of Thin Slices to show the Effect of varying Back-up Material on the Soundness of Shell-cast Grey-iron Test Plates.*



(*a*) Control; (*b*) Zircon Sand; (*c*) Steel Grit; (*d*) Steel Shot; (*e*) Rammed Green-sand; (*f*) Copper Shot.

FIG. 25.—*X-ray Photographs of Thin Slices to show the Effect of varying Back-up Materials on the Soundness of Shell-cast, class " B " Steel Plates.*

E.F.Co. Extensions

High-frequency Plant Manufacture

Annealing, surface and deep hardening, as well as brazing, are among the many uses to which electric induction methods of heating are applied in industry to-day. Such applications involve the improvement of working conditions in the heat-treating shop, metal economy and better precision and reliability of heat-treatment processes. The attractive advantages of such techniques and applications which are among those developed by the Electric Furnace Company, Limited, have necessitated the extension of their manufacturing works at Burton-on-Trent to provide accommodation for the heat-treatment division. This comprises a single bay 290 ft. long by 50 ft. wide, serviced by one 3-ton crane. Installed in the building are some 21 different types of heating stations using induction heating techniques which demonstrate the many applications for which this type of heating is suited in industry. The plant has been established for further development and research in this field. Although the new shop has been in operation for some months, an opportunity was given by the firm for industrialists to watch these processes in operation and to discuss their own problems of heat-treatment at the official opening at the end of last month.

Power Available

The high-frequency power available in these works exceeds 1,000 kw. and is believed to be one of the largest of its kind in this country. The high-frequency generating equipment is housed in two sub-stations—the first having two 100-kw, 10,000 c. per sec. motor-generator sets and an 80 kw, 2,400 c. per sec. motor generator. From here, the high frequency power is distributed by overhead busbars to a number of heating stations down the centre and one side of the building. The second sub-station houses three 210 kw, 8,300 c. per sec. vertical motor-generator sets feeding a group of three heater stations operated by E.F.Co., on behalf of the Ministry of Supply. In addition, there are a 20 kw, 5,000 cycle motor-generator set and a 20 kw, 450 kc. per sec. radio-frequency generator. The total connected load is 1,650 kw.

The water required for cooling the inductors, transformers and for quench purposes is treated through Permutit softeners, and stored in rock asphalt-lined tanks under the floor, and is continuously recirculated and filtered. Any loss is made up from the town's water supply, which is softened before entering the storage tanks. Heenan and Froude cooling plant is incorporated in the circulating system, and motor-driven pumps are used to give the requisite volumes and pressure of water cooling and quenching.

THE Manganese/Nickel/Cobalt committee of the International Materials Conference has announced the allocation of 36,315 metric tons of primary nickel and oxides to 36 countries for the third quarter of the year, compared with 36,675 tons in the second quarter. The U.K. will receive 5,470.5 metric tons.

Parliamentary

Prosperity of Shipbuilding Industry

MR. WINGFIELD DIGBY, Civil Lord of the Admiralty, told MR. WILLEY, who raised the question of shipbuilding, that he was too pessimistic. There was four years' work on the order-books and the lag in delivery dates was bound to be considered seriously by anyone ordering a new ship. The industry was in a prosperous state and with the expected increase in the supply of steel plates there should be great confidence in the future of the industry. The number of cancellations in relation to the total of orders was negligible.

Mr. Willey, in the course of a review of the problems of the industry said that there had been complaints about steel allocations not being fulfilled. No orders of any magnitude had been placed this year. Besides cancellations of tanker orders there had also been cancellation of dry-cargo vessels.

Industrial Injuries Bill

A second reading of the Industrial Injuries Bill, which grants improved benefits to workers injured at work, was given unopposed in the House of Commons. An additional expenditure of £140,000 is involved, of which £100,000 is accounted for by the easing of the conditions under which disablement pay is granted.

The Minister of National Insurance, MR. OSBERT PEAKE, who introduced the Bill, said that the industrial injuries scheme would be reviewed next year at the same time as the National Insurance Scheme. Later on there might be a more formal investigation into the whole basis of the scheme.

Contribution rates would not be amended at present, he stated, but this could be considered when the actuarial review took place next year.

Copper Semis Inquiry

In a written answer, MR. PETER THORNEYCROFT, President of the Board of Trade, to MR. SHEPHERD that the reference to the Monopolies Commission on some manufacturers of copper and copper-base alloys limited its investigation and report to the facts about supply in the United Kingdom and exports. He had now decided to ask the Commission to extend its investigation to the bearing of the facts on the public interest. He would lay the completed report before Parliament in due course.

Scrap Supplies for North-east Foundries

There were no statistics showing heavy machinery scrap separately from other types, the MINISTER OF SUPPLY told MR. P. WILLIAMS. There was a general shortage of the types most suitable for ironfoundries, but he had no evidence that foundries in the North-east had received less favourable treatment than others. His information was that the proportion of heavy scrap delivered to North-east foundries was higher than the average for the country as a whole.

THE MINISTER OF SUPPLY stated that he would not direct that there should be published a shortened popular illustrated edition of the most recent annual report of the Iron and Steel Board.

IMPORTS OF TUNGSTEN ORES consigned from China were last recorded in the trade statistics in March and April, 1952, the quantity imported in the two months being 21 tons.—The President of the Board of Trade.

I.B.F. London Branch—Annual Meeting

Year of Unparalleled Activity

The annual general meeting of the London branch of the Institute of British Foundrymen was held in the Waldorf Hotel, Aldwych, London, W.C.2, at the close of the session, Mr. D. Graham Bisset (branch president) in the chair.

Presidential Badge

MR. L. G. BERESFORD, B.SC., F.I.M. (immediate past-president) reminded the meeting of the decision of the general council of the Institute some time ago that if the branches so desired they could give to their president a badge which he should wear during his year of office at ordinary branch meetings and at national meetings of the Institute. Mr. Beresford was happy to announce that Mr. Barrington Hooper, C.B.E., a past-president of the London branch, had been kind enough to provide such a badge for the president of the London branch. The offer was accepted gratefully, and Mr. Beresford duly invested Mr. D. G. Bisset with the badge amid applause.

In expressing appreciation, the PRESIDENT said the badge was a gift to succeeding presidents, and in his opinion it marked a step towards the greater recognition of the officers of branches of the Institute throughout the country. It had often been felt in the past, when branch presidents attended other functions, that there was nothing to distinguish them. Due to the kindness of Mr. Barrington Hooper, one of the oldest and staunchest supporters of the Institute, the badge had not cost the London branch a halfpenny. Knowing it to be the wish of the members, Mr. Bisset extended to Mr. Barrington Hooper sincere thanks for his public-spiritedness.

The minutes of the previous annual general meeting of the branch were then dealt with and were confirmed and signed. Next, the hon. secretary and treasurer (Mr. W. G. Mochrie) presented the accounts for the year 1952, and proposed their adoption. He pointed out that the membership subscription received (£2,351) constituted an all-time record for the branch.

MR. A. R. WIZARD, seconding the adoption, congratulated the branch on getting to within £1 4s. 8d. of its estimated expenditure for 1952, even though the expenditure was somewhat higher than in 1951, which was justifiable. He was also pleased to find the statement was available for circulation.

(The accounts were adopted without discussion.)

SECRETARY'S REPORT

The Secretary's report on the activities of the session was then read by Mr. W. G. Mochrie, from which the following extract has been made:—

The text for the report was taken from the third paragraph of the fourth page of the current branch programme, which read "The principal object of our meetings is to pool knowledge, discuss knowledge and disseminate knowledge, and the more who attend and take part in these discussions the more useful does the branch become." In reviewing the session's work, one will see how the programme committee have as usual interpreted this motive by arranging sufficient variety in the technical papers, as well as in social and practical matters, to cater for the widest possible cross-section of individual members. The reviewer will also find that the individual member has not been slow to follow up this opportunity. Indeed, even more members than usual have helped most markedly by interested attendance and participation in discussion. Thus knowledge has been pooled, discussed and disseminated. The contributions from members to discussions this year indicate greater spontaneity and volume than ever before.

Technical Meetings

On *September* 24, 1952, the new president, Mr. D. Graham Bisset, was installed, and following tradition in the branch gave his Presidential Address. This was followed by a film and paper on "External Dust Control for a Pedestal Grinder," by Mr. W. H. White, F.R.S.A., of the British Cast Iron Research Association, and Mr. W. B. Lawrie, M.SC., H.M. Engineering Inspector of Factories. These speakers were supported by Mr. Colin Gresty, chairman of the Joint Standing Committee on Conditions in Ironfoundries. For the first time, the London branch heard its name mentioned in acknowledgment in the sound track of a film, the commentary having been prepared taking cognizance of the inauguration of the film in the London branch.

October 29, 1952.—Mr. E. M. Currie, past president, chairman of the Institute's sub-committee T.S.35, presented the sub-committee's report and film "Flow of Metal into Moulds." This film and report were first given at the Buxton conference. The programme committee's decision to include this report in the branch programme at the earliest possible opportunity thereafter was well justified by the attendance and discussion.

November 12, 1952.—A session on Research was held, opened by Mr. Morrogh representing the B.C.I.R.A., Mr. F. N. Lloyd of the British Steel Founders' Association, for the steel founders, and Mr. W. A. Baker of the British Non-Ferrous Metals Research Association, for the non-ferrous section of the industry. This proved to be a most interesting evening and, so far as the annals show, is the first occasion where the views and experiences of all three sections of the industry have been brought together.

December 4, 1952.—As guests of the Institute of Metals, London section, at 4, Grosvenor Gardens, members heard Mr. R. W. Ruddle, of the B.N.F.M.R.A., give his paper on "Mould Reaction." The branch was well represented, constituting the majority in attendance, and provoked a lively discussion.

