FOUNDRY TRADE JOURNAL

EST. 1902

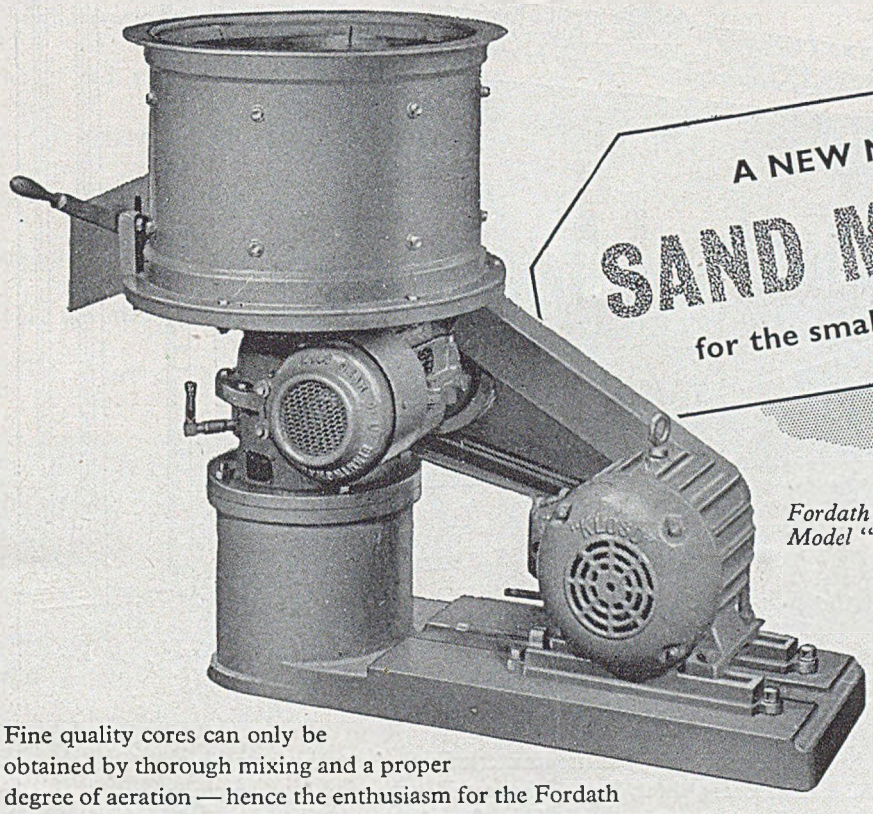
VOL. 90
No. 1801
Registered at the G.P.O. as a Newspaper

WITH WHICH IS INCORPORATED THE IRON AND STEEL TRADES JOURNAL
MARCH 8, 1951
Offices: 49, Wellington Street, Strand, London, W.C.2

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

NEWS

MORE FORDATH IN THE FOUNDRY



A NEW MODEL

SAND MIXER

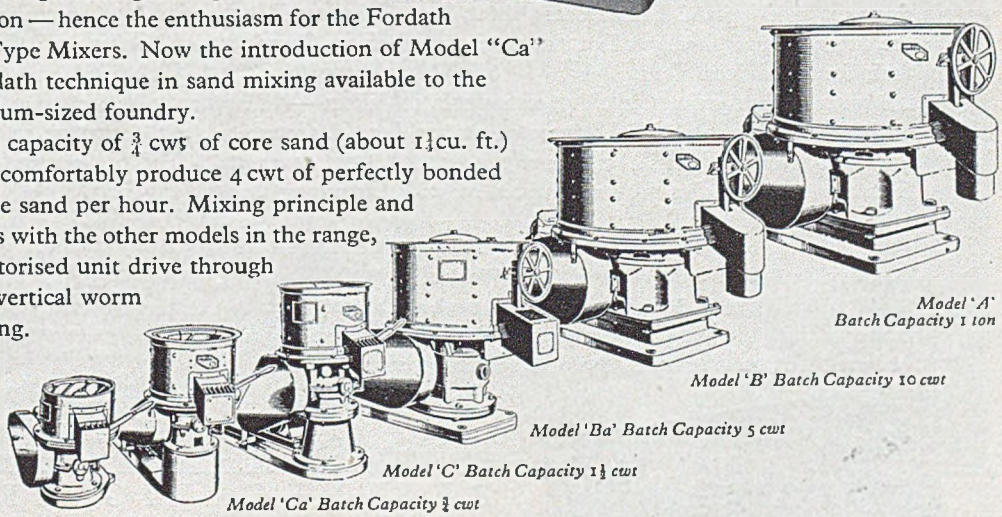
for the smaller core-shop

Fordath New Type Sand Mixer, Model "Ca": Batch capacity ¾ cwt

Fine quality cores can only be obtained by thorough mixing and a proper degree of aeration — hence the enthusiasm for the Fordath range of New Type Mixers. Now the introduction of Model "Ca" makes the Fordath technique in sand mixing available to the small and medium-sized foundry.

With a batch capacity of ¾ cwt of core sand (about 1¼ cu. ft.) this model can comfortably produce 4 cwt of perfectly bonded and aerated core sand per hour. Mixing principle and transmission, as with the other models in the range, consist of a motorised unit drive through V-Pulleys and vertical worm reduction gearing.

THE FORDATH RANGE OF NEW TYPE MIXERS



Model 'A' Batch Capacity 1 ton

Model 'B' Batch Capacity 10 cwt

Model 'Ba' Batch Capacity 5 cwt

Model 'C' Batch Capacity 1½ cwt

Model 'D' Batch Capacity 20lbs

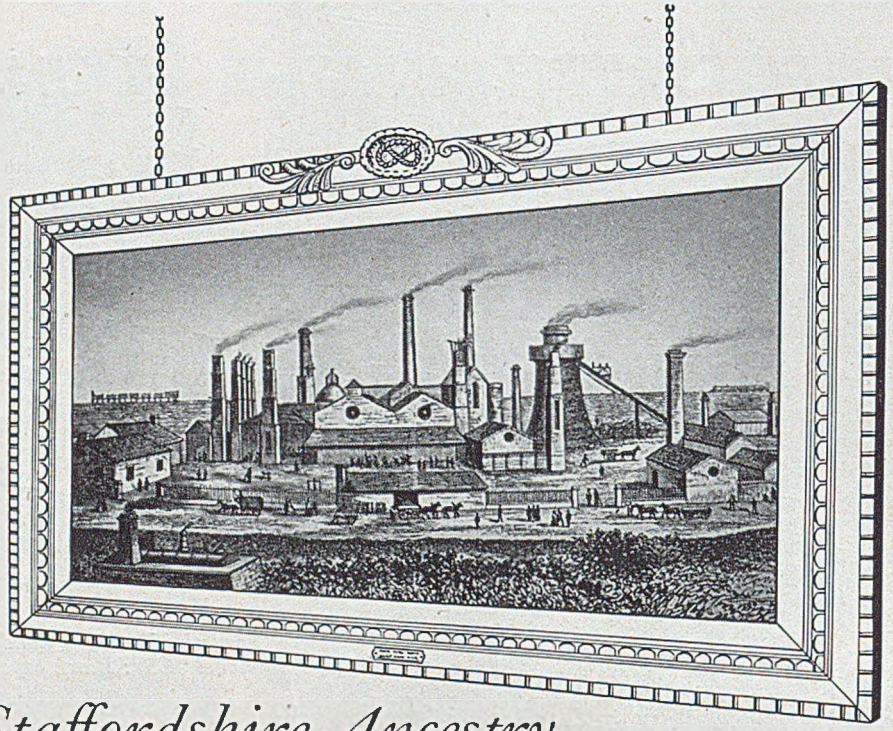
Model 'Ca' Batch Capacity ¾ cwt

SOLE GLYCO CORE OIL COMPOUNDS MAKERS

Detailed information and prices from :

THE FORDATH ENGINEERING CO. LTD. Hamblet Works · West Bromwich · Staffs

Phone : West Bromwich 0549, 0540, 1692 *Grams :* Metallical West Bromwich



Staffordshire Ancestry

Since 1700 almost every major improvement in the technique of iron founding has originated in Staffordshire.

No. 5. STONEFIELD IRON WORKS, BILSTON.

At Bilston, during the nineteenth century, an ironmaster might operate his own blast furnaces, puddling and ball furnaces, sheet, bar and hoop mills and mine his own coal, ore, limestone and fireclay, all on the same ground. Here Chambers and Sankey opened their Stonefield Iron Works.

An historian had written in 1817 of a works at Bilston — "The power of the steam engine and other mechanical improvements are here employed to great advantage in the wielding of ponderous hammers of two or three tons in weight . . . and bars of iron from one to four inches thick are sheared off with astonishing facility."

For the past 136 years Pig Iron has been manufactured at Bradley & Foster's Darlaston Iron Works.
Today, Bradley & Foster's spectrographic control of raw material and finished product enables them to supply pig iron of consistent uniformity to the most exacting specification.

• *Pictorial reference is reproduced by courtesy of the publishers of Samuel Griffiths' "Guide to the Iron Trade of Great Britain" to whom grateful acknowledgment is made.*

Bradley & Foster LIMITED

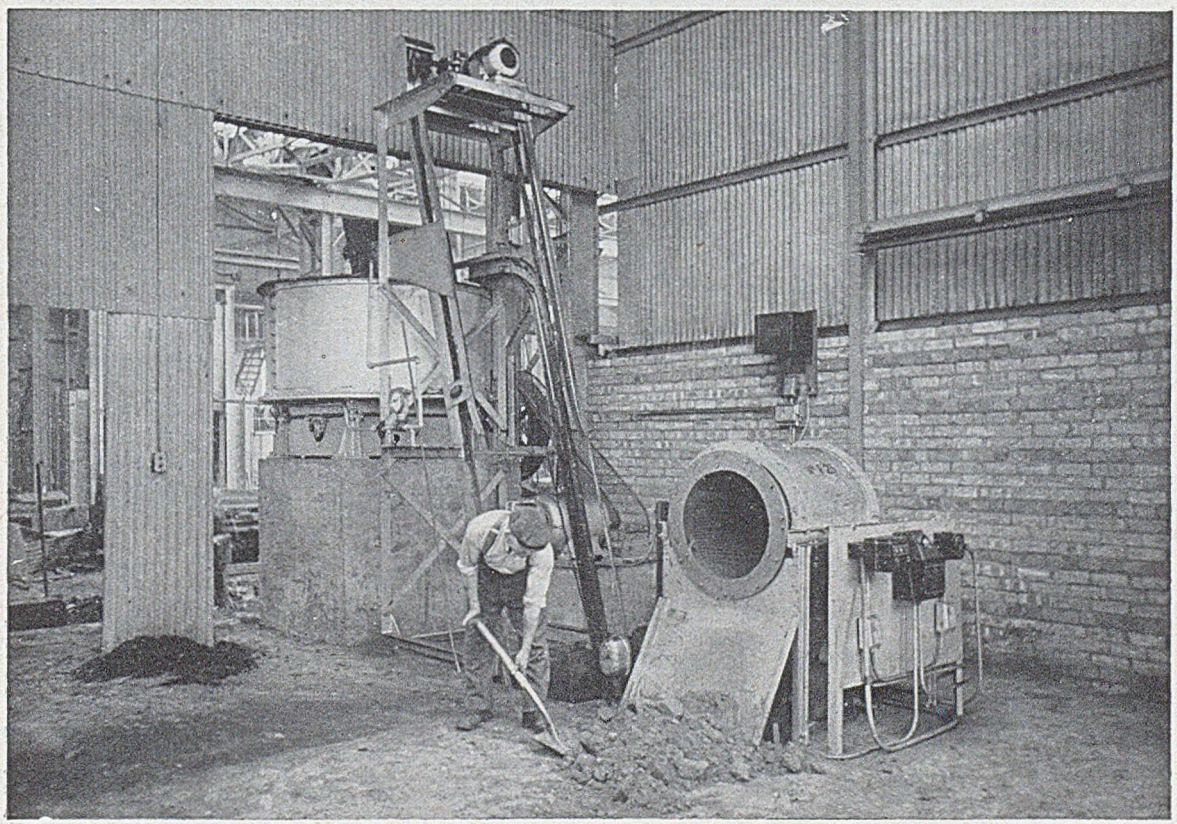
FOR QUALITY CONTROLLED
REFINED PIG IRON

DARLASTON · STAFFORDSHIRE

L.G.B.