January 28, 1953.—"Runners and Risers" took the form of one short paper each from Mr. E. Daybell, of K. & L. (Steelfounders and Engineers), Limited, Letchworth, Mr. P. A. Russell, B.SC., F.I.M., of S. Russell & Sons, Limited, Leicester, and Mr. R. W. Ruddle. Again all three sections of the industry were represented. The committee had been rather am-

bitious in the inclusion of all three papers that evening and it was obvious from the discussion—which had to be cut short—that there might well have been one evening devoted to each of three speakers.

February 25, 1953.—Mr. Frank Evans, F.I.M., member, of John Miles & Partners (London) Limited, gave members the benefit of "Operating Experiences with Hot-blast Cupolas in Great Britain." Mr. Evans' record was so well handled and so complete that it left little room for discussion.

March 18, 1953.—At the invitation of the Institute of Vitreous Enamellers, Southern section, branch members attended a meeting at the Howard Hotel, Norfolk Street, Strand, to discuss the problems of cast iron *apropos* vitreous enamelling. Mr. A. Adam, of R. & A. Main, Limited, and Mr. George Pierce, championed the foundrymen's cause and did their subject justice, to such effect that the programme committee are investigating the possibilities of including a similar item in the branch programme for next session, when the Institute of Vitreous Enamellers would be invited.

March 25, 1953.—The paper by Mr. D. H. Potts, of Westinghouse Brake & Signal Company, Limited, on "Matchplates," was illustrated and was accompanied by one of the largest collection of samples presented to the branch; moreover the paper attracted the largest audience ever (over 200), indicating a widespread interest in this subject in this country at the present time.

Section Activities

Sectional activity has been augmented this year with the inclusion of the Southampton section which, by the close of the session, will have had five technical meetings, at three of which the authors were from the home section—a most commendable achievement. East Anglian section meetings have lived up to their reputation in both number attending and variety of technical papers—six, apart from their A.G.M. Slough section have had six technical meetings, five of which included authors from the branch. The attendances at all these section meetings have been remarkably high.

Continental and Social Events

In the secretary's report last year it was stated that the last official meeting of the branch would be in Paris at the end of June. Some 49 members and their ladies took part, and it was the secretary's pleasant duty to report that they had a most enjoyable visit from both a technical and social point of view. Moreover, the branch returned the hospitality of the Ardennes when they visited London in May. A five-day programme was arranged for them and our French colleagues were most appreciative of the efforts to make their stay an enjoyable one.

The usual social events were repeated. There was a dinner-dance and cabaret at the Café Royal on November 21, when again records were broken as 265 were present to welcome the president, Dr. Dadswell, and Mrs. Dadswell. The "Stag Party" on March 20 caused the management of the Horse Shoe Hotel further embarrassment by exceeding last year's numbers, when no fewer than 182 participated. The cabaret was excellent. Thanks are due to Mr. A. R. Parkes for his excellent organization of these functions.

Works Visits

Since the institution of the National Works Visits the branch Council has not made any elaborate local arrangements. In October, last year, the branch was very well represented in South Wales, when a most interesting day of visits was organized on a national basis. Although the maximum number of works to be visited for any one party was two, several London branch members managed to see five. The proceedings ended with a dinner in the evening.

Membership

Last year it was reported that the membership was about 784. After making adjustment for resignations and erasures, etc., between that date and the date of publication of the Institute's Annual Report the figure was confirmed at 778. It is anticipated that the present figure on the London branch register will be much closer to the figure reported to the Conference than last year's, and, at the moment, membership stands at 839 (see Table I). Total membership subscriptions received during 1952 were £2,351 10s. 11d. (£150 more than last year's record). While London has always claimed to be the largest branch and, for the past year or so, the largest body of qualified foundrymen in the world, the headway so far enjoyed is being lost.

TABLE I.—*Summary of I.B.F., London Branch Membership.*

	Subscribing firms.	Members.	Associate members.	Associates.	Total.
Position at Buxton A.G.M., 1952 ..	30	395	285	68	778
Applications approved	5	30	35	18	88
Transfers inwards	—	4	12	2	18
Up-grading ..	—	—	2	—	2
	35	429	334	88	886
Less :					
Transfers outwards ..	—	4	3	—	7
	35	425	331	88	879
Estimated erasures, etc.	—	19	15	6	40
Total to date ..	35	406	316	82	839

Council Business

Owing to the increasing demands by the business of the branch and the more frequent necessity to hold Council meetings, it was decided early this session to delegate certain special items to sub-committees. This has been a pronounced success by reducing the number of Council meetings necessary for the smooth running of the branch and it has spread the discussion time over various sub-committees. There have been six full meetings of the Council, and of course various sub-committee meetings, including executive, programme, dinner-dance, "stag party," and a special *ad hoc* committee. There have been four general council meetings of the Institute, at each of which the London branch has been well represented. It is doubted whether members realize just how much time and effort is expended on affairs of the branch by members of the Council, and by representatives and delegates to the Institute's general council. This latter particularly involves much travelling time, and this session has meant journeying to and from Buxton, Manchester and York. All this backroom work so spontaneously and unselfishly undertaken by the Council creates the opportunity for you to "pool, discuss and disseminate knowledge." To each member an appeal is personally addressed to widen the scope and enlarge the fund of knowledge by (1) making constructive suggestions for the programme; (2) overcoming still further any feeling of diffidence or restraint in discussions; (3) attracting visitors and new members to the meetings; and (4) choosing branch officers with care.

Appreciation of Assistance

First, thanks are due to the president, Mr. D. Graham Bisset; his chairmanship at the meetings throughout the session has been outstanding. Each of the four presidents the writer has had the honour to serve as secretary has been outstanding in some way or other. I shall not embarrass those "past" with details, but it is germane to mention that Mr. Bisset is a stickler for detail. He has an uncanny knack of sifting this detail and throwing overboard the chaff.

Continuing, the secretary included in his thanks the past-presidents, other members of Council, Mr. Parkes, delegates and representatives to the Institute's general Council, the section presidents, Mr. Hart, Dr. Scheuer, Mr. Meager, and their honorary secretaries, Mr. Sanders, Mr. Hoesli and Dr. Einerl, the stewards and reception committee, and especially Mr. Phil Ellis, the projectionist.

OTHER BUSINESS

The BRANCH PRESIDENT complimented Mr. Mochrie and said he had displayed another facet of his character which perhaps had not been suspected, and this added to his stature.

MR. A. R. PARKES, proposing the adoption of the Report, felt sure that never before had the branch heard so lucid an account of so many activities. Members, he said, should bear in mind the secretary's continual request (like that of Oliver Twist) "for more . . . "—more members, more discussions, more output, and more reports. That was typical of the divine discontent which made for progress, and Mr. Mochrie had given a lead in that respect.

MR. L. G. BERESFORD, seconding, said the report was most interesting, but did not reflect fully the large amount of work that Mr. Mochrie himself had put in on behalf of the branch.

Technical Report

MR. F. HUDSON then reported on the work of the Technical Council of the Institute, on which he is the branch's delegate.* At the conclusion, he stressed the value to members of the unselfish co-operation of their fellows in this committee work.

The BRANCH PRESIDENT, for the benefit of members who might not be fully aware of what Mr. Hudson meant when referring to the Joint Iron Council, explained how that body made grants to finance technical investigations and other activities which would benefit the industry. His purpose was to emphasize that it was incumbent on members of the industry to suggest, from their own experience, subjects which might with advantage be investigated by expert sub-committees. If members of the branch could suggest subjects which called for investigations which were beyond the ability of the man in the foundry to undertake, they would be put before the proper authorities and finance would be made available to cover any investigation necessary.

MR. GLENNY said the branch was very fortunate in having a man of Mr. Hudson's international reputation as its representative on the Technical Council of the Institute.

MR. A. TALBOT, supporting Mr. Glenny, said he was impressed by the fact that it was possible to get hold of people who understood the subjects so fully to solve the problems for the benefit of the industry. In response to Mr. Hudson's request for suggestions as to subjects for investigation, he said that if a sub-committee could take the "black" out of black sand it would do something for him and for all other foundrymen.

Election of Officers

The BRANCH PRESIDENT proposed with great pleasure that Mr. B. Levy be elected president of the branch. Mr. Levy, he said, was first and foremost a master patternmaker—and foundrymen would be the first to admit that without a master patternmaker a foundry would be a very poor place. Also, he was not content with just making the patterns, but he took great interest in the work of the foundry, and he could go into any foundry and hold his own with foundrymen on technical matters. His hobby was the Institute of British Foundrymen, and the branch president said he knew of no one more assiduous in attendance at meetings or more dependable than Mr. Levy, as had been proved by his work on the Council of the branch for years past.

MR. G. C. PIERCE (Past Branch President) seconded and, as there were no further nominations, Mr. Levy was unanimously elected.

The following other officers were then elected or re-elected for the 1953-54 session:—As *senior vice-president,* Mr. W. Wilson; as *junior vice-president,* Mr. Frank Hudson; as *honorary secretary and treasurer,* Mr. W. G. Mochrie; and *honorary auditors,* Mr. V. Delport and Mr. Barrington Hooper, C.B.E.

There were five vacancies for the *branch Council,* and Mr. Bissett invited nominations, which were duly put forward and at the conclusion of the ballot Mr. Buxton, Mr. Booth, Mr. Barnard, Mr. Emmerson and Mr. Wizard were elected. Mr. Bissett said that three of them would be elected to serve for three years, one for two years and one for one year. Their rotation would be based strictly on the length of their membership of the branch.