PNEULEC *facing sand plant unit*

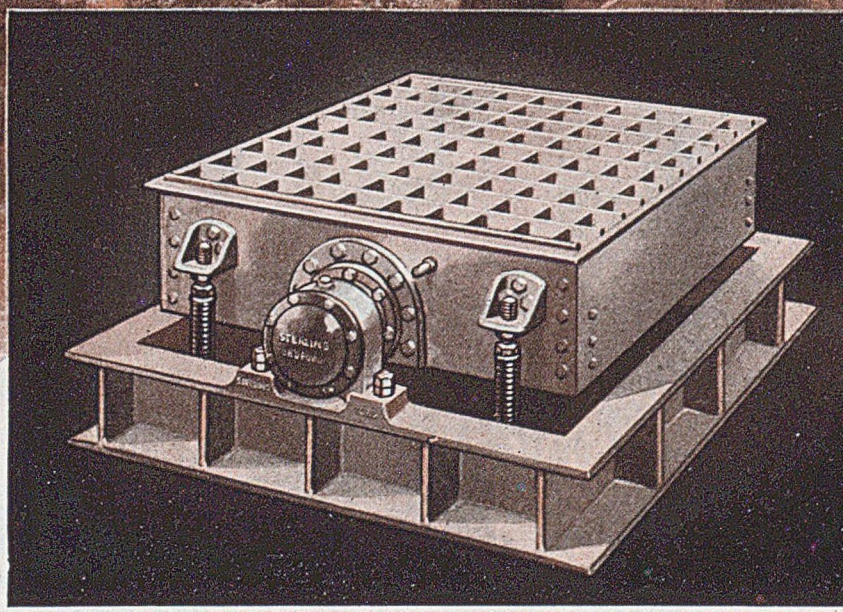
The illustration shows our facing sand plant unit which includes shovel fed rotary screen, collecting belt conveyor, magnetic pulley, loader and 6ft. 0in. diameter mill with disintegrator. The recommended batch capacity of the plant for facing is 6 cwts. and the normal batch cycle 6 minutes. This is a standard layout and there are many successful installations operating in all parts of the world. Further information will be gladly supplied on request.



Built in England by

PNEULEC LIMITED, SMETHWICK, Nr. BIRMINGHAM

Goodbye to all this



Mechanised shaking out quickly pays its way by extending the accurate life of your moulding boxes—the foundryman's most important tool. You can reduce wear and tear on men and boxes at the knockout by installing Sterling Shake-out Machines. Capacities from 5 cwts. to 5 tons, engineered with Sterling thoroughness and experience.

Sterling

SHAKE-OUT MACHINE

STERLING FOUNDRY SPECIALTIES LTD. BEDFORD ENGLAND

IMPORTANT NEWS
ABOUT
RECLAMATION OF DEFECTIVE CASTINGS

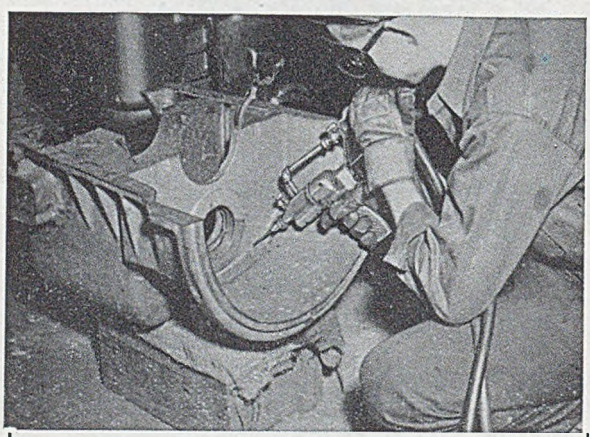
The new DOT-WELD Process

reclaims defective castings

***without* distortion of the parent body**

***without* residual stresses or contraction**

***without* leaving hard spots**



This photograph shows blow holes in a gear case casting being filled in by the DOT-WELD Process. Over a hundred of these a day are being reclaimed by a foundry in America.

THE NEW DOT-WELD PROCESS is being extensively used throughout America and Canada with outstanding success. Now, for the first time, it is made available for use in Britain.

DOT-WELD marks the very latest advance in the field of casting reclamation, fulfilling a long-felt need for an efficient method which eliminates the usual residual stresses and contractions resulting from high temperature welding. It is a vastly improved technique of *fusing metal by an air cooled process.* Holes in all types of castings and patterns are filled in *without* distorting the parent body, *without* burning or oxidation, and *without* leaving hard spots.

DOT-WELD can be applied to castings of Grey Iron, Aluminium (Sand and Die Castings), Steel, Malleable Iron, and Bronze.

The DOT-WELD unit is unique in its principle—does not require a skilled operator, is extremely mobile, and maintenance costs are almost negligible. It offers Foundries, Machine Shops and Pattern Shops an economical means of reducing costs and increasing output.

U.K. Patent Numbers 612412 and 616338
Also patented in U.S.A., CANADA and other countries.

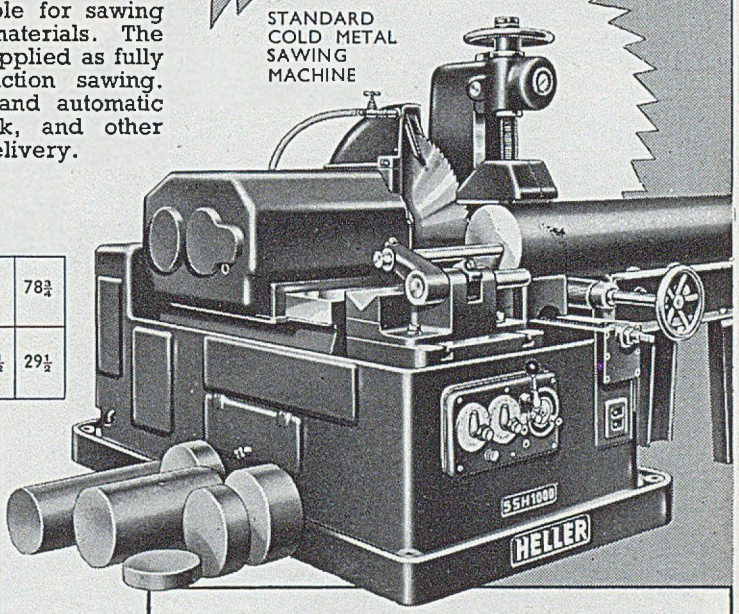
For further information please write to the Sole Licensees and Manufacturers in the United Kingdom and the British Commonwealth.

BRITISH RONCERAY LTD

ELECTRICAL DEPT., BENEFIT BUILDINGS, MOORHEAD, SHEFFIELD 1

HELLER COLD METAL SAWING MACHINES

Seven standard sizes are available for sawing iron and steel or non-ferrous materials. The three smaller machines can be supplied as fully Automatic Units for mass-production sawing. Several sizes of both standard and automatic types are obtainable from stock, and other models are available for early delivery.



STANDARD COLD METAL SAWING MACHINE

STANDARD MACHINES

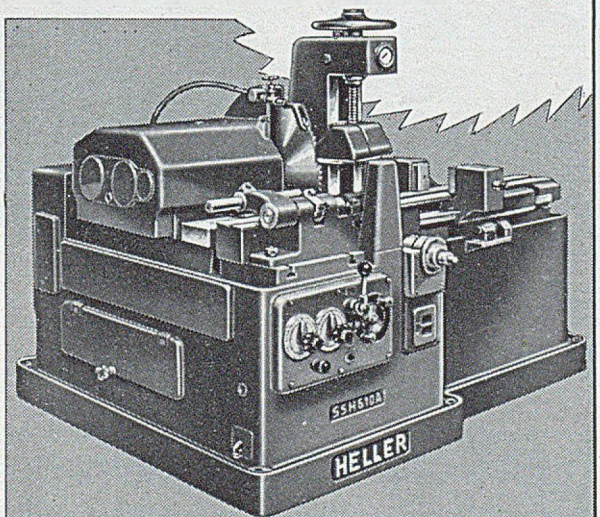
For either ferrous or non-ferrous materials.

Maximum Sawblade dia., ins.	$12\frac{3}{8}$	$24\frac{3}{4}$	$31\frac{1}{2}$	$39\frac{1}{4}$	49	63	$78\frac{3}{4}$
Maximum Rounds, ins.	$4\frac{1}{4}$	$8\frac{3}{4}$	$11\frac{3}{4}$	$14\frac{3}{4}$	$18\frac{1}{2}$	$23\frac{1}{2}$	$29\frac{1}{2}$

AUTOMATIC MACHINES

For either ferrous or non-ferrous materials.

Maximum Sawblade dia., ins.	$12\frac{3}{8}$	$24\frac{3}{4}$	$31\frac{1}{2}$
Maximum Rounds, ins.	$4\frac{1}{4}$	$8\frac{3}{4}$	$11\frac{3}{4}$



AUTOMATIC COLD SAWING MACHINE

Other Heller Sawing Machines include

RAIL SAWING & DRILLING MACHINES

For straight cutting rails to length or drilling and cutting off in the one set-up.
Maximum Sawblade dia.; $24\frac{3}{4}$ ins. Maximum Square, $7\frac{7}{8}$ ins.

VERTICAL MITRE SAWS with sawhead turning through 360°.

For mitring beams and sections utilised in structural engineering, etc.

Maximum Sawblade diameter, ins.	$12\frac{3}{8}$	$24\frac{3}{4}$	$39\frac{1}{4}$
Maximum Rounds .. .. ins.	$4\frac{1}{4}$	$8\frac{3}{4}$	$14\frac{3}{4}$

UNIVERSAL FOUNDRY SAWS with sawhead turning through 180° and with revolving work table.

For cutting off headers and for general foundry work.

Maximum Sawblade diameter, ins.	$24\frac{3}{4}$	$39\frac{1}{4}$	$78\frac{3}{4}$
Maximum Rounds .. .. ins.	$8\frac{3}{4}$	$14\frac{3}{4}$	$29\frac{1}{2}$

COMBINED CUT-OFF AND CENTRING MACHINES for special applications.

Automatic machines for centre drilling and cutting off to specified lengths.