For reason of business commitments, Mr. E. M. Currie was not able to seek re-election as *branch delegate to General Council.* Announcing this, Mr. Bisset assured Mr. Currie that he carried with him the appreciation of the branch for all that he had done in the past, and the hope that, when circumstances permitted him to do so, he would offer his services again. Mr. Barrington Hooper, C.B.E., was elected to succeed Mr. Currie and Mr. C. H. Kain, Mr. F. Arnold Wilson and Mr. L. G. Beresford were re-elected as representatives. Mr. Frank Hudson was re-elected as representative of the branch on the Technical Council, with Dr. A. B. Everest as his deputy. As *stewards,* Mr. E. H. Brown, Mr. G. C. Pierce, Mr. R. Pipes, Mr. A. Whiles and Mr. A. R. Wizard were reappointed, and a tribute was paid to them by Mr. F. Arnold Wilson for their excellent work. Mr. J. P. Ellis was asked to continue to serve the branch as *projectionist,* and Mr. Bisset expressed gratitude to him for the unobtrusive

The full report of the Institute's Technical Council was printed in the JOURNAL last week.

I-B.F. London Branch—Annuul Meeting

manner in which he had taken charge for many years of the projection of slides and films.

(The formal business of the annual general meeting was concluded.)

Following the business meeting, a film, "Avec le Feu Sacré," was shown, which was introduced by Mr. W. Wilson. It was produced by the French foundry industry to help recruitment in the foundry industry through the *Syndicat Générale des Fondeurs de France,* and thanks for its loan were accorded to the French Association. It portrayed the industry as both an art and a craft, showing the various aspects of foundrywork and emphasizing the importance of the industry in everyday life. It sought to show children from the primary schools and the technical schools that there was an outlet for them in the foundry, and chances of promotion. Although the commentary was in French, members agreed at the conclusion that the film was a step forward in the presentation of such material, and should materially assist the French foundry industry to attain the end desired.

Kirkstall Forge Site Uncovered

A discovery of exceptional interest was made at Kirkstall Abbey, Leeds, last week, when a team of 14 archæological students, under the charge of Dr. David E. Owen, director of Leeds City Museum, undertaking their fourth "dig" in the last three years, succeeded in uncovering the original Kirkstall Forge, and were in consequence able to establish its actual date as being *circa* 1150. Dr. Owen was surprised that the forge—a monk's iron furnace—should have been discovered right in the middle of the cloisters of the abbey, after a hole 10 by 6 by 3 ft. deep had been dug. In the cavity was clearly visible the hole through which molten iron was poured over 800 years ago into a channel, after percolating through heated charcoal, the ashes of which have been removed by the diggers. Although Mr. Rodney Butler, managing director of Kirkstall Forge, possesses manuscript evidence that the forge was originally a monastic forge dating back to the thirteenth century, it was not until the discovery of fragments of twelfth-century pottery, during the excavation, that the date of the original forge could be more accurately established.

Board Changes

THOS. W. WARD, LIMITED—Mr. C. F. Bishop is to retire from the Board.

BRITISH ROPES, LIMITED—Mr. A. R. Allan has resigned from the Board.

ALFRED HERBERT, LIMITED—Mr. Leslie J. Hugo has been elected a director.

GUEST, KEEN & NETTLEFOLDS, LIMITED—Mr. Allan Macbeth has resigned from the Board.

FAIRBAIRN LAWSON COMBE BARBOUR, LIMITED—Mr. John A. Page has retired from the Board.

AVELING-BARFORD, LIMITED—Mr. E. R. Howlett and Mr. C. R. Ritchie have retired from the Board.

URQUHART LINDSAY & ROBERTSON ORCHAR, LIMITED—Mr. John A. Page has retired from the Board.

CALEDON SHIPBUILDING & ENGINEERING COMPANY, LIMITED—Mr. Lawrence D. Holt has resigned from the Board.

Foundry Practice at Fraser and Chalmers

(*Continued from page* 52)

13 tons and the procedure is to cast four halves of the cheeks in a sequence of pairs, one upper, two lower, and one upper giving thereby two pairs which are then put together on the shaft.

Also among the larger winding-engine castings are the spiral-cone drums, which vary from 12 to 20 ft. dia. and weigh up to 12 tons. These castings are produced by the loam and spindle method (Fig. 3), and are run from a "soft" iron mixture, having a tensile strength of between 13 and 14 tons per sq. in. The same tests and conditions apply with these castings as those detailed earlier.

Other Castings

As to the wide variety of other equipment manufactured at Erith and the types of metal used in their pouring, the soft cylinder iron of silicon content 1.6 per cent., phosphorus content 0.5 per cent. is used for such items as oil-cooler shells, which have to be hard enough to withstand wear but soft enough to allow for contraction without cracking. A medium cylinder iron 1.3 to 1.4 per cent. silicon, 0.4 per cent. phosphorus is used for casting governor bearing-pedestals, valves, pistons and toggles, and white, hard-cylinder iron 1 to 1.1 per cent. silicon, 0.3 per cent. phosphorus is used for grizzley discs for the screens, inlet trunnions, nozzles and liners. Besides these mixtures, another hard-cylinder iron is made for pouring the anti-braze tubes for conveyor idler-pulleys. It has a silicon content of 0.8 to 0.9 per cent. with the phosphorus around 0.2 per cent.

A further mixture of this kind reserved for liner plates for the interiors of crushing drums in ball mills and coal-crushing plants, consists of a metal having a composition 0.5 to 0.6 per cent. silicon, and 0.2 per cent. phosphorus. This is the hardest iron used in the foundry, except for "Diamite," which has a Brinell hardness of over 600 and is used for sand-pump shells, suction sealing-rings and pump liners. On every type of iron used during the day's pouring two samples are taken for analysis, one from the ladle and one from the test-bar after breaking, and mixtures used each day are based on the analysis of the previous day's metal.

Two hundred people are employed in the foundry, a dozen of whom are women employed in the making of small cores. Every effort is made to ensure the well-being of employees, and up-to-date and well-appointed washing shower-baths and changing rooms are installed. In addition there are individual lockers for each member of the staff and a separate, comfortable rest room. All of these amenities are kept in order by a full-time attendant.

THE FLOW OF INDUSTRY into new towns was not satisfactory, except in two cases, and he appealed to industrialists to investigate thoroughly the advantages that might accrue to them in the new towns, said Mr. E. Marples, Parliamentary Secretary to the Ministry of Housing and Local Government, in the course of the second reading of the New Towns Bill.

Imports and Exports of Iron and Steel in May

The following tables, based on Board of Trade returns, give figures of imports and exports of iron and steel in May. Figures for the same month in 1952 are given for the purpose of comparison, and totals for the first five months of 1952 and 1953 are also included. (All figures in tons.)

Total Exports of Iron and Steel and Destination.

Destination.	Month ended May 31.		Five months ended May 31.	
	1952.	1953.	1952.	1953.
Channel Islands	834	511	3,150	2,813
Gibraltar	174	155	509	957
Malta and Gozo	398	352	1,051	1,564
Cyprus	783	883	2,220	5,762
Sierra Leone	316	704	2,219	2,960
Gold Coast	1,140	2,961	13,645	20,667
Nigeria	3,137	4,150	18,773	26,309
Union of South Africa	13,186	6,477	63,020	66,756
Northern Rhodesia	3,248	1,562	12,959	11,825
Southern Rhodesia	4,463	5,166	20,703	27,054
Tanganyika	1,766	1,639	9,398	8,552
Kenya	4,100	7,240	19,789	33,541
Uganda	297	402	3,314	3,275
Mauritius	614	942	2,474	3,918
Bahrein, Qatar, and Trucial Oman	1,788	3,604	7,596	13,547
Kuwait	668	3,963	7,624	13,997
India	6,015	6,264	31,035	32,927
Pakistan	8,345	2,615	32,990	15,972
Malaya	7,338	5,753	34,770	32,086
Ceylon	2,415	2,389	10,331	11,190
North Borneo	408	373	1,445	2,785
Hongkong	2,976	4,111	8,741	15,415
Australia	23,035	12,225	144,125	82,952
New Zealand	15,088	13,088	60,545	59,144
Canada	21,504	19,167	80,340	76,954
Jamaica	4,234	1,616	12,988	9,008
Trinidad	6,696	2,494	22,027	18,213
British Guiana	563	606	2,278	3,072
Anglo-Egyptian Sudan	2,739	2,520	7,700	12,988
Other Commonwealth	4,310	4,918	13,314	31,011
Irish Republic	6,463	3,909	28,021	23,759
Soviet Union	—	—	37	4
Finland	6,037	2,079	29,093	13,660
Sweden	14,923	7,777	52,157	35,269
Norway	6,372	5,643	27,722	28,123
Iceland	383	346	1,468	1,266
Denmark	7,392	8,481	40,350	39,527
Poland	32	84	81	226
Western Germany	94	2,502	605	5,489
Netherlands	10,250	11,038	41,164	62,771
Belgium	831	2,511	3,599	10,169
France	174	1,869	1,090	5,310
Switzerland	1,082	1,059	4,025	4,322
Portugal	936	2,222	4,133	7,758
Spain	1,530	485	3,208	2,559
Italy	514	5,167	6,472	21,655
Austria	132	166	292	612
Yugoslavia	109	129	2,446	1,509
Greece	306	233	1,715	1,779
Turkey	838	2,176	3,727	6,222
Netherlands Antilles	1,783	472	5,813	5,144
Belgian Congo	271	175	1,444	1,049
Angola	251	1,710	2,146	3,711
Portuguese E. Africa	745	345	2,211	1,781
Canary Islands	55	44	427	322
Syria	276	171	1,005	675
Lebanon	1,688	748	7,348	3,348
Israel	2,194	270	7,760	3,315
Egypt	2,539	1,582	14,570	12,718
Saudi Arabia	657	382	2,697	1,363
Iraq	5,111	6,826	21,736	29,283
Iran	274	425	4,606	1,924
Burma	1,368	2,184	5,869	9,446
Thailand	781	745	3,847	5,753
Indonesia	2,291	2,105	7,090	7,063
China	—	76	8	163
Philippine Republic	567	711	2,160	1,373
U.S.A.	5,471	9,828	22,863	23,765
Cuba	315	460	1,033	2,018
Colombia	325	796	2,421	4,087
Venezuela	2,515	4,878	19,480	24,522
Ecuador	351	408	1,969	1,492
Peru	779	621	4,244	3,717
Chile	424	179	1,966	1,189
Brazil	3,418	150	11,718	1,592
Uruguay	506	180	2,897	540
Argentina	3,692	630	18,033	6,028
Other foreign	2,725	2,671	9,986	10,195
TOTAL	242,348	217,188	1,089,834	1,086,779

Total Imports of Iron and Steel and Origin.

From	Month ended May 31.		Five months ended May 31.	
	1952.	1953.	1952.	1953.
India	71	3	226	128
Canada	14 892	3,379	27,813	50,502
Other Commonwealth countries and the Irish Republic	526	7,109	2,114	44,718
Sweden	2,392	1,333	11,797	8,411
Norway	4,219	4,780	27,445	24,802
Western Germany	7,853	13,121	40,043	22,173
Netherlands	13,314	15,228	57,843	53,031
Belgium	31,552	15,367	125,141	111,643
Luxembourg	19,009	11,504	64,943	58,487
France	18,626	20,976	102,626	136,695
Italy	370	7,124	2,845	12,812
Austria	24,237	37,077	47,273	175,821
Japan	17,280	12,403	57,480	55,112
U.S.A.	113,954	3,534	246,164	96,352
Other foreign countries	471	4,059	2,839	26,426
TOTAL	269,666	157,057	827,592	883,113
Iron and steel scrap and waste, fit only for the recovery of metal—	48,936	72,305	209,008	313,668

Exports of Iron and Steel by Products.

Product.	Month ended May 31.		Five months ended May 31.	
	1952.	1953.	1952.	1953.
Pig-iron	511	316	1,633	2,519
Ferro-tungsten	1	3	76	24
Other ferro-alloys	278	192	1,704	1,142
Ingots, blooms, billets, and slabs	15	54	156	214
Iron bars and rods	324	182	1,650	961
Wire rods	178	1,227	568	5,203
Bright steel bars	987	1,299	5,382	7,193
Alloy steel bars and rods	1,417	1,633	6,743	7,259
Other steel bars and rods	10,275	8,708	48,366	45,064
Angles, shapes, and sections	15,031	10,346	58,936	53,179
Iron and other castings and forgings	1,702	2,023	5,658	5,902
Girders, beams, joists, and pillars (rolled)	4,223	2,266	16,525	10,133
Hoop and strip	4,306	7,639	22,384	23,536
Iron plates and sheets	4	9	223	171
Tinplate	29,748	25,462	129,256	115,434
Tinned sheets	180	146	666	686
Terneplates and decorated tinplates	74	90	340	526
Other steel plate (⅛ in. thick and over)	27,992	18,399	105,619	98,980
Galvanized sheets	6,154	9,190	27,568	41,794
Black sheets	14,184	17,722	60,443	61,917
Other coated plates and sheets	508	707	4,438	4,462
Cast-iron pipes up to 6 in. dia.	8,488	7,246	38,410	35,193
Do., over 6 in. dia.	5,054	5,302	27,180	29,640
Wrought-iron tubes	41,619	35,098	185,915	186,357
Railway material	16,153	17,583	85,565	108,108
Wire	4,799	4,897	23,519	23,989
Cable and rope	3,415	2,819	13,255	14,502
Wire nails, etc.	1,096	1,586	4,981	6,348
Other nails, tacks, etc.	1,016	674	5,229	3,428
Rivets and washers	549	314	2,726	2,089
Wood screws	366	157	1,863	937
Bolts, nuts, and metal screws	2,265	1,600	11,303	8,492
Baths	1,096	229	8,164	1,673
Anchors	914	790	4,556	4,619
Chains, etc.	838	759	4,634	4,001
Springs	613	367	2,706	2,233
Holloware	8,819	8,238	40,239	44,572
Doors and windows	1,938	1,778	9,078	8,771
TOTAL, including other manufactures not listed above	242,348	217,188	1,089,834	1,086,779

Personal

LT.-COL. R. F. GALBRAITH has been elected president of the Institution of Structural Engineers for 1953-54.

MR. J. R. C. JOHNSON has been appointed manager of the contracts division of the Marconi International Marine Communication Company, Limited, London, W.C.2.

MR. D. H. DAVIES, organizer in the north-east area, has been appointed to succeed MR. HARRY DOUGLASS as assistant general secretary of the Iron and Steel Trades Confederation.

SIR RODERICK HILL, Rector of the Imperial College of Science and Technology, London, since 1948, has been elected Vice-Chancellor from September 1 for the university year 1953-54.

PROFESSOR A. J. MURPHY, professor of Industrial Metallurgy, Birmingham University, has been appointed director of the combined Departments of Metallurgy and Industrial Metallurgy.

MR. J. JENKINS has joined the staff of the Belmos Company, Limited, electrical engineers, of Bellshill (Lanarkshire), and will be concerned with flameproof and industrial control gear sales in the Scottish area.

MR. LEWIS CHAPMAN, managing director of William Jessop & Sons, Limited, steelmakers, founders, etc., of Sheffield, has been re-elected to the East Midland Gas Consultation Council to represent commerce and industry.

THE INSTITUTION OF LOCOMOTIVE ENGINEERS have awarded their Institution's Gold Medal (their highest award) to Mr. R. A. Riddles, C.B.E., member for mechanical and electrical engineering, of the Railway Executive, for outstanding services in the advancement of locomotive engineering.

To succeed MR. J. H. JOLLY, who is soon to give up the chairmanship of Guest, Keen & Nettlefolds, Limited, the directors have appointed MR. KENNETH SWIFT PEACOCK. Mr. Jolly will continue to hold a seat on the Board. Mr. Peacock has spent the whole of his professional life with the companies he will now head. He was appointed a managing director of Guest Keen & Nettlefolds in 1936 and became deputy chairman three years ago.

PROFESSOR ARNOLD TUSTIN, professor of Electrical Engineering at Birmingham University, has received an invitation from the Massachusetts Institute of Technology to accept an appointment to the Webster Chair of Electrical Engineering from October 1, 1953, to May, 1954. He has been granted leave from Birmingham University for that period. Professor Tustin was with Metropolitan-Vickers at Sheffield for many years before going to Birmingham University, in 1947. Between 1934 and 1937, he was a consulting engineer in Moscow Dynamo Works, engaged chiefly on projects for the electrification of Russian main-line railways. In America, his work will be principally concerned with experiments in the field of heavy-current electrical machines.

MR. NORMAN L. GOODCHILD has been appointed managing director of Cowlishaw Walker (London), Limited, 17, Victoria Street, London, S.W.1, the London office of Cowlishaw Walker & Company, Limited, engineers and ironfounders, of Biddulph, Stoke-on-Trent. Before his appointment he was raw materials officer of the British Iron and Steel Federation. He was previously general manager of the B.I.S.C. (Ore), Limited, and from 1939 to 1946 director for pig-iron and an assistant controller of Iron and Steel in the Ministry of Supply. He was one of the technical advisers accompanying the European Mission to America, headed by Sir Oliver Franks, in 1947, in connection with the Marshall Plan. Before the war he was on the staff of the Stanton Ironworks Company, Limited. He has been a member of the Institute of British Foundrymen since 1934.

Metro-Vick., Appointment

Metropolitan-Vickers Electrical Company, Limited, announce that Willis Jackson, D.SC., D.PHIL., F.R.S., M.I.E.E., was appointed director of research and education on July 1, 1953; he has also joined the Board of the company. Dr. Jackson's appointment releases Dr. Dannatt for an extension of his present duties as assistant managing director. Dr. Jackson has been professor of Electrical Engineering at the Imperial College of Science and Technology, University of London, since 1946. He was educated at Burnley Grammar School and Manchester University, and after lecturing in electrical engineering at Bradford Technical College he went to Metropolitan-Vickers as a college apprentice in 1929. Following a further period of lecturing at the Manchester College of Technology, he carried out research work for three years in the engineering laboratories at Oxford and then returned to Metropolitan-Vickers as a research engineer. In 1938, he was appointed professor of Electrotechnics at Manchester, a position that he continued to hold until his transfer to the Imperial College in 1946. Among his many other activities, Dr. Willis Jackson is a member of the Scientific Advisory Council of the Ministry of Supply, of the Scientific Grants Committee and Radio Research Board of D.S.I.R., and the technology committee of the University Grants Committee. He is also a member of Council of the Institution of Electrical Engineers and has read a number of papers before the Royal Society and other learned institutions.

Non-ferrous Metal Outlook

In his presidential address at the annual meeting of the British Non-Ferrous Metals Federation in Birmingham, Mr. H. E. Jackson referred to serious price declines in raw materials which, following decontrol, may extend to copper when private dealings are resumed early next month. Mr. Jackson said that great industries have become the playthings of politics and that bedevils an industrial community, which should have its whole energy concentrated on the task of running itself competitively in a fiercely-competitive world. He added that, against a background of current production of raw materials exceeding requirements, and with the price trends affecting the free metals, there was little wonder that customers had been holding off. Copper was about £50 a ton in 1939 and still only £62 at the end of the war. During last year it reached £287 a ton.

Whether the price of copper would follow that of other metals on the reopening of the Metal Exchange was a matter of opinion. Customers thought it might. Mr. Jackson urged that they should not accept for a moment the suggestion that the Metal Exchange was incapable of reflecting in price the true position of supply and demand for metals in Europe. What mattered was that the prices set by the Exchange for marginal dealings provided the standard on which much larger tonnages passed between buyer and seller outside the Exchange.

News in Brief

"GALA DAY" held recently by the Athletic and Social Club of British Insulated Callender's Cables, Limited, at Erith Works, Kent, was attended by over 4,000.

ON THE COMPLETION of its relining, the No. 3 blast furnace of the Workington Iron & Steel Company Branch of the United Steel Companies, Limited, has been relit.