COLD METAL CIRCULAR SAWING MACHINES

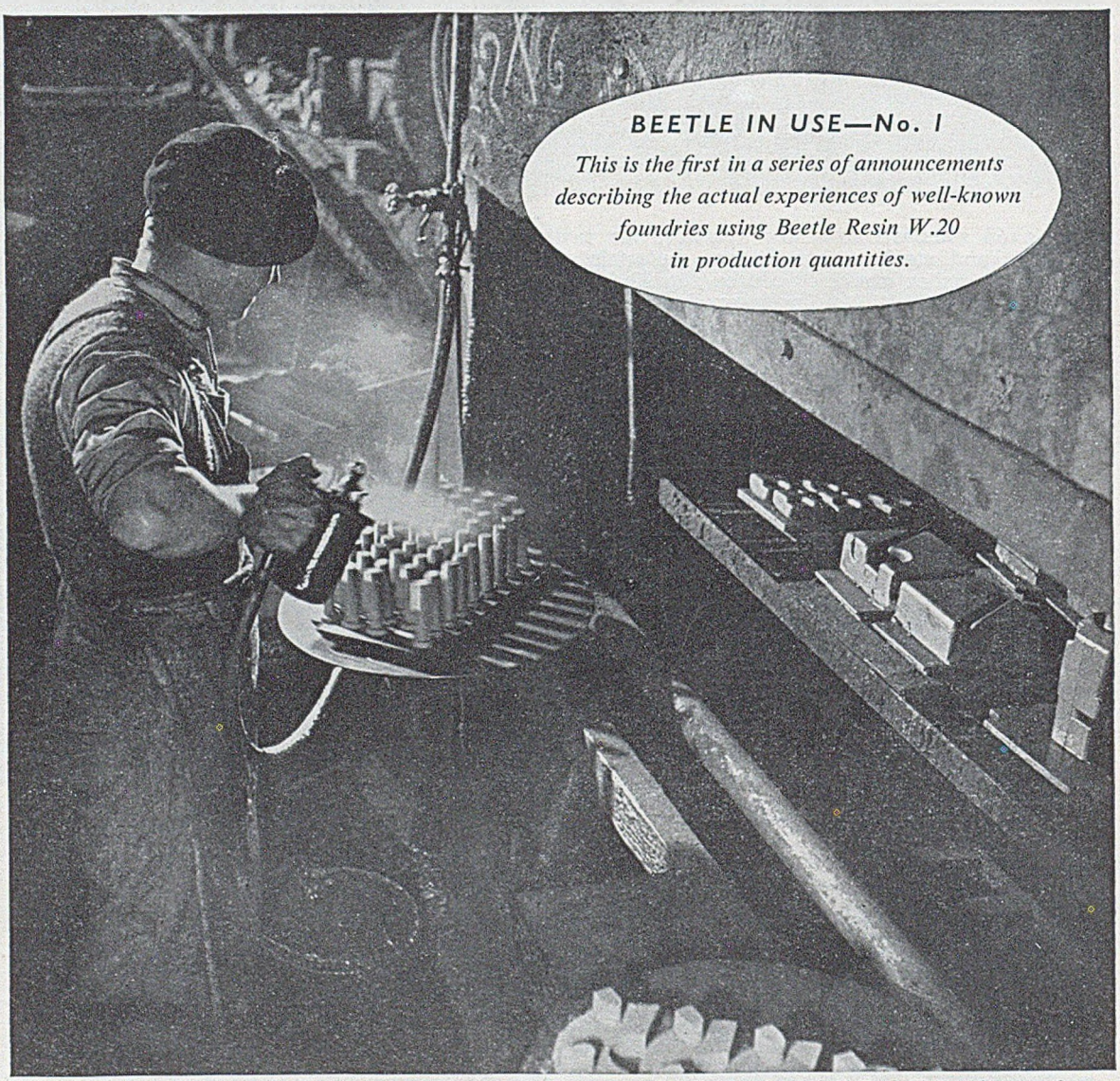
are also available for special applications such as cutting out operations on crankshafts, cutting large castings, etc. Details on request.

A. C. WICKMAN LTD., COVENTRY

LONDON · BRISTOL · BIRMINGHAM · MANCHESTER
LEEDS · GLASGOW · NEWCASTLE · BELFAST

A.C. Wickman LIMITED

154F 32



Spraying cores bonded with Beetle W.20 as they enter the oven. Photograph by courtesy of Coneygre Foundry Ltd.

"Core output increased by 30—40 tons a week" SAY CONEYGRE

This foundry attributes its substantial increase of core output to synthetic resin core-binder, now used almost exclusively. The quick-stoving properties of resin-bonded cores have eliminated hold-ups in core drying. The cores are hard and strong and yet retain exceptionally good collapse features.

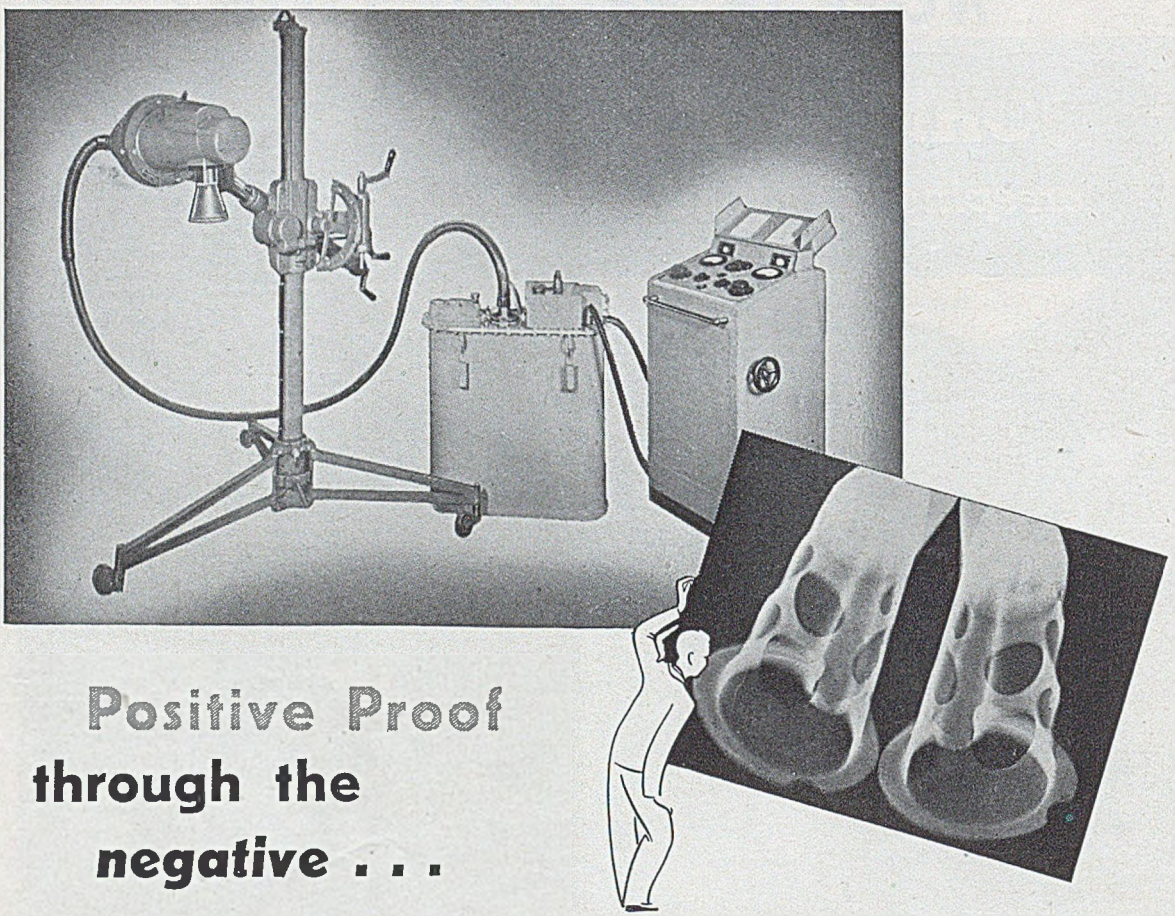
Write for Technical leaflet CB1

B·I·P GROUP

BEETLE RESIN W20 Core-Binder

BEETLE BOND LIMITED, 1 Argyll Street, London, W.1

'Beetle' is a trade mark registered in great Britain and in most countries of the world.



Positive Proof through the *negative . . .*

By means of X-ray inspection it is possible to "see into" the product and to detect faults at *an early stage* in manufacture. As a simple routine method, in the laboratory or the factory, it has been adopted by a wide range of industries. The Philips ' Macro ' 150 X-ray Inspection Unit answers the purpose most efficiently. To illustrate its capacity, the maximum tension delivered by the H.T. Generator is 150 kVp, which is sufficient for the examination of steel up to 2" in thickness.

The equipment consists of an H.T. Transformer and a shock-proof and ray-proof tube mounted on a mobile stand. A control table of the desk type completes the assembly. An outstanding feature of this Unit is its mobility which enables it to be used in positions previously inaccessible to radiographic technique.

Write for descriptive Catalogue No. XI/I, or why not discuss your inspection problem in more detail with one of our application engineers?

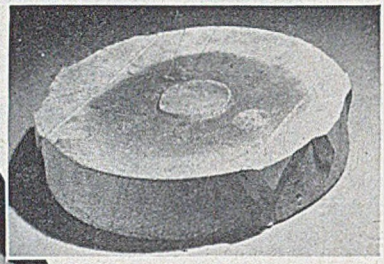
'Macro' 150 X-ray Inspection Unit

PHILIPS ELECTRICAL LIMITED

Makers of: INDUSTRIAL X-RAY EQUIPMENT · ELECTRONIC APPARATUS · LAMPS & LIGHTING EQUIPMENT · ARC & RESISTANCE WELDING PLANT & ELECTRODES · SOUND AMPLIFYING INSTALLATIONS · MAGNETIC FILTERS · BATTERY CHARGERS & RECTIFIERS

X-RAY DEPT., CENTURY HOUSE, SHAFTESBURY AVENUE, LONDON, W.C.2

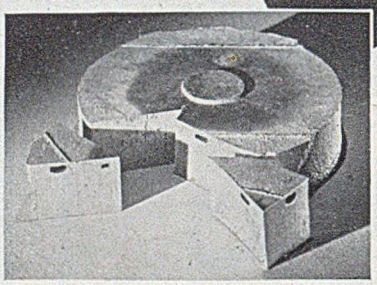
XB667A



▲ Aluminium alloy casting 2¼" x 1¼" for aircraft accessory part.

▲ Radiograph which revealed defect in casting.

◀ Section reveals hole detected by radiography.



Radiography *ensures aircraft reliability*

After machining, this aluminium alloy casting was to be an important part in an aircraft accessory vital to high altitude flying. The finished part was needed quickly by the customer. Design specifications demanded high quality.

In a few minutes, radiography checked the quality, and revealed a defect that caused rejection of the rough casting at the foundry. Other castings, proved sound by radiography, were sent to the customer.

Cases like this show how more and more foundries are able to release only sound castings. Even more important, radiography is showing how to make consistently sound castings, by revealing the internal effects of changes in gating, venting, chilling, pouring temperature and other variables.