SOUTH SHIELDS CORPORATION is to sell 7,370 sq. yds. of land for £4,500 at Templetown, South Shields, to Charles W. Taylor & Son, Limited, ironfounders, for proposed foundry extensions.

A CONTRACT will be let shortly for the construction of railway sidings in connection with proposed factory additions at Team Valley, Gateshead, for the Huwood Mining Machinery Company, Limited.

BECAUSE OF A SHARP RISE in buildings costs, the Pacific Steam Navigation Company, Limited, has cancelled an order with Greenock Dockyard Company, Limited, for a cargo passenger steamer of 11,100 tons d.w.

THE FIRST CARGO of iron ore from the newly developed deposits in French New Guinea arrived in the Tees recently from Conakry. The Italian vessel Caprara is also discharging 10,400 tons of Malayan ore.

THE BELGO-LUXEMBOURG UNION exported 409,242 metric tons of iron and steel in March, compared with 353,001 tons in February, when there was a substantial fall in exports. The first quarter's total of 1,198,135 tons compares with 1,368,983 tons in the corresponding period of 1952.

IT IS ANNOUNCED that William Baird & Company, Limited, B.I.S.C. (Ore), Limited, Powell Duffryn, Limited, and W. C. Pitfield & Company, Limited (Montreal), have joined the British Newfoundland Corporation, Limited, which was incorporated in St. John's, Newfoundland, on April 17.

IN A NEW TRADE AGREEMENT, operative for one year, between Norway and Western Germany, Norway is to increase her export of iron ore from 450,000 tons last year to 850,000 tons. German exports will include 60,000 tons of rolled products and 125,000 tons of coal and coke, raised from 112,000 tons last year.

INDUSTRIALISTS and trade-union officials are among those in the North-east invited by the North-East Development Association to join an advisory committee to give more publicity to the North-east, because, the Association feels, the area and its products are insufficiently known to buyers at home and abroad.

DEALINGS were expected to begin on Monday on the London and Birmingham Stock Exchanges in the shares of the Metal Products Company (Willenhall), Limited, copper refiners and manufacturers of high-grade non-ferrous metal alloys. The company has an issued capital of £223,735 divided into 5s. shares, all of one class.

FIVE SHIPS (three tankers, a cargo ship and a cargo liner) representing 50,000 gross tons are due for launching on the Tyne during July. These will bring the Tyne's output for the first seven months of this year to 17 vessels of 158,000 gross tons compared with 15 vessels of 92,000 tons in the corresponding period of last year.

THE GROUP TRADING PROFIT of Allied Ironfounders, Limited, for the year ended March 31, 1953, amounted to £1,484,338 compared with £2,077,989 last year. Net profits after deducting for depreciation, directors' fees, etc., was £1,364,495 (£1,801,377); taxation absorbed £731,523 (£1,078,618), leaving available for reserves and dividends £632,972 (£722,759).

THE FIRST of over 100 productivity committees envisaged for the country has been set up in Glasgow. There was an inaugural meeting on July 3, with Mr. J. Malley, a director of the Mirrlees Watson Company, Limited, presiding, and members received a message of good wishes from the Earl of Home, Minister of State, who said he was glad that in this matter Scotland was leading the way.

THE INSTITUTE OF INDUSTRIAL SUPERVISORS is staging at Dillington House, near Taunton, from September 3 to September 10 a summer school for foremen. The school will include three of the Institute's short residential courses and the programme is designed so that each of these courses may be taken separately if desired. Details are available from Bank Chambers, 47, Temple Row, Birmingham, 2.

PUDDLING at the Netherton, Dudley, works of Noah Hingley & Sons is still carried on the same way as it was in 1828 when the trade was first introduced to the Black Country, but since it is now becoming increasingly difficult to recruit puddlers, the firm believes it may soon have to revise production methods. At present the firm has enough puddlers, but some are nearing retiring age and few youngsters will accept this kind of craft training. It is on record that in 1870 there were over 2,000 puddling furnaces in the Dudley area; to-day there are only about 20.

PROFESSOR H. S. KIRKALDY, Professor of Industrial Relations, Cambridge University, was chairman of a conference on personnel management and human relations in industry held last month (June 27 to 28) at Queen's College, Cambridge. The conference was convened by the personnel management branch of the Ministry of Labour in conjunction with the Institute of Personnel Management. Among the speakers were Sir Hugh Beaver, chairman of the British Institute of Management; Mr. R. M. Currie, head of the work-study department of Imperial Chemical Industries, Limited; Mr. J. R. Armstrong, chief education officer of Joseph Lucas, Limited (who was also leader of the Anglo-American Productivity Council Team on supervisory training) and Mr. E. Fletcher, head of the production department of the Trades Union Congress.

Sequel to Climbing Escapades

"Satisfactory," was the hospital staff's report on the condition of Percy Hammond (aged 57), of Friston Street, Ladywood, Birmingham, who is in Coventry and Warwickshire Hospital, with injuries suffered when he fell from the roof of the Coventry foundry of Holbrooks, Limited. It was only the previous Monday that Hammond admitted to the Birmingham Stipendiary that he was the man responsible for a number of roof-climbing "practical jokes" in the city. He had been caught fixing a red, white and blue umbrella on the roof of Ladywood Police Station on Coronation day, and confessed to have climbed church steeples and to placing an effigy on the chimney stack of the Children's Hospital.

He fell from the Coventry roof last Wednesday night, when engaged in cleaning operations, and suffered a fractured pelvis, fractured leg and facial injuries. As ambulance men were taking him to hospital he said: "Just think that I should fall when working 30 ft. up, when I've been up hundreds of feet just for a joke."

Raw Material Markets

Iron and Steel

Although the foundry trades generally are not receiving anywnere near sumcient business to keep all plant working to capacity, a satisfactory feature is that increased business for castings has been placed with some of the engineering foundries by the motor-vehicle industry, following the improvement in the export trade. These foundries now appear to be more favourably employed, and those providing castings for machine-tool makers, the heavy electrical trades, steelworks, and collieries are also fairly well placed for orders. The demand from these foundries for the low- and medium-phosphorus irons and for hematite has shown some expansion, but outputs of these grades are so limited that some producers find it difficult to supply increased quantities. In the case of hematite pig-iron, the shortage in home supplies is being relieved by imported iron, which has been very helpful to the foundries and has enabled them to overcome to a large extent a difficult home supply position.

Although most of the engineering and speciality foundries are limited in their outputs by the amount of work on hand, the difference in the present supply and demand of the low- and medium-phosphorus grades of pig-iron is so narrow that it would be difficult, if not impossible to meet any appreciable increase in the calls on the furnaces.

The light and some of the jobbing foundries are unable to report any general improvement in their trade, which can be gauged by the reduced demand for high-phosphorus pig-iron. Work in many instances is still confined to four days a week and it is difficult for many of them with the present state of their order-books to keep up this rate of working. There is keen competition for any business which arises and some foundries are unable to face the cut prices which are being quoted in order to keep plants in production.

Scrap supplies are adequate, particularly light scrap, and the foundries only appear to be interested in heavy cast-iron and machinery scrap. Foundry coke, ganister, limestone, and firebricks are equal to requirements.

Somewhat easier conditions are developing in regard to supplies of steel semis. Slackness in the tinplate industry has released certain quantities of steel from the South Wales area which has operated to the advantage of the re-rolling industry. Sheet bars, slabs, and, to a limited extent, billets also, are now more freely available from home sources, and it should be possible to reduce considerably the purchase of foreign material during the remainder of the year.

The system of dual pricing in the steel trade has not been abandoned, but a reduction of £7 per ton in the export price of joists, beams, etc., is the first step in that direction. It may also be regarded as an indication of more resolute efforts to increase British exports of finished steel, which during the past six months have not reached expected proportions. Rollers of heavy steel products have substantial bookings and the capacity of the plate mills is overtaxed. On the other hand, the home market for light sheets has taken a quieter turn, which has only been concealed by the placing of transatlantic orders.

Non-ferrous Metals

After all, the reduction to the consumer in the price of aluminium proved to be more than the £6 per ton announced by the Minister of Materials, for, as reported in our last issue, the Canadian producers decided to bring down their selling limit to £150. The full drop has therefore amounted to £11, which is certainly a satisfactory reduction; it should do something to encourage demand, which has not been any too good for some time now. This £11 reduction in aluminium may be said to have set the pattern for copper, and doubtless we shall find, when trading begins on August 4 next, that the value will be lower than it is to-day, but not so much lower as was thought a few weeks ago when sentiment was decidedly bearish about the prospects. People are now beginning to realize that, initially, the Government is likely to be the only seller, of cash at any rate, and that, whatever may be the forward quotation, the cash price is likely to be based on 30 cents f.a.s. New York, which might give an equivalent of, say, £245 c.i.f. U.K.

Much—everything perhaps— depends on the trend of events in the United States, where the price keeps very steady. But July and August are holiday months when demand falls off and the price may well decline also. Moreover, it is evident from the daily quotations on the Commodity Exchange what view the market takes of forward values. These are quoted at a considerable discount and London is likely to follow this trend.

The tin restriction talks at Brussels between members of a working party of the International Tin Study Group have ended and the governments concerned have been asked to say by mid-August whether they agree that the Geneva tin conference, held in 1950, should again meet for discussions. In some quarters it is felt that it might prove feasible to operate a tin restriction scheme from early next year. Many interests are, of course, involved and it is not going to be easy to satisfy every point of view, but it must be remembered that but for stockpiling by the United States there would be a considerable excess of tin.

The following official tin quotations were recorded:—

Cash—July 2, £652 10s. to £655; July 3, £635 to £637 10s.; July 6, £625 to £627; July 7, £620 to £622 10s.; July 8, £612 10s. to £615.

Three Months—July 2, £650 to £652 10s.; July 3, £630 to £632 10s.; July 6, £622 10s. to £625; July 7, £615 to £617 10s.; July 8, £610 to £612.