For reliable radiographs, you need

KODAK FILMS & CHEMICALS for Industrial Radiography

KODAK LTD., INDUSTRIAL SALES DIVISION · KODAK HOUSE · KINGSWAY · LONDON · W.C.2. *'KODAK' is a registered trade-mark.*

INDEX TO ADVERTISERS

	PAGE NOS.
Adaptable Moulding Machine Co., Ltd.	—
Aerograph Co., Ltd.	—
Alar, Ltd.	41
Albion Pulverising Co., Ltd.	—
Alldays & Onions, Ltd.	56
Alley & MacLellan, Ltd.	56
Aluminium Union, Ltd.	—
Allied Ironfounders, Ltd.	—
Anderson Grice Co., Ltd.	59
Anglardia, Ltd.	—
Armstrong Whitworth & Co. (Ironfounders), Ltd., Sir W. G.	—
Aron Foundry Equipment	—
Asea Electric, Ltd.	—
Aske, Wm., & Co., Ltd.	—
Associated Lead Manufacturers	—
Atlas Preservative Co., Ltd.	2
August's, Ltd.	28
Badische Maschinenfabrik A. G.	—
Baines, C. J. & Co. Ltd.	4
Ballard, F. J., & Co., Ltd.	45
Beakbane, Hy., & Co.	—
Beck H. & Son Ltd.	58
Beetle Bond, Ltd.	16
Berk, F. W., & Co., Ltd.	62
Bigwood, J., & Son Ltd.	—
Bilston Stove & Steel Truck Co., Ltd.	48
Birlec, Ltd.	—
Blythe Colour Works, Ltd.	—
Bradley & Foster, Ltd.	6
Bridges, S. N., & Co., Ltd.	46
Brightside Foundry & Engineering Co., Ltd.	40
British Aero Components, Ltd.	—
British Electrical Development Assoc.	—
British Electro Metallurgical Co., Ltd.	10
British Foundry Units, Ltd.	—
British Moulding Machine Co., Ltd.	62
British Oxygen Co., Ltd.	—
British Pigirons, Ltd.	—
British Railways	—
British Ronceray, Ltd.	14
British Shotblast & Engineering Co., Ltd.	—
British Thomson-Houston Co., Ltd.	—
British Tyre & Rubber Co., Ltd.	—
British Wedge Wire Co., Ltd.	—
Broom & Wade, Ltd.	—
Bullows, Alfred, & Sons, Ltd.	271
Butterworth Bros.	—
Carborundum Co., Ltd.	—
Carlisle, E. A.	—
Cellactite & British Uralite Ltd.	—
Chamberlain Industries, Ltd.	—
Chance Bros., Ltd.	—
Clayton Crane, Hoist Co., Ltd.	13
Climax Molybdenum Company of Europe, Ltd.	—
Climax Rock Drill & Engineering Co., Ltd.	—
Cohen, Geo., Sons & Co., Ltd.	33 & 47
Coleman Foundry Equipment Co., Ltd.	—
Consolidated Pneumatic Tool Co., Ltd.	—
Constructional Engineering Co., Ltd.	—
Copper Development Association	—
Core Oils, Ltd.	58
Corn Products Co., Ltd.	—
Crockett Lowe, Ltd.	—
Crooke & Co., Ltd.	—
Cumming, Wm., & Co., Ltd.	54
Cuxson, Gerrard, & Co., Ltd.	—
Davidson & Co., Ltd.	—
De La Rue & Co., Ltd., Thomas	—
Dunford & Elliott, Ltd.	—
Dunlop Rubber Co., Ltd.	—
Durrans, James, & Sons, Ltd.	61
Easton & Johnson, Ltd.	—
Electric Furnace Co., Ltd.	—
Electromagnets, Ltd.	—
Enamelled Iron & Steel Products Co.	—
Ether, Ltd.	—
Evans, Stanley N.	—
Every Hy., & Co., Ltd.	37
Eyre Smelting Co., Ltd.	—
F. & M. Supplies, Ltd.	24
Fisher Foundries, Ltd.	—
Flextol Engineering Co., Ltd.	—
Fordath Engineering Co., Ltd.	5
Foundry Equipment, Ltd.	8
Foundry Mechanisations (Bailliot), Ltd.	—
Foundry Plant & Machinery, Ltd.	55
Foundry Services, Ltd.	—
Foxboro-Yoxall Ltd.	—
Fullers' Earth Union, Ltd., The	57
Gadd, Thos.	—
General Electric Co., Ltd.	29
General Metallurgical & Chemical, Ltd.	—
General Refractories, Ltd.	12
Gibbons Bros., Ltd.	—
Glenboig Union Fireclay Co., Ltd.	—
Godfrey, Sir Geo., & Partners, Ltd.	—
Greatrex, John, & Son	—
Green, Geo., & Co.	—
Grove Painting & Decorating Co., Ltd.	20
Guest, Keen, Baldwins Iron & Steel Co., Ltd.	1
Harborough Construction Co., Ltd.	26
Hargraves Bros.	—
Harper, Wm., Son & Co. (Willenhall), Ltd.	—
Hawkins, W. T., & Co.	—
Hepburn Conveyor Co., Ltd.	2
Herbert, Alfred, Ltd.	—
Heywood, S. H., Ltd.	—
Hill-Jones, Thomas, Ltd.	—
Hillman, J. & A., Ltd.	—
Hills (West Bromwich), Ltd.	—
Holman Bros., Ltd.	—
Hooker, W. J., Ltd.	35
Ilford, Ltd.	—
Imperial Chemical Industries, Ltd.	—
Incandescent Heat Co., Ltd.	—
International Mechanite Metal Co., Ltd.	—
Jackman, J. W., & Co., Ltd.	—
Jacks, Wm., & Co., Ltd.	31
Jeffrey & Co. Ltd.	—
Keith Blackman, Ltd.	20
King Bros. (Stourbridge), Ltd.	—
King, Geo. W., Ltd.	19
Kodak, Ltd.	22
Laidlaw, Drew & Co., Ltd.	—
Lambeth & Co. (Liverpool), Ltd.	51
Lees, Hall & Sons, Ltd.	—
Lennox Foundry Co., Ltd.	—
Levy, B., & Co.	36
Lord, E. S., Ltd.	—
Luke & Spencer, Ltd.	—
Lyte Ladders, Ltd.	—
Lythgoe Adam	—
Macdonald, John, & Co. (Pneumatic Tools), Ltd.	—
Macdonald, John, & Son	46
Macnab & Co., Ltd.	—
Major, Robinson, & Co., Ltd.	—
Mansfield Standard Sand Co., Ltd.	24
Marco Conveyor & Engineering Co., Ltd.	37
Marsden & Bateson, Ltd.	—
Matterson, Ltd.	—
Mavor & Coulson, Ltd.	—
May, J. H.	—
Metalectric Furnaces Ltd.	—
Metropolitan-Vickers Electrical Co., Ltd.	—
Midland Tar Distillers, Ltd.	44
Mining & Chemical Products, Ltd.	—
Mirrlees Watson Co., Ltd.	—
Mitchells Emery Wheel Co., Ltd.	—
Modern Furnaces & Stoves, Ltd.	44
Mole, S., & Sons (Green Lane Foundry), Ltd.	—
Molineux Foundry Equipment, Ltd.	49
Mond Nickel Co., Ltd.	—
Monometer Manufacturing Co., Ltd.	47
Morgan Crucible Co., Ltd.	—
Morris, B. O., Ltd.	—
Morris, Herbert, Ltd.	—
Moss, Wm., & Sons, Ltd.	—
Muir, Murray & Co., Ltd.	—
Musgrave & Co., Ltd.	—
National Savings Committee	—
Neville, T. C., & Son, Ltd.	—
New Conveyor Co., Ltd.	—
Newman, Hender & Co., Ltd.	57
Newton, Victor, Ltd.	21
Norton Grinding Wheel Co., Ltd.	45
Orwin, R., & Son, Ltd.	—
Paget Engineering Co. (London) Ltd.	23
Palmer Tyre, Ltd.	—
Pantin, A. C., Ltd.	—
Parish, J., & Co.	1
Passe, J. F., & Co.	—
Paterson Hughes Engineering Co., Ltd.	58
Pattern Equipment Co. Ltd.	—
Pearson, E. J. & J., Ltd.	—
Perry, G., & Sons	—
Phillips Electrical, Ltd.	18
Phillips, J. W. & C. J., Ltd.	—
Pickerings, Ltd.	—
Pickford, Holland & Co., Ltd.	—
Pitt, H. S., & Co., Ltd.	59
Pneulec, Ltd.	7
Portway, C., & Son, Ltd.	—
Precision Presswork Co., Ltd.	—
Premo Pattern Co., Ltd.	—
Price, J. T., & Co., Ltd.	—
Ransomes, Sims & Jefferies, Ltd.	—
Rapid Magnetic Machines Ltd.	—
Reavell & Co., Ltd.	38
Richardson, R. J., & Sons, Ltd.	—
Ridsdale & Co., Ltd.	—
Riley Stoker Co., Ltd.	—
Robson Refractories, Ltd.	—
Roper, E. A., & Co.	—
Rotolift Sales Co.	—
Round Oak Steel Works, Ltd.	53
Rowland, F. E., & Co., Ltd.	—
Rownson, Drew & Clydesdale, Ltd.	—
Rozalex, Ltd.	—
Rustless Iron Co., Ltd.	35
Safety Products Ltd.	—
Scottish Foundry Supplies Co.	35
Sheard, Geo. (Congleton), Ltd.	—
Sheepbridge Co., Ltd.	—
Sheffield Smelting Co., Ltd.	38
Sheppard & Sons, Ltd.	—
Sieber Equipment Co., Ltd., James	38
Sinex Engineering Co., Ltd.	—
Sklenar Furnaces, Ltd.	—
Slough Metals, Ltd.	—
Smedley Bros., Ltd.	—
Smeeton, John A., Ltd.	62
Smith, Albert, & Co.	—
Smith & Fawcett, Ltd.	48
Smith, J. (Keighley), Ltd.	17
Spencer & Halstead, Ltd.	—
Spermolin, Ltd.	3
St. George's Engineers, Ltd.	60
Standard Brick & Sand Co., Ltd.	—
Stansby, W., & Co., Ltd.	—
Stanton Ironworks Co., Ltd., The	269
Staveley Iron & Chemical Co., Ltd.	52
Steele & Cowlishaw, Ltd.	—
Stein & Atkinson, Ltd.	50
Stein, John G., & Co., Ltd.	—
Sterling Foundry Specialties, Ltd.	11
Sternol, Ltd.	—
Stewart and Gray, Ltd.	—
Stewarts and Lloyds, Ltd.	—
Stone-Wallwork, Ltd.	39
Sturtevant Engineering Co., Ltd.	—
Swynnerton Red Moulding Sand	—
Tallis, E., & Sons, Ltd.	42
Tangyes, Ltd.	48
Technically Controlled Castings Group	—
Telsen, Th.	—
Thomas, G. & R., Ltd.	—
Tilghman's Patent Sand Blast Co., Ltd.	43
Traughber Filter Co., Ltd.	—
Tyseley Metal Works, Ltd.	—
United Steel Companies, Ltd.	—
Universal Conveyor Co., Ltd.	—
Universal Pattern Co., Ltd.	30
Vaughan Crane Co., Ltd.	60
Vaughans (Hope Works), Ltd.	—
Victor Products (Wallsend), Ltd.	—
Vokes, Ltd.	—
Walker, I. & I., Ltd.	50
Walsall Sandblasting Co., Ltd.	—
Ward, Thos. W., Ltd.	1, 9, & 33
Waring Bros.	—
Warner & Co., Ltd.	—
Watsons (Metallurgists), Ltd.	—
Webster & Co. (Sheffield), Ltd.	—
Wengers, Ltd.	—
West Midland Refining Co., Ltd.	—
Wickman, A. C., Ltd.	15
Wiggin, Hy., & Co., Ltd.	—
Wilkins, Campbell & Co., Ltd.	—
Winget, Ltd.	—
Wilson, Alexander (Aberdeen), Ltd.	—
Woodward Bros. & Copelin, Ltd.	—

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 :—

THE INSTITUTE OF BRITISH FOUNDRYMEN

PRESIDENT : **J. J. Sheehan, B.Sc., A.R.C.Sc.I.**, Coneygre Foundry, Ltd., Tipton, Staffs.