Official zinc prices were:—

July—July 2, £72 5s. to £72 12s. 6d.; July 3, £72 12s. 6d. to £72 15s.; July 6, £72 to £72 5s.; July 7, £72 5s. to £72 10s.; July 8, £72 5s. to £72 7s. 6d.

October—July 2, £72 5s. to £72 10s.; July 3, £72 10s. to £72 15s.; July 6, £72 5s. to £72 10s.; July 7, £72 5s. to £72 10s.; July 8, £72 5s. to £72 10s.

Official prices of refined pig-lead were as follow:—

July—July 2, £92 to £92 10s.; July 3, £91 to £92; July 6, £91 to £91 10s.; July 7, £90 to £90 10s.; July 8, £91 to £91 5s.

October—July 2, £89 to £89 10s.; July 3, £88 5s. to £88 10s.; July 6, £88 5s. to £88 10s.; July 7, £88 to £88 5s.; July 8, £88 10s. to £88 15s.

Conference Aftermath. At the final session of the recent Blackpool conference of the Institute of British Foundrymen on Thursday afternoon (June 18), Session E, the reporter was not able to secure all the names of speakers contributing to the discussion. To help in publishing a correct version, it would be appreciated if contributors at this session would send their names to the Editor, FOUNDRY TRADE JOURNAL, 49, Wellington Street, London, W.C.2, along with a brief note of the topic raised, so as to identify themselves against the reporter's notes. This particularly applies to Paper 1070 on pressure feeding and the films on dust suppression at grinding machines.

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

(Delivered unless otherwise stated)

July 8, 1953

PIG-IRON

Foundry Iron.—No. 3 Iron, Class 2:—Middlesbrough, £13 18s.; Birmingham, £13 11s. 3d.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent. P, £16 14s. 6d., delivered Birmingham. Staffordshire blast-furnace low-phosphorus foundry iron (0.10 to 0.50 per cent. P, up to 3 per cent. Si), d/d within 60 miles of Stafford, £17 0s. 3d.

Scotch Iron.—No. 3 foundry, £16 11s., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £18 3s.; South Zone, £18 5s. 6d.

Refined Malleable.—P, 0.10 per cent. max.—North Zone, £19 3s.; South Zone, £19 5s. 6d.

Hematite.—Si up to 2½ per cent., S. & P. over 0.03 to 0.05 per cent.:—N.-E. Coast and N.-W. Coast of England, £16 12s.; Scotland (Scotch iron), £16 18s. 6d.; Sheffield, £17 13s.; Birmingham, £17 19s. 6d.; Wales (Welsh iron), £16 18s. 6d.

Basic Pig-iron.—£14 6s. 6d. all districts.

FERRO-ALLOYS

(Per ton unless otherwise stated, delivered).

Ferro-silicon (6-ton lots).—40/55 per cent., £53 10s., basis 45 per cent. Si, scale 21s. 6d. per unit; 70/84 per cent., £82 10s., basis 75 per cent. Si, scale 23s. per unit.

Ferro-vanadium.—50/60 per cent., 23s. 8d. to 25s. per lb. of V.

Ferro-molybdenum.—65/75 per cent., carbon-free, 10s. to 11s. 6d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., carbon-free, £204 to £210 per ton; 38/40 per cent., £235 to £265 per ton.

Ferro-tungsten.—80/85 per cent., 21s. 10d. to 22s. 6d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 24s. 8d. to 27s. per lb. of W.

Ferro-chrome (6-ton lots).—4/6 per cent. C, £85 4s., basis 60 per cent. Cr, scale 28s. 3d. per unit: 6/8 per cent. C, £80 17s., basis 60 per cent. Cr, scale 26s. 9d. per unit; max. 2 per cent.C, 2s.2d. per lb. Cr; max. 1 per cent. C, 2s. 2½d. per lb. Cr; max. 0.15 per cent. C, 2s. 3½d. per lb. Cr; max. 0.10 per cent. C, 2s. 3¾d. per lb. Cr; max. 0.06 per cent. C, 2s. 4d. per lb. Cr.

Cobalt.—98/99 per cent., 20s. per lb.

Metallic Chromium.—98/99 per cent., 6s. 5d. to 7s. 6d. per lb.

Metallic Manganese.—93/95 per cent., carbon-free, £262 to £275 per ton; 96/98 per cent., £280 to £295 per ton.

Ferro-columbium.—60/75 per cent., Nb + Ta, 40s. to 70s. per lb., Nb + Ta.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—Basic: Soft, u.t., £25 12s. 6d.; tested, 0.08 to 0.25 per cent. C (100-ton lots), £26 2s. 6d.; hard (0.42 to 0.60 per cent. C), £28; silico-manganese, £33 16s. free-cutting, £28 16s. 6d. Siemens Martin Acid: Up to 0.25 per cent. C, £32 12s.; case-hardening, £33; silico-manganese, £34 17s. 6d.

Billets, Blooms, and Slabs for Forging and Stamping.—Basic, soft, up to 0.25 per cent. C, £29 16s.; basic, hard, over 0.41 up to 0.60 per cent. C, £30 16s.; acid, up to 0.25 per cent. C, £33.

Sheet and Tinplate Bars.—£25 11s. 6d.

FINISHED STEEL

Heavy Plates and Sections.—Ship plates (N.-E. Coast), £30 6s. 6d.; boiler plates (N.-E. Coast), £31 14s.; floor plates (N.-E. Coast), £31 15s. 6d.; heavy joists, sections, and bars (angle basis), N.-E. Coast, £28 9s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., untested, £32 4s. 6d.; flats, 5 in. wide and under, £32 4s. 6d.; hoop and strip, £32 19s. 6d.; black sheets, 17/20 g., £41 6s.; galvanized corrugated sheets, 24 g., £49 19s. 6d.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £51 14s. 3d.; nickel-chrome, £73 3s. 6d.; nickel-chrome-molybdenum, £80 18s. 3d.

Tinplates.—57s. 9d. per basis box.

NON-FERROUS METALS

Copper.—Electrolytic, £252; high-grade fire-refined, £251 10s.; fire-refined of not less than 99.7 per cent., £251; ditto, 99.2 per cent., £250 10s.; black hot-rolled wire rods, £261 12s. 6d.

Tin.—Cash, £612 10s. to £615; three months, £610 to £612; settlement, £612 10s.

Zinc.—July, £72 5s. to £72 7s. 6d.; October, £72 5s. to £72 10s.

Refined Pig-lead—July, £91 to £91 5s.; October, £88 10s. to £88 15s..

Zinc Sheets, etc.—Sheets, 15 g. and thicker, all English destinations, £100 15s.; rolled zinc (boiler plates), all English destinations, £98 10s.; zinc oxide (Red Seal), d/d buyers' premises, £90.

Other Metals.—Aluminium, ingots, £150; magnesium, ingots, 2s. 10½d. per lb.; antimony, English, 99 per cent., £225; quicksilver, ex warehouse, £70 to £70 10s. (nom.); nickel, £483.

Brass.—Solid-drawn tubes, 23½d. per lb.; rods, drawn, 32⅜d.; sheets to 10 w.g., 256s. 3d. per cwt.; wire, 30½d.; rolled metal, 243s. per cwt.

Copper Tubes, etc.—Solid-drawn tubes, 28⅞d. per lb.; wire, 282s. 9d. per cwt. basis; 20 s.w.g., 311s. 9d. per cwt.

Gunmetal.—Ingots to BS. 1400—LG2—1 (85/5/5/5), £160 to £170; BS. 1400—LG3—1 (86/7/5/2), £172 to £190; BS. 1400—G1—1 (88/10/2), £254 to £285; Admiralty GM (88/10/2), virgin quality, £252 to £300 per ton, delivered.

Phosphor-bronze Ingots.—P.Bl, £265 to £295; L.P.Bl, £215 to £240 per ton.

Phosphor Bronze.—Strip, 368s. per cwt.; sheets to 10 w.g., 389s. 9d. per cwt.; wire, 45½d. per lb.; rods, 40½d.; tubes, 38½d.; chill cast bars: solids 3s. 3d., cored 3s. 4d. (C. Clifford & Son, Limited.)

Nickel Silver, etc.—Ingots for raising, 2s. 5¾d. per lb. (7 per cent.) to 3s. 8¾d. (30 per cent.); rolled metal, 3 in. to 9 in. wide × .056, 2s. 11¾d. (7 per cent.) to 4s. 2¾d. (30 per cent.); to 12 in. wide × .056, 3s. to 4s. 3d.; to 25 in. wide × .056, 3s. 2d. to 4s. 5d. Spoon and fork metal, unsheared, 2s. 8¾d. to 3s. 11¾d. Wire, 10 g., in coils, 3s. 6½d. (10 per cent.) to 4s. 8¾d. (30 per cent.). Special quality turning rod, 10 per cent., 3s. 5½d.; 15 per cent., 3s. 11¼d.; 18 per cent., 4s. 4d. All prices are net.

Obituary

THE DEATH is announced from Italy of Dr. Antonio Tucci, the director of Campfond, the foundry employers' federation.

MR. WILLIAM THOMAS ELLISON, of W. T. Ellison & Company, Limited, engineers, brassfounders, etc., of Salford (Lancs), died recently at the age of 86.

MR. WALTER FRASER, cashier for some years of the Furness Shipbuilding Company, Limited, Haverton Hill-on-Tees has died. He had been associated with the company since the yard was first opened in 1918.

THE DEATH occurred last Sunday of MR. CHARLES LE MAISTRE, C.B.E., who at one time was director of the British Standards Institution, in which position he did sterling work in building up this body to its present eminent position.

MR. ARTHUR JOHN FIELD, a directer of Bromford Spring Company, Limited, and previously manager of J. Brockhouse & Company, Limited, spring and axle manufacturers, etc., both of West Bromwich, died recently at the age of 70.

MR. REGINALD ALFRED SIDDONS, who has died at the age of 75, was associated with the firm of J. & J. Siddons, Limited, hollowware manufacturers, West Bromwich, founded by his grandfather, for 54 years as secretary, 48 of them as director. In 1934 Mr. Siddons was chairman of West Bromwich Manufacturers' Association.

MR. WILLIAM DAWSON, 74, a director of Dawson & Downie, Limited, ironfounders and pump-makers, Clydebank, has died from injuries sustained in a road accident. With his brother, Mr. A. Dawson, and the late Mr. W. Downie, the founders of the firm, he built Dawson & Downie from small beginnings to a concern trading with shipowners, sugar refiners, and oil companies all over the world.

MR. H. M. HIBBERD, who died on June 26, aged 61, was a director and works manager of Belling & Company, Limited, Enfield. He was educated at Stafford Grammar School and received his early training with Siemens Brothers. During the first war he served overseas in charge of M.T. workshops, R.A.S.C., and subsequently joined the domestic-appliance works of the General Electric Company, in 1920, with whom he held various positions including that of assistant works manager of the cooker and appliance works in Birmingham. He joined Belling & Company, Limited, as works manager in 1938. He was a member of the Institute of Vitreous Enamellers (to whom he presented a Paper last year), the Institute of British Foundrymen, and the Institute of Works Managers. He was also closely associated with many local organizations and during the second world war served as a major in the Home Guard.

AT BRADFORD CITY COURT last week, a proprietor of a welding concern was fined £8, with 2 gns. costs, for failing to keep his factory clean.

YESTERDAY, C. & L. Hill, Limited, of Stringes Lane, Willenhall, held the opening ceremony of their new sports ground. Mrs. A. G. B. Owen, wife of the chairman of the Owen Organization, and managing director of C. & L. Hill, Limited, performed the ceremony at the works. These grounds have been provided for the recreation of the employees of the firm, and consist of a first-class hard tennis court and a full-size bowling green, with seats for spectators.

CLASSIFIED ADVERTISEMENTS

PREPAID RATES : Twenty words for 5s. (minimum charge) and 2d. per word thereafter. Box Numbers 2s. extra (including postage of replies).

Advertisements (accompanied by a remittance) and replies to Box Numbers should be addressed to the Advertisement Manager, Foundry Trade Journal, 49, Wellington Street, London, W.C.2. If received by first post Tuesday advertisements can normally be accommodated in the following Thursday's issue.

SITUATIONS WANTED

METALLURGIST (28) requires progressive position. Midlands or South. B.Sc., A.I.M., A.M.I.B.F. Several years' senior research experience on cast ferrous metals.—Box 3558, FOUNDRY TRADE JOURNAL.

FOUNDRY FOREMAN MANAGER desires change. 30 years' experience light castings, jobbing, mechanisation, and plate. Energetic, strong disciplinarian. Excellent record.—Box 3598, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT

The engagement of persons answering these advertisements must be made through a Local Office of the Ministry of Labour or a Scheduled Employment Agency if the applicant is a man aged 18-64 *inclusive or a woman aged* 18-59 *inclusive unless he or she, or the employment, is excepted from the provisions of the Notification of Vacancies Order* 1952.

QUALIFIED METALLURGIST required for the control of whiteheart malleable iron production. A person who has experience of gas annealing preferred. —Write giving details of age, training, experience, etc., to Box 3592, FOUNDRY TRADE JOURNAL.

METALLURGIST required for Iron-foundry, West of Scotland. Manufacturing castings up to 20 tons. Must be energetic, able to take full control of laboratory. High duty iron, sand and cupolas. Modern house available.—Write giving full particulars, age and experience, Box 3580, FOUNDRY TRADE JOURNAL.

NATIONAL COAL BOARD invite applications for a superannuable appointment as COAL SUPPLY AND PREPARATION SUPERVISOR at the Central Research Establishment I, Stoke Orchard, near Cheltenham, Glos. Salary on appointment will depend on qualifications and experience, and will be within the grade of Scientific Technical Officer I, scale £730× £25 to £880 per annum.

The selected applicant will be required to supervise supply of all coals to the Establishment and the crushing, screening, and other routine preparations for experimental work. Candidates should have had experience of traffic arrangements and materials handling at ironworks, foundries or other heavy industrial plant, and should have dealt with ordering, purchasing and recording of supplies. Qualifications in Fuel, Engineering or Chemical Technology to Higher National Certificate standard would be an advantage.

Write, giving full particulars (in chronological order) of age, education, qualifications and experience (with dates), to NATIONAL COAL BOARD, Central Research Establishment, Stoke Orchard, near Cheltenham, Glos., marking envelope TT/649. Original testimonials should *not* be forwarded. Closing date: 31st July, 1953.

SITUATIONS VACANT—*Contd.*

FOUNDRY MANAGER required for non-ferrous foundry employing 100 people. Gravity die-casting experience essential.—Reply to Box 3569, FOUNDRY TRADE JOURNAL.

PLANT ENGINEER required. Fully experienced in maintenance of buildings and equipment of modern mechanised foundry and auxiliary Departments. Leeds area.—Box 3588, FOUNDRY TRADE JOURNAL.

ALL-ROUND ENAMELLER required as Night Foreman for large Vitreous Enamelling Department. Must be a good disciplinarian.—Apply in writing giving full particulars as to age, experience and salary required to Personnel Manager, R. & A. MAIN, LTD., Gothic Works, Angel Road, Edmonton, N.18.

FOUNDRY METHODS ENGINEER required in West of Scotland for Modern Steel Foundry operating Electric Furnaces. Applicants should have sound experience of all sides of up-to-date Steel Foundry practice.—Replies, giving full particulars of experience and qualifications, to Box 3571, FOUNDRY TRADE JOURNAL.

FOREMAN PATTERNMAKER, to take charge of Master Patternshop (25 hands) in Croydon area, having a thorough knowledge of production patterns in wood and metal. Applicant must be capable administrator and experienced in control of labour. Send in confidence fullest details of experience and salary required.—Box 3575, FOUNDRY TRADE JOURNAL.

JUNIOR FOUNDRY TECHNICIAN (aged 22-25) required by a large Company in Birmingham for work in connection with a special investigation into core making and shell moulding techniques. The assignment is an interesting one for a young man who has already some experience in a light castings foundry, and presents an opportunity for an insight into foundry methods throughout the industry. —Apply, in strict confidence, giving an indication of salary required, to Box 3582, FOUNDRY TRADE JOURNAL.

METALLURGIST required by a well-known company of Engineer-Founders in the South West Midlands area. To take control of small Physical and Chemical Laboratory (2 assistants), principally conducting routine analytical tests covering the production of quality castings in Iron, Bronze and Nickel Alloys. Some knowledge of steel would be an advantage, but not essential. Full particulars in confidence, stating age, previous experience and salary expected to Box 3573, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT—*Contd.*

TECHNICAL REPRESENTATIVE required to represent an important Ferro-Alloys Manufacturer in the Scottish Area. Only men with intimate knowledge of the principal manufacturing processes in cast iron and steel metallurgy need apply. Preference given to applicants with L.I.M. or A.I.M. qualifications.—Apply, stating age, experience and salary, to Box 3593, FOUNDRY TRADE JOURNAL.

GENERAL MANAGER required for Steel Foundry. Must have thorough knowledge of the trade, and capable of taking complete control. Position permanent and progressive for man with necessary experience and enthusiasm.—Full details of career to date in writing to Box 3581, FOUNDRY TRADE JOURNAL.

ASSISTANT METALLURGIST required (age 20-25) for training in experimental and routine practical metallurgy in Yorkshire Steel Foundry. Must have initiative and preferably technical education and experience.—Full details to Box 3583, FOUNDRY TRADE JOURNAL.

ASSISTANT FOUNDRY MANAGER required in West of Scotland for Modern Steel Foundry operating Electric Furnaces. Applicants should have sound experience of Electric Furnace Melting Plant practice.—Replies, giving full particulars of experience and qualifications, to Box 3570, FOUNDRY TRADE JOURNAL.

WEST YORKSHIRE FOUNDRIES, Sayner Lane, Leeds, require ASSISTANT FOUNDRY METALLURGIST for technical control in iron foundries. Previous experience on cupola control and foundry practice an advantage. Five-day week; canteen facilities.—Apply in writing to CHIEF METALLURGIST.

PATTERNMAKER FOREMAN required for Master Patternshop employing 20 (East Midlands area). Wood and metal patterns.; modern workshop.—Reply, stating age and experience, Box 3596, FOUNDRY TRADE JOURNAL.

WEST of Scotland Foundry requires a qualified FOUNDRY TECHNICIAN with practical foundry experience. Applicant must be capable of working on his own initiative, and capable of developing new foundry technique. Help given with housing.—Full details, which will be treated in confidence, should be addressed to 0175, WM. PORTEOUS & CO., Glasgow.

LIGHT-ALLOY FOUNDRY.—Applications are invited for a SENIOR EXECUTIVE appointment in an important light-alloy foundry. Applicants should be 35/45 years and at present in receipt of four-figure salary; must have wide experience in production of aluminium and magnesium castings by the most modern methods; proved administrative ability and preferably an engineering background.—Box 3530, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT—*Contd.*

PATTERNSHOP SUPERINTENDENT (36 years of age), married, seeks position offering scope for initiative. Fully conversant with the production of medium and heavy engineering castings. Able to estimate and introduce piecework schemes. Specialist in production planning and job control. Travelled extensively overseas as firm's Representative. Established and laid out patternshop employing 40 men on piecework. Past positions held include production engineer, chief rate fixer with firms of repute. At present completing overseas contract. Willing to accept any position allied with the foundry trade. Available from October.—Box 3597. FOUNDRY TRADE JOURNAL.

AGENCIES

FIRST-CLASS AGENT (Commission) required by manufacturers of Colliery Plant (Haulage Gears, Hydraulic Presses, and newly developed Steel Reclamation Plant) for the Cannock, Dudley and Stoke areas of the West Midlands Division.—Full particulars in strict confidence to Box 3576, FOUNDRY TRADE JOURNAL.