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

BRANCHES

Birmingham, Coventry and West Midlands : E. R. Dunning, 16, Hay Lane, Monkspath, Shirley, Birmingham. *Bristol and West of England* : A. Hares, 648, Stapleton Road, Bristol, 5. *E. Midlands* : S. A. Horton, 163, Morley Road, Chaddesdon, Derby. *Lancs.* : R. Yeoman, 11, Sumner Road, Salford, 6. *Lincs.* : E. R. Walter, Ph.D., The Technical College, Lincoln. *London* : W. G. Mochrie, Tyseley Metal Works, Limited, Balfour House, Finsbury Pavement, London, E.C.2. *Middlesbrough* : F. Shepherd, Head, Wrightson & Co., Ltd., Teesdale Iron Works, Thornaby-on-Tees. *Newcastle-upon-Tyne* : F. Robinson, Sir W. G. Armstrong Whitworth & Co. (Ironfounders), Ltd., Close Works, Gateshead. *Scottish* : J. Bell, 60, St. Enoch Square, Glasgow. *Sheffield* : J. H. Pearce, 31, Causeway Head Road, Dore, Sheffield. *Wales and Monmouth* : A. S. Wall, 14, Palace Avenue, Llandaff, Cardiff. *West Riding of Yorkshire* : H. W. Griffiths, 46, Peckover Drive, Thornbury, Bradford. *South Africa* : Secretaries, S.E.I.F.S.A., Barclays Bank Buildings, Cr. Commissioner and Harrison Street, Johannesburg.

SECTIONS

Burnley : W. L. Lord, 123, Blackburn Road, Clayton-le-Moors, Accrington, Lancs. *Cape Town* : S. Wade, P.O. Box 46, Salt River. *East Anglia* : L. W. Sanders, Lake and Elliot, Limited, Braintree, Essex. *Falkirk* : D. Fleming, Robert Taylor & Company, Limited, Muirhall Foundry, Larbert. *Slough* : P. Hoesli, Light Production Co., Ltd., Slough, Bucks. *West Wales* : A. S. Wall, 14, Palace Avenue, Llandaff, Cardiff.

BRITISH STEEL FOUNDERS' ASSOCIATION

Chairman : **F. W. Rowe, B.Sc.**, K. & L. Steelfounders and Engineers, Limited, Letchworth, Herts. *Secretaries* : **Peat, Marwick, Mitchell & Company**, 301, Glossop Road, Sheffield, 10. 'Phone and 'Grams : Broomhill 63031.

RESEARCH AND DEVELOPMENT DIVISION

Chairman : **F. N. Lloyd**, F. H. Lloyd & Co., Ltd. *Director*: **J. F. B. Jackson, B.Sc., A.R.I.C., F.I.M.**, Broomgrove Lodge, Broomgrove Road, Sheffield 10. 'Phone and 'Grams Sheffield 61235.

ASSOCIATION OF BRONZE AND BRASS FOUNDERS

President : **G. F. Mundell**, Knowsley Cast Metal Company, Limited, Manchester. *Secretaries* : **Heathcote & Coleman**, 25, Bennetts Hill, Birmingham, 2. 'Phone : Midland 2901. 'Grams : "Clarify," Birmingham.

LIGHT METAL FOUNDERS' ASSOCIATION

Chairman : **A. H. Sturdee, M.B.E., Wh.Ex., M.I.Mech.E.** *Secretary* : **Eric L. Heathcote**, 25, Bennetts Hill, Birmingham, 2. 'Phone : Midland 2901/4. 'Grams : " Clarify," Birmingham.

FOUNDRY TRADES' EQUIPMENT AND SUPPLIES ASSOCIATION

President : **W. E. Aske**, William Aske & Co., Ltd., Waterside, Halifax. *Secretaries* : **Peat, Marwick, Mitchell & Company**, 94/98, Petty France, London, S.W.1. 'Phone : Abbey 7515. 'Grams : "Crusades, Sowest," London.

THE INSTITUTE OF VITREOUS ENAMELLERS

President : **Dr. J. E. Hurst, J.P.**, Bradley & Foster, Limited, Darlaston, Staffs. *Chairman* : **S. Hallsworth**, Metal Porcelains, Limited, Cornwall Road, Smethwick 40, Staffs. *Secretaries* : **John Gardom & Company**, Ripley, Derbyshire. 'Phone : Ripley 136.

COUNCIL OF IRONFOUNDRY ASSOCIATIONS

Chairman : **N. P. Newman**, Newman Hender and Company, Limited, Woodchester, nr. Gloucester, *Director*: **K. Marshall**, *Secretary* : **J. W. Butler**, Crusader House, 14, Pall Mall, London, S.W.1. 'Phone : Whitehall 7941.

Participating Associations : British Cast Iron Research Association (affiliated) ; Institute of British Foundrymen (affiliated) ; and the following :—

Automobile Ironfounders' Association.—Secretaries : Heathcote and Coleman, 25, Bennetts Hill, Birmingham, 2. 'Phone : Midland 2901 ; 'Grams : " Clarify," Birmingham.

British Ironfounders' Association and British Bath Manufacturers' Association.—Director and Secretary : J. Galbraith Sneddon, C.A., 145, St. Vincent Street, Glasgow, C.2. 'Phone : Central 2891 ; 'Grams: 'Groundwork." Glasgow.

British Grit Association.—Secretary : J. Campbell MacGregor, 10 Bank Street, Airdrie, Lanarkshire.

British Malleable Tube Fittings Association.—Secretary : F. B. Ridgwell, 196, Shaftesbury Avenue, London, W.C.2. 'Phone : Temple Bar 3261 : 'Grams : " Brimatufle," London.

Cast Iron Chair Association : Secretaries : Peat, Marwick, Mitchell & Co., The Cast Iron Chair Association, Queen's Square, Middlesbrough, Yorkshire.

Cast Iron Axlebox Association and National Ingot Mould Association.—Secretaries : Peat, Marwick, Mitchell & Company, 301, Glossop Road, Sheffield. 'Phone and 'Grams : Broomhill 63031.

Cast Iron, Heating, Boiler and Radiator Manufacturers' Association.—Secretary : Stanley Henderson, 69, Cannon Street, London, E.C.4. 'Phone : City 4444.

Cast Iron Pipe Association : Secretary : T. Clark, Crusader House, 14, Pall Mall, London, S.W.1. 'Phone : Whitehall 7941.

Cast Iron Segment Association.—Secretary : H. A. D. Acland, 5, Victoria Street, London, S.W.1. 'Phone : Abbey 3194.

Greensand Pipe Founders' Association.—Secretaries : McClure Naismith Brodie & Company, 77, St. Vincent Street, Glasgow, C.2. 'Phone : Central 8476 ; 'Grams : " Lycidas," Glasgow.

National Association of Malleable Ironfounders.—Secretary : Miss L. Verity, Chamber of Commerce Offices. Tudor House, Bridge Street, Walsall. 'Phone : Walsall 5671.

IRONFOUNDERS' NATIONAL CONFEDERATION

Chairman : **D. Graham Blaset**, Enfield Foundry Co., Ltd., Waltham Cross. *Director* : **R. Forbes Baird**, 117, Church Lane, Handsworth Wood, Birmingham, 20. 'Phone : Northern 0343 & 0037; 'Grams " Irocast," Birmingham.

LOCAL BRANCH ASSOCIATIONS

East and West Ridings : Secretary : O. Gibson, Oliver Gibson & Sons Ltd., Leeds. 'Phone : Leeds 21226. *North Midland* : Secretary : E. A. Phillips, Harper, Phillips & Co., Ltd., Albion Foundry, Eastgate, Grimsby, 'Phone : Grimsby 2541. *North Western* : Secretary : E. Morris, F. Morris & Sons, Ltd., Whaley Bridge. 'Phone : Whaley Bridge 98. *Scottish* : Secretary : A. F. Ure, Allen Ure & Co., Ltd., Keppochill, Glasgow, 'Phone : Glasgow, Douglas 2641.

NATIONAL IRONFOUNDING EMPLOYERS' FEDERATION

President : **C. Gresty**, North Eastern Marine Engineering Co. (1938) Ltd., Wallsend-on-Tyne. *Secretaries* : **Mann, Judd & Co.**, 8, Fredericks Place, Old Jewry, London, E.C.2. 'Phone : Metropolitan 8613 ; 'Grams : " Manjudca Phone," London.

LOCAL ASSOCIATIONS

Cardiff and District Founders' Association.—Secretary : G. Morris, 12, West Bute Street, Docks, Cardiff. 'Phone : Cardiff 4356-7.

Leeds and District Ironfounders' Association.—Secretary : F. Bowling, John Bowling & Co., Ltd., Cyclops Foundry, Kirksall Road, Leeds, 3. 'Phone : Leeds 25183.

Leicester and District Ironfounders' Employers' Association.—Secretary C. S. Bishop, 8, New Street, Leicester. 'Phone : Leicester 58842.

Liverpool and District Ironfounders' Association.—Secretary : J. S. Hassal, 15, Victoria Street, Liverpool. 'Phone : Central 0114.

Manchester and District Ironfounders' Employers' Association.—Secretaries : Webb & Hall, 90, Deansgate, Manchester. 'Phone : Blackfriars 8367 ; 'Grams : " Sound," Manchester.

Midland Ironfounders' Association.—Secretary : R. Forbes Baird, 117 Church Lane, Handsworth Wood, Birmingham, 20. 'Phone : Northern 0343 & 0037 ; 'Grams : " Jacelace," Birmingham.

Monmouthshire Founders' Association.—Secretary : F. Lawton, Gould Foundries, Limited, Newport, Mon. 'Phone : Newport 4275 ; 'Grams : " Rogerwinch," Newport.

North of England Ironfounders' Association.—Secretaries : Mann, Judd, Gordon & Co., 61, Westgate Road, Newcastle-upon-Tyne. 'Phone : Newcastle 20836 ; 'Grams : " Mannca," Newcastle.

North Staffordshire Ironfounders' Association.—Secretary : R. Pepper, 4, St. Anthony's Drive, Westlands, Newcastle, Staffs. 'Phone : Stoke-on-Trent 87303.

Scottish Ironfounders' Association.—Secretaries : Mann, Judd, Gordon & Co., 142, St. Vincent Street, Glasgow, C.2. 'Phone : Central 8563 ; 'Grams : " Mannca," Glasgow.

Sheffield and District Ironfounders' Association.—Secretary : T. Goddard Mander, 59, Clarkehouse Road, Sheffield, 10. 'Phone : Sheffield 60047 'Grams : " Emplofedra," Sheffield.

South of England Ironfounders' Association.—Secretaries : Mann, Judd & Co., 8, Fredericks Place, Old Jewry, London, E.C.2. 'Phone Metropolitan 8613. 'Grams : " Manjudca Phone," London.

Welsh Engineers and Founders Association.—Secretary : W. D. M. Davis, 1, St. James Gardens, Swansea. 'Phone : Swansea 59166 ; 'Grams : " Iron " Swansea.

West of England Ironfounders' Association.—Secretary : R. Forbes Baird, 117, Church Lane, Handsworth Wood, Bimingham, 20. 'Phones: Northern 0343 & 0037 ; 'Grams : " Jacelace," Birmingham.

West Riding Ironfounders' Association.—Secretary : C. D. Buckle, 13 Cheapside, Bradford. 'Phone : Bradford 25346.

BRITISH CAST IRON RESEARCH ASSOCIATION

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

Scottish Laboratories.—Blantyre Industrial Estate, Blantyre, Lanarkshire. ('Phone 486.)

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

Vol. 90 Thursday, March 8, 1951 No. 1801

CONTENTS

	Page
Industrial Films and the Technologist	247
London Branch Fortieth Anniversary	248
Home-grown Linseed	248
American Film on Gating	248
National Foundry Craft Training Centre	248
Dominion Scholars Help Scheme	248
North British Steel Foundry	249
Publication Received	256
House Organs	256
Gas-turbine Steels and Alloys	257
Centrifugal Steel Castings for Gas Turbines	259
Notes on Productivity	261
Machine Tools in Schools	262
A.I. Apprentice School	262
Stress Relief and Allied Problems in Magnesium-Alloy Castings	263
Canadian International Trade Fair	266
Obituary	266
Wills	266
Contracts Open	266
Nationalised Subsidiary Steel Companies	267
King and Queen open Steelworks	267
Iron and Steel Values	267
News in Brief	268
Personal	268
Pig-iron and Steel Production	270
Raw Material Markets	272
Forthcoming Events (Advert. Section)	31

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

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

Industrial Films and the Technologist

The object of any business, be it nationalised or operating as a private enterprise, is to produce goods or provide services at such a price as to be economic and yet create a reserve to ensure continuity, modernity and adequate return for the capital invested. Disregard of any of these fundamentals leads either to the bankruptcy court or, in the case of the nationalised industries, raids on the pockets of the general public.

For a manufacturing concern, there must be intelligent buying, well-controlled processing and enlightened selling. It is with this last section that we propose to deal because of misconceptions held by some technicians. In the salesman's armoury there are appeals mainly to the eye and ear, and, very infrequently, to nose and palate. The prototype of the salesman was the colourful man with the big drum outside the booths at the annual fairs. He exaggerated the worth of his wares, but was in general very successful. Then came the dignified newspaper advertising, garnished by the more enterprising with wood-cuts. In recent years, colour has been introduced and, significantly, a modicum of documented technology. Radio apart, the latest phase is the production of sales films. In this field the founding industry has been particularly active and here again the salesman to an increasing extent relies on his documentary material to stress care in control and ultimate quality. He may have in mind purely prestige advertising, designed to publicise the name of the firm so that, when one thinks of, say, steel castings, he immediately associates with them the name of Montgomery Jones. On the other hand, he may decide—and we believe often rightly—to emulate the man with the big drum, and include a real sales angle. That is his business.

Now because many of the films which have been produced, especially the earlier ones, were very largely of the "prestige" variety, they were not only accepted by the various technical institutes, but were appreciated by them. Yet they were in varying degrees of obviousness purely advertising. Some of the more recent ones, notably in America, go to some length in stressing the worth of their products, whilst still retaining a wealth of documentary matter. Such films, when shown to engineer buyers—for whom they have been designed—are performing their normal function, but when shown to their competitors or potential competitors, they automatically become documentary. They carry two facets—one is the disclosure of their technical processes and the other a method of selling. We introduced these remarks by stressing salesmanship as one of the three cardinal factors governing the conduct of a business. Thus the showing of a sales film must be judged by members of technical associations, not so much from the sales appeal it makes to potential consumers, who often in those circumstances do not make up any considerable proportion of the audience, but rather from the angle of according an insight into the methods used by a concern in the same line of business. What is advertising to one audience is documentary to another, but in both cases it is publicity for the concern sponsoring the film.

E.

London Branch Fortieth Anniversary

Last Thursday, the London branch of the Institute of British Foundrymen marked by a mild celebration the fortieth anniversary of its establishment. The older branches, Lancashire, Birmingham, Scottish, Sheffield and Newcastle let theirs go by unnoticed, but the progress of London has been so noteworthy in its increase in membership so as to attain the position of being the largest local group of foundrymen in this country if not in the world. The inaugural meeting took place at the Institution of Mechanical Engineers on February 24, 1911. Mr. (later Dr.) Longmuir took the chair as president of the British Foundrymen's Association. He was supported by two past-presidents, Mr. Robert Buchanan and Mr. H. Pilkington; the honorary secretary, Mr. J. E. H. Allbut, and three local foundrymen, Mr. J. Ellis, later to become a president; Mr. J. Oswald and Mr. J. W. Horne. Some 50 people attended and at the conclusion a council was elected to conduct the future affairs of the branch. For some time, progress was erratic, and after ten years of existence there was some gossip to the effect that unless greater progress was made, the branch might cease to function. A meeting was called and only 10 members were present. They formed themselves into a committee and from that time continuous progress has been maintained. The branch has furnished five or seven national presidents, depending on the statistical approach, including Mr. Ellis; Mr. Wesley Lambert, C.B.E.; Mr. W. B. Lake; and Mr. R. B. Templeton; all of whom made noteworthy contributions to the Institute's activities and general good. Because of its position in the metropolis, the branch has been host for the holding of international meetings and even in 1923 it had the honour of receiving the American Foundrymen's Association.

The success of the branch has been due to a number of factors, not the least of which has been the noteworthy retention of interest by past officers; others are the choice of its executives; selection of suitable meeting places, and, in general, the absence of cliques. These factors, coupled with a well-balanced lecture programme plus the organisation of a few social events will ensure the straight-line progress of any branch or society. We congratulate the branch and especially all those who have given so much time and energy into building up the membership from a problematic hundred or so in 1921 to something approaching 750 to-day.

Home-grown Linseed

When the revocation of the Home Grown Linseed (Control) Order, 1948, was announced in January, it was stated that the Ministry of Food would be willing to buy home-grown linseed after June 30, 1951, at prices related to those which it would at the time be prepared to pay for imported linseed or linseed oil. So that farmers may have some idea what price their 1951 crop will realise, the Ministry of Food now announces that it will guarantee a minimum price of £65 a ton ex-farm for home-grown linseed of 90 per cent. purity delivered during the year July, 1951, to June, 1952.

MR. D. MORRIS, B.COM., formerly cost accountant, has been appointed secretary of General Refractories, Limited, in succession to the late Mr. J. Walker. Mr. Morris has been with the company for 14 years.

American Film on Gating

Through the courtesy of the American Foundrymen's Society, the Research and Development Division of the British Steel Founders' Association, has recently had the loan of an interesting film entitled "A Study of the Principles of Gating." The film records the results of a year's work conducted by the Battelle Memorial Institute, in which a technique employing transparent Perspex moulds and water containing a suspension of fine aluminium powder was used. By filming the flow of liquid in slow motion, the influence of runner, sprue and ingate design and of pouring method upon both mould gas entrainment and turbulence of flow have been demonstrated in an interesting and convincing manner.

The investigation was sponsored by the Aluminium and Magnesium Division of the American Foundrymen's Society, and the results of further studies employing the same technique have more recently been recorded in a colour film, a description of which appeared in the December, 1950, issue of the "American Foundryman."

The Research and Development Division has shown the film within its own organisation in several parts of the country, and arrangements have also been completed for it to be shown by the Institute of British Foundrymen both at the Foundry Foremen's Training Course at Ashorne Hill this week, and at a meeting of their technical sub-committee TS24 in Birmingham on March 19.

National Foundry Craft Training Centre

It is rather unusual for schools to receive any testimonials from ex-students until about "forty years onwards" at the annual old boys' dinner to recall happy memories of school days. However, this is an era of speed and there has come into our possession five unsolicited testimonials from last year's apprentices. They are simple but obviously sincere expressions of the good will they feel towards the Training Centre and the Hostel. They recognise that the tuition and living conditions alike are excellent and both Mr. Roper, the instructor, and Mr. Jenkins, the warden of the hostel receive, as they no doubt deserve, the thanks of the boys. Lessons which have been obviously taught are those of gratitude and politeness. The centre is now becoming known and appreciated in the area, and recently the boys were invited to attend the local Conservative Association Ball as the guests of Mrs. Reginald Siddons. This and other groupings take an interest in boys' welfare.

The employees sending youths to the centre also seem to be well satisfied and, only last week, one decided to send two of his boys for a second course accompanied by three new ones. Any reader unfamiliar with this activity can receive full details by writing to the director Mr. R. Forbes Baird, 117, Church Lane, Handsworth Road, Birmingham, 20.

Dominion Scholars Help Scheme

The Brush-A.B.O.E. group of factories have inaugurated a scheme whereby graduates from the universities in the Dominions will be properly trained in the various works contained within the group. The student is granted a return tourist passage to this country and is paid a weekly wage of the same order as the graduate apprentices on the staff. The details of the scheme are splendidly set out in a brochure carrying a form of application which is available to our overseas readers on application to Brush-A.B.O.E., 32, Duke's Court, Duke Street, St. James's, London, S.W.1.

North British Steel Foundry, Limited, of Bathgate, Scotland, is a jobbing steel foundry which has expanded considerably in recent years and a new fettling shop containing very modern equipment was opened about 18 months ago. The production is of straight carbon and low-alloy steel castings from a few pounds up to about five tons.

CASTINGS MADE at the North British Steel Foundry include locomotive and tramway wheel centres, gear wheels and blanks, brake shoes, miscellaneous colliery castings, cast-steel crankshafts and a large variety of castings for the oil industry, including fully-machined pipes and pipe flanges. About 30 per cent. of the castings are machined in the company's own shops, the production of castings being of the order of 90 to 100 tons per week. Of a total of 500 employees, some 350 are employed in the foundry.

This foundry was described in these columns some 17 years ago,* but so many changes have taken place since that time that it is deemed worthwhile to recapitulate the main features, describe the structural and process improvements which have been made and include a detailed account of the new fettling shop and its integration with the rest of the operations.

Buildings and Layout

An aerial view of North British Steel Foundry is shown above and, Fig. 1 is a plan of the works, from which it will be seen that the foundry departments comprise two moulding bays (one for green-sand work and other for dry-sand), a core-shop, cleaning shop and light and heavy dressing shops. Part of a third bay is in process of conversion to a moulding shop, having previously been occupied by the dressing department. The stockyard and melting plant is at the north end of the green-sand moulding bay, while despatch of finished castings or machined components is effected from the "loading bank" (Fig. 2) in convenient relation both to the dressing shops and engineering departments.

The buildings themselves reflect to some extent the gradual development of the company since its foundation in 1907, in that the bays are not all of uniform span and height. Generally, the moulding bays are of 40 ft. span and 21 ft. to eaves, but the roofs and crane gantries of the melting shop and core-shop have been raised considerably above this level. All foundry buildings are of brick construction with concrete floors wherever possible; in the new dressing shop a Ferrogran finish has been used to provide better wear resistance.

Artificial lighting of conventional types is provided on an adequate scale, and in the dressing shops space heating is provided by gas-fired radiant panels, carefully spaced in relation to door openings, the heat-treatment furnace, etc. This shop is also equipped with a "Colt" system of controlled ventilation. Ample lifting capacity is provided in all departments by cab-operated overhead electric travelling cranes of from 3 to 15 tons capacity, according to requirements. Other departments, such as pattern-shop and stores, laboratory, test house and gamma-ray inspection department, machine, smiths' and constructional shops, offices and canteen and amenities are housed in adjoining bays or in separate buildings as shown in the illustrations.

Melting Plant

Steel production is at present by the cupola/side-blown converter process, although this is likely to be replaced by electric-furnace melting in the near future. Furnace raw materials are received on the rail siding, which passes through the north end of the foundry bays, and are unloaded by overhead crane (equipped with an electromagnet), which is also used for hoisting weighed charges to the cupola stage for hand charging.

* FOUNDRY TRADE JOURNAL, July 27, 1933.

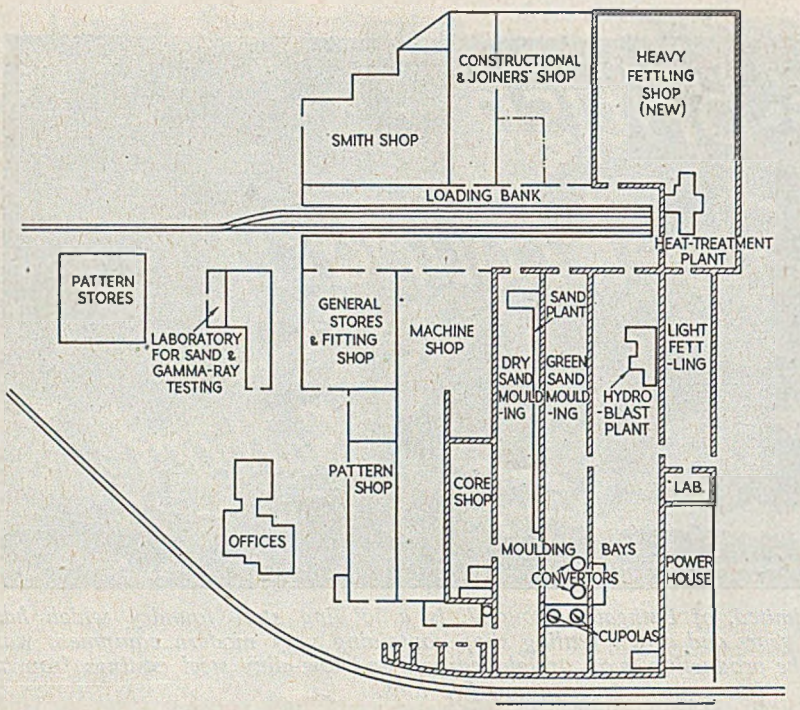


FIG. 1.—*Plan view of North British Steel Foundry; (compare with Aerial View shown on the Preceding Page).*

Although two fan-blown "Titan" cupolas of 7 tons per hr. nominal capacity are provided, one is used only as a standby and to permit major relining at approximately 18 months' intervals. About 30 to 33 tons of metals are melted per day, the charge comprising 25 per cent. pig-iron and 75 per cent. steel scrap, of which half is shop returns. The final silicon content of the cupola metal is approximately 1.0 per cent.—ferro-silicon being added to the cupola charge as required. The iron-to-coke ratio (Durham coke) is between 7 and 8 to 1 and the consumption of cupola patching material (Sheffield ganister) averages 82 lb. per ton of metal melted.

De-sulphurising

All cupola metal is de-sulphurised before pouring into the converters. This is effected by soda-ash in firebrick-lined ladles which are of 2-tons capacity. Metal is tapped from the cupola on to the soda ash in the ladle (30 lb. per ton) and the whole is transferred to a second ladle and thence,

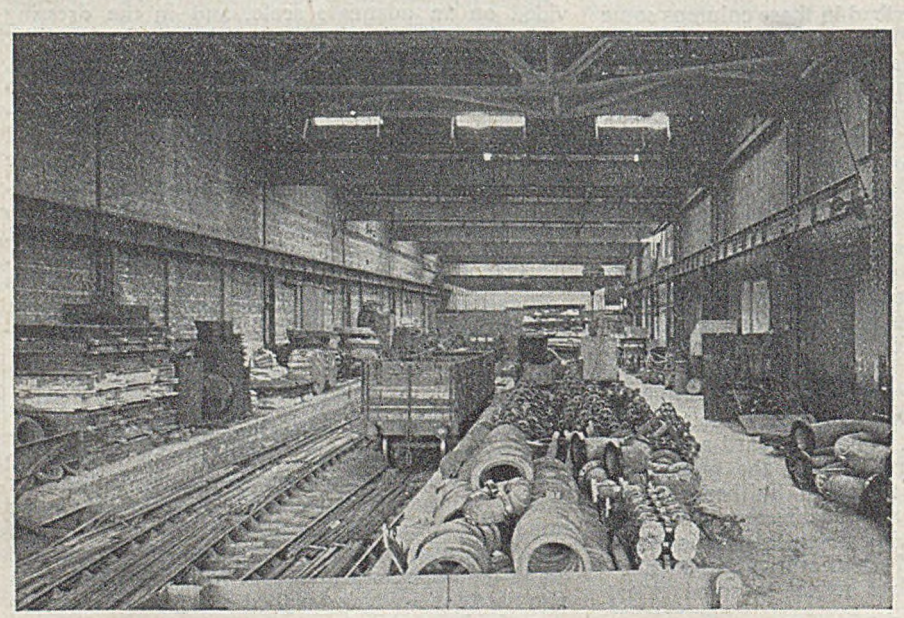


FIG. 2.—*Foundry Despatch Bay; Note that the Rail Siding comes right inside the Works and is Served by Overhead Gantry Crane.*

FIG. 3.—*General View of the Dry-Sand Moulding Bay. Note the Lofty Construction giving Ample Lifting Headroom.*

after the slag has been raked off, to the converter which is suitably tilted. Single ladle-treatment reduces sulphur from 0.10 per cent. to about 0.06 per cent.; the double ladle-treatment outlined above reduces it a further 0.02 per cent.; while for some special steels a treble ladle-treatment is practised to bring the sulphur to 0.02 to 0.03 per cent. No undue erosion of the ladle linings by the soda ash is experienced; instead, a glaze seems to be imparted early in the life of the lining, and this seems to resist further attack. Similarly, the converter lining life is considered to be little affected by the soda-ash pre-treatment of the metal. Temperature drop during the double treatment is of the order of 50 deg. C.

Converters

The converters, two of which are used each day in normal practice, are of orthodox Tropenas cylindrical design, and made by George Green &

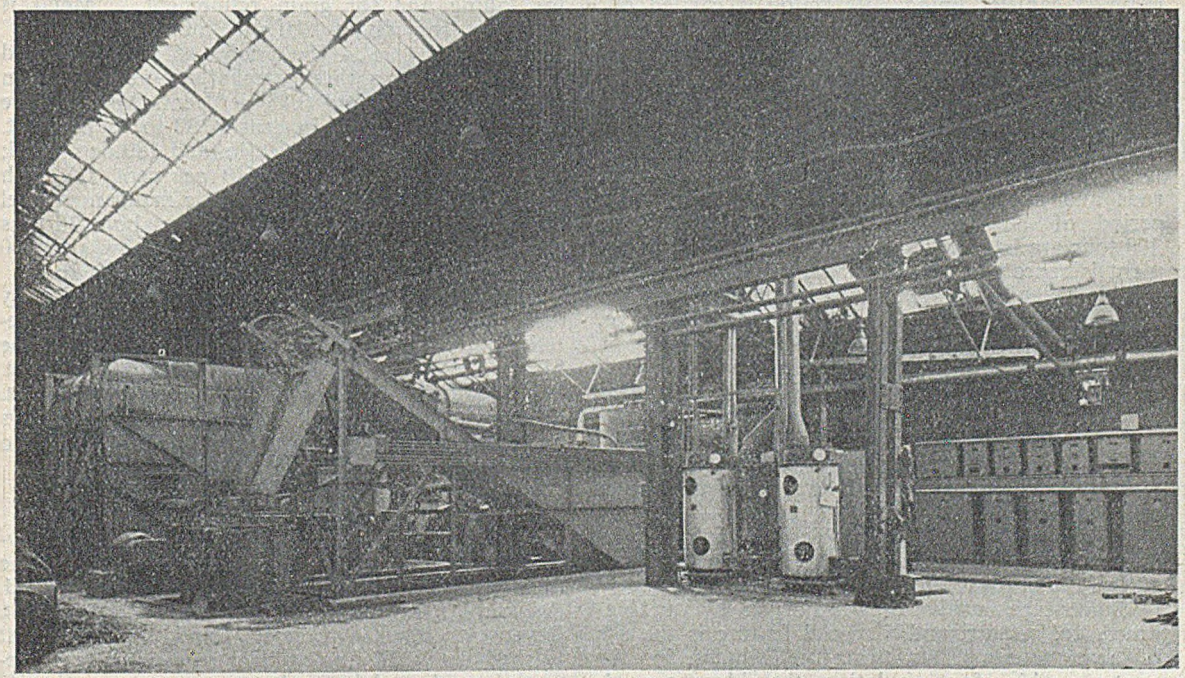


FIG. 4.—*Recently-installed Hydroblast Cleaning Plant. The Blasting Chambers are on the L.H. Side of the Illustration.*

FIG. 5.—*View of the Dressing Shop for Light Steel Castings. The Ample Space Available facilitates the use of Mechanical Internal Transport.*

Company, Limited, of Keighley. Nominal capacity is 2 tons, although this weight is only reached towards the end of a lining's life. The tuyeres are 1½ in. dia. holes formed in the completely-rammed ganister lining. Ramming is carried out to formers inserted in the body, and a proprietary Sheffield ganister is used. Pride is justifiably taken by the operators in the lining life secured. There is a small nose-patch daily, but 150 to 200 tons are handled before a converter requires tuyere repair. This is effected by removing the hood, inserting the bottom former and tuyere rods and ramming-up new tuyeres. A further period of blowing then follows, again 150 to 200 tons are handled before the tuyere-repair treatment is repeated and a final additional tonnage of similar magnitude is put through before a major lining repair is carried out. Even at this stage, the body is not completely stripped; the lining is merely cleaned back to good refractory (this may be only an inch or so thick), and more is rammed in. Converter lining materials averaged 19 lb. per ton of metal melted during a recent twelve months' period when approximately 7,000 tons of steel was tapped. The ramming mixture contains 6.0 per cent. moisture.

Operating Cycle.—Normal blowing time for the converters is 8 min. for a 30-cwt. charge up to from 12 to 13 min. for a 2-ton charge. Blowing is effected by Roots-type positive blowers, driven by variable-speed a.c. motors, and a special feature is the use of rev. counters plus pressure gauges in the control cabin for regulating the blow according to a standard cycle. Judgment is additionally by flame appearance. No oxygen enrichment is practised. The ladle-to-ladle time is about 20 min.; finishings of ferro-manganese or silicon-manganese are made for final carbon and manganese control, and aluminium up to 6 lb. per ton is used for killing and for grain refinement. Metal is available from about 10.0 a.m. each day.

Grades of Steel.—The grades of steel produced fall roughly into three categories:—Low carbon (0.2 per cent. C, and 0.75 per cent. Mn) to give about 30 tons per sq. in. tensile, 30 to 35 per cent. elongation, Izod 40 to 50 ft.-lb. and 180 deg. bend; medium carbon (0.35 to 0.40 per cent. C), with 35 to 40 tons tensile, and pearlitic manganese steel (1.0 to 1.5 per cent. Mn), this gives about 38 tons per sq. in. tensile, 28 per cent. elongation, and 180 deg. bend test, with an Izod of 25 to 30 ft.-lb.

Alloy steels are made successfully, usually by ladle additions, although nickel is added, if required, in the converter towards the end of the blow. Into this category fall the 2 per cent. Ni/Cr alloys, 2 per cent. Cr/Mo and 2½ per cent. Cr/Mo steels. The 4 to 6 per cent. Cr/Mo alloys have been made, but not very economically, for no alloy recovery from the scrap is possible.

Moulding Sand

Facing sand, naturally-bonded and synthetically-bonded, is used with a floor-sand backing for the majority of moulds, both green-sand and dry-sand. A typical mixture for facing sand is: 16 per cent. Levenseat naturally-bonded sand; 5 Levenseat washed sand; 16 Hydro-blast recovered sand, returned sand, and bentonite.

This facing sand is prepared in a small self-contained August's sand plant comprising a riddle,

magnetic separator, storage hopper, dust extractor, batch-type hoist to a No. 3 Simpson-type mixer and a belt feed overhead to distribution points between the two moulding bays. The mill takes 25-cwt. batches and about 25 to 30 tons of facing and core sand (at present prepared in the same mill) are treated per day. Only hand treatment of backing sand is carried out. A typical core mixture consists of Hydro-blast recovered sand with 1.0 per cent. bentonite and 2.0 per cent. Spermolin cream.

Moulding

Fig. 3 is a general view of the dry-sand moulding bay beyond which is the green-sand moulding bay. The facing sand distribution conveyor may be seen supported from the intervening stanchions. The core-shop, in course of reconstruction, is to the left of the illustration, and the mould- and core-drying stoves are also on this side. The total floor area of these departments is approximately 17,500 sq. ft. The majority of orders for dry-sand moulded castings comprise only very small quantities, and all work is hand moulded; floor pits are available for large jobs, if required, but most of the work can be accommodated in moulding boxes. Box-storage areas are located at the ends of the moulding bays to facilitate rapid handling of box parts by the overhead cranes.

Steel castings from pattern plates on moulding machines are produced by the associated company, Bonnington Castings Company, Limited, at Leith, where the production of small repetition items from synthetic-sand moulds is of the order of 50-60 tons per week; this foundry also is producing Tropenas-converter steel. Similarly, iron castings are made at the associated iron foundry, Primrose & Company, Limited, also at Leith, the output in this case being in the region of 25-30 tons weekly.

In the dry-sand moulding bay at Bathgate are made castings of quite large dimensions (a half-drum-cheek casting for a colliery winder is 12 ft. diam. and weighs 4½ tons); sections of metal up to 6 in. square are not uncommon. Very occasionally skin drying of moulds by gas torch is used.

For some very heavy jobs, steel "compo" facing sand is used. It is used sparingly up to a 1½-in. thick facing, especially confined to top-part moulds which are subjected to conditions likely to cause spalling. A fair amount of sprigging of moulds is practised, chiefly in green-sand moulds with large flat surfaces.

The green-sand moulding bay is devoted, naturally, to the smaller types of castings; these include such items as colliery-tub wheels, pipes, crank-shafts (up to 2 to 3 cwt.), flywheels and ships' cylinder castings. All sand moulds and cores are painted with zircon paint, while "compo" moulds are, of course, treated with a wash of this material. There is no central knockout or sand-return system, but with the shop being so lofty, little or no trouble with fumes is encountered. Green-sand moulds are lip-poured from tea-pot spout ladles, while dry-sand work is cast with conventional bottom-pouring ladles.

Cleaning and Dressing Shops

The fettling shops comprise three sections, a rough cleaning area, a light dressing shop, and a heavy dressing shop and heat-treatment department. The whole of this section of the works has been

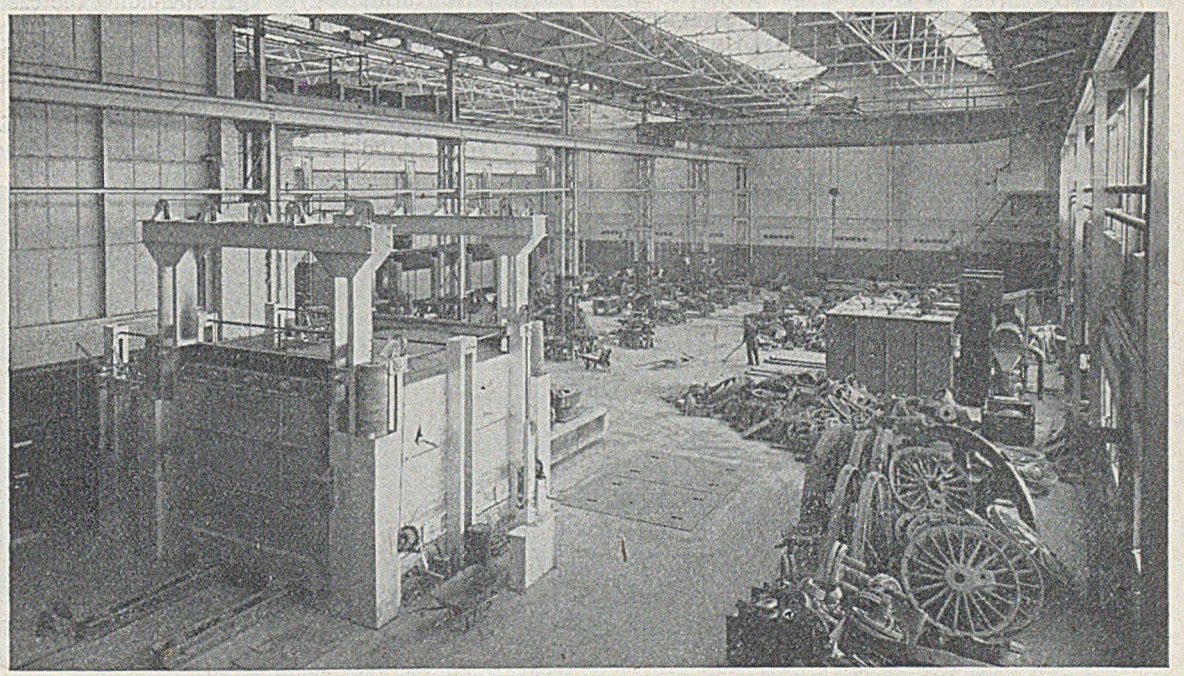


FIG. 6.—*Dressing Shop for Heavy Castings. In the foreground is the Wellman-Smith Double-bogie Heat-treatment Furnace.*

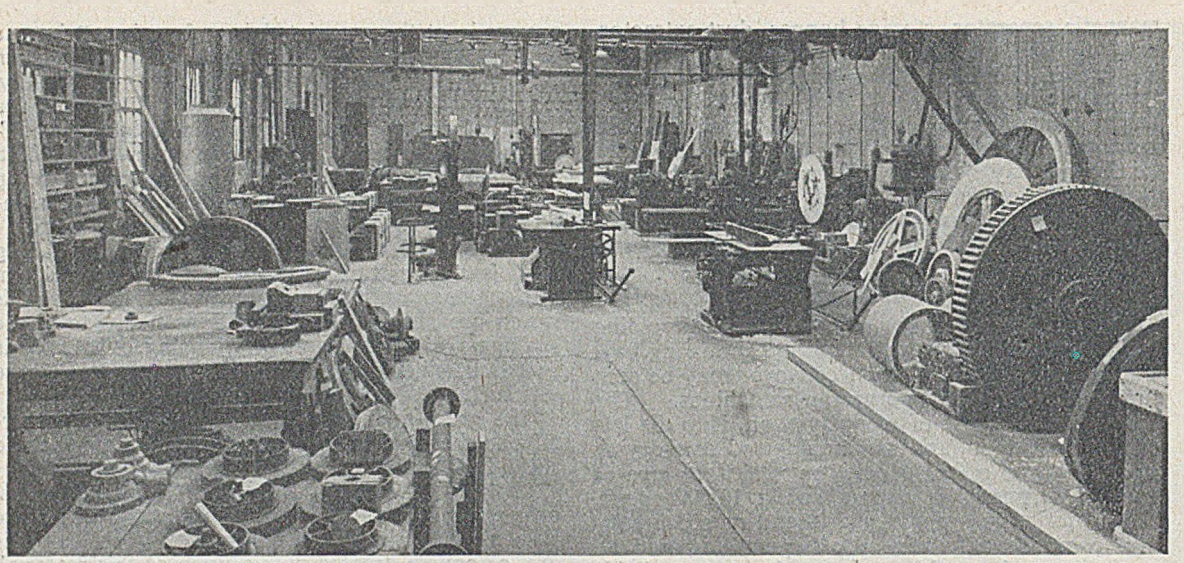


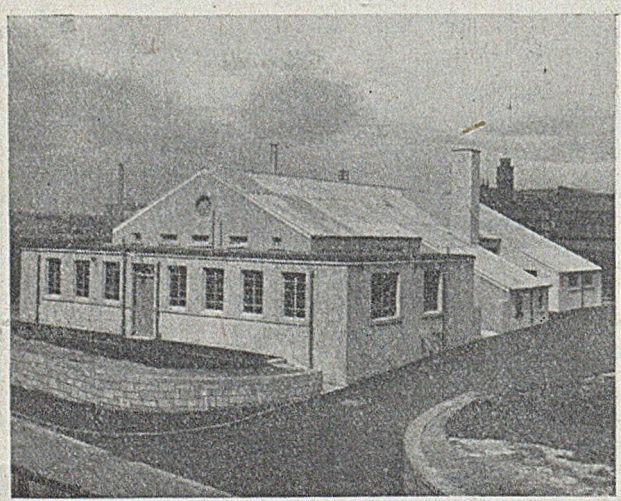
FIG. 7.—*Pattern Shop; Much of the Line-shaft-driven Plant is being Replaced by Individual-drive Machines.*

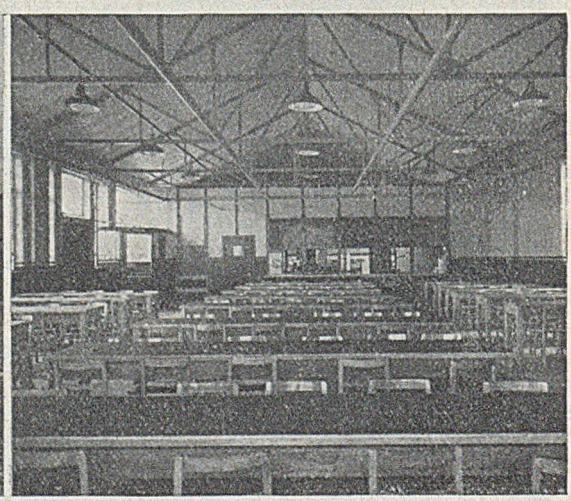
reorganised in the past few years in conjunction with the Company's advisers, John Gardom & Company.

The castings-cleaning area is equipped with a two-gun Hydro-blast installation by Pneulec, Limited, which is illustrated in Fig. 4. The first of the two blasting