MANUFACTURER'S AGENT, University degrees engineering, wide technical, commercial and export experience, seeks first-class agency for London and Home Counties.—Box 3574, FOUNDRY TRADE JOURNAL.

NOTICE

ADVANCED TRAINING FOR THE FOUNDRY INDUSTRY.

THE building of the new Laboratories, Classrooms, etc., for the National Foundry College is nearing completion, and will be available for use during the next session of the College. The College continues to offer facilities for the training of qualified students, for the many executive positions in the founding industry, through its two-year full-time Diploma Course. Students who successfully complete this Course are awarded the National Foundry College Diploma, which has already gained an international reputation.

Applications are invited for admission to the Diploma Course, which opens on 21st September, 1953. Sufficiently qualified candidates may enter directly into the final year.—Individuals and firms in the foundry industry who are interested in advanced foundry training should write for particulars regarding entry qualifications, scholarships, hostel accommodation, etc., to the HEAD, National Foundry College, Wulfruna Street, Wolverhampton.

PROPERTY

MANCHESTER (7 miles), abundant skilled engineering labour. Extensive rail connected Factory/Warehouse. Floor space about 278,000 sq. ft. Undeveloped land approx. 4½ acres. Five electric lifts. Overhead travelling cranes. Fixed foundry equipment, including Cupolas, Core Drying Furnaces, etc. Price £50,000, or near offer. Adjoining buildings providing further 95,000 sq. ft. available if required.

HILLIER PARKER MAY & ROWDEN,
77, Grosvenor Street, W.1.
MAYfair 7666.

PROPERTY—*Contd.*

BIRMINGHAM: Central position. Valuable Freehold Manufactory with Vacant Possession; over 20,000 superficial feet. Spacious intercommunicating ground floor main workshops cover nearly 8,000 superficial feet, together with ancillary workshops, light machine shops, packing room, commodious office accommodation, drawing office and canteen; loading yard, gateway entrance; electric goods lift. Freehold site area 1,563 square yards. For Auction 21st July, 1953, at Birmingham—BRIGHT WILLIS & SON, Chartered Auctioneers, 1 & 2, Waterloo Street, Birmingham. Central 2238.

WILLIAM TAGG & COMPANY, LIMITED,
ENGINEERS & FOUNDERS,
NEWCASTLE-UNDER-LYNE, STAFFS.

EDWARD RUSHTON SON & KENYON are instructed by Harry E. Evans, Esq., F.C.A., the Receiver herein, to OFFER FOR SALE BY AUCTION, on the premises as above, at 11 a.m. prompt, on WEDNESDAY, JULY 22nd, 1953 (unless previously sold by Private Treaty) the INDUSTRIAL PREMISES situate in Sutton Street, Newcastle-under-Lyne, containing a total floor area of about 12,000 sq. ft., mainly of one storey construction, together with the land containing an area of 1,804 5/9 sq. yds. or thereabouts; open storage yard held on an annual tenancy at a rent of £5 0s. 0d.; also dwelling house adjoining the Works let at a weekly rent of 15s.; also the FOUNDRY AND ENGINEERING PLANT AND MACHINERY comprising:—Greens No. 3 Rapid Economic Cupola with linings and motorised blower, new; 30 and 20 cwt. Cupolas; MRV size 4 tilting furnace; 3 Hilltop plate moulding m/cs, types NT5, NT6, NT4; pneumatic jolting moulding m/cs; core blowing m/c; sand mill; Ballard insulated gas core drying oven; core wagons; geared metal ladles; new crucibles; pneumatic rammer; pneumatic turnover stand; c.i., steel and brass moulding boxes; c.i. and non-ferrous metals; moulding powder; pattern timber; lifting tackle, runways and jib crane; fans; tup; crab; Denham 6½ in. AGH, SSSC gap bed lathe; Investa motorised 8½ in. lathe; Smith 8½ in. lathe; Kerry motorised pillar drill; Selson 4 ft. radial drill; Brook 18 in. shaper; 12 in. circular sawbench; metal bandsaws; motorised hacksaws; grinders; dust extractor; Broomwade motorised air compressor type EH220; pneumatic and portable electric drills; Murex electric welder type SCB002; BOC blowpipe; Smiths Hearth; honing spindle 5 ft. by 3 in.; 15,000 cage roller races 1½ in. by 15/16 in.; 25 new ram pumps 240 g.p.h. ½ h.p. single phase; 180 galls. paint; electric motors; electric vacuum cleaner; glazed boarded cabin; Avery weighing machine type 3205ABA; Howden steel desks; filing cabinets; plan drawers; typewriters; safe, time recorder, etc.

Manner of Offering:—(*a*) The Land, Buildings, Plant and Machinery will first be offered as a whole in one lot including Goodwill, and if not sold in that manner then (*b*) The Land and Buildings as a separate lot to be followed by (*c*) Piecemeal Auction Sale of the Plant and Machinery.

On view 9 a.m. to 5 p.m. July 15th, 16th, 17th, 20th and 21st. 9 a.m. to Noon Saturday, July 18th and on morning of sale.

Particulars and Catalogues obtainable from the Auctioneers, 12 York Street, Manchester, 2. Tel.: CENtral 1937-8; Messrs. Morris Gregory & Co., Chartered Accountants, 3, York Street, Manchester, 2. Tel.: DEAnsgate 3207-8; or from Messrs. Sale, Lingards & Co., Solicitors, 29, Booth Street, Manchester, 2. Tel.: DEAnsgate 4084 and 3771.

MACHINERY WANTED

WANTED.—Oil-fired Furnace—Lip Axis Tilting Type. Capacity 10 cwts. aluminium. Hydraulically or mechanically operated. Must be in good condition.—Send price and particulars to Box 3594, FOUNDRY TRADE JOURNAL.

HIGH Frequency Furnace, 5-10 cwts. capacity, complete with electrical gear.

Walker Casting Wheel, or similar.

Conveyor, suitable for handling ingot moulds of various sizes, approximately 25 to 35 ft. long.

Rotary Drier, suitable for Aluminium and Brass turnings.

Reversible Ball Mill, 5-10 cwts./hour.

Electrostatic Dust Collector, 15,000, 20,000 c.f.m. approx.

Box 3559, FOUNDRY TRADE JOURNAL.

WANTED.—Izod Impact Testing Machine. Brinell Hardness Testing Machine.—Box 3585, FOUNDRY TRADE JOURNAL.

MACHINERY FOR SALE

ALBION TWW WORKS

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BMM. RD. 5 JOLT SQUEEZE STRAIGHT DRAW, cap. 1,300 lb. pattn. draw 12 in.; table 48 in. by 30 in.

BMM. HPL. 2 JOLT SQUEEZE STRAIGHT DRAW, cap. 400 lb., pattn. draw 9 in.; table 30 in. by 21 in.

C/WALLWORK ON JOLT SQUEEZE DRAW, cap. 600 lb., pattn. draw 10 in.; max. size boxes 20 in. sq. or 25 in. by 12 in.

C/WALLWORK WT562C JOLT SQUEEZE TURNOVER, cap. 800 lb. pattn. draw 10½ in.; table 35 in. by 24 in.

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2 FT. 6 IN. Cupola. Drop bottom type. 30 cwt. per hr. New and unused.
4 ft. Sand Mill, underdriven.
30-cwt. Geared Crane Ladle. New.
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1-ton Electric Hoist Block, 400/3/50. Fitted with hand geared travelling carriage by Patterson & Hughes. Second-hand, equal to new.

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TILGHMAN SINGLE CYLINDER COMPRESSOR, 5 in. by 6 in. 465 r.p.m. Working pressure 30 lbs. per square inch. Complete with driving motor on base plate. 400/3/50.—FRANK SALT & CO., LTD., Station Road, Blackheath, Staffs.

2-TON ELECTRIC OVERHEAD TRAVELLING CRANE, 3 motor type, 30 ft. span, floor controlled, 400/440/3/50; modern and almost new. Price: £1,190.—FRANK SALT & CO., LTD., Station Road, Blackheath, Staffs.

GAS HARDENING OVEN manufactured by Incandescent Heat Co. for immediate disposal. Hearth 12½ in. high (centre), 18¾ in. wide by 2 ft. 7 in. deep.
GAS CORE OVEN manufactured by Foundry Engineering Co. for immediate disposal. Size of cabinet 6 ft. 4 in. wide by 6 ft. 0 in. high by 3 ft. 4 in. deep. Complete with motor ½ h.p. 400/440-v., 3 ph., 50 c.
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Osborn Jolt Roll-over moulding machine. £225.
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SAND MIXERS and DISINTEGRATORS for Foundry and Quarry; capacities from 10 cwts. to 10 tons per hr.—W. & A. E. BREALEY (MACHINERY), LTD., Misterton, nr. Doncaster. Tel.: Misterton 202.

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NEW 6-ton "Coles" Electric Travelling Hoist Block, fitted with hand geared travelling carriage. 400-440/3/50. Price £385, ex works.
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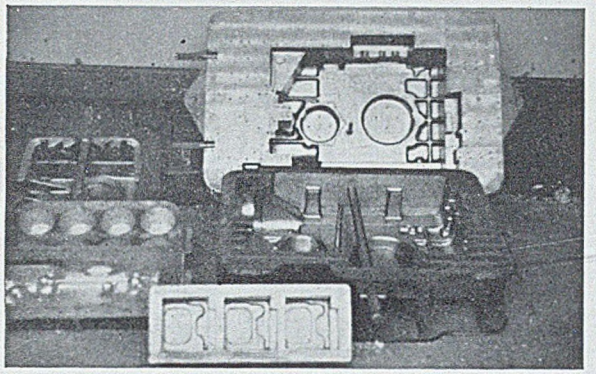

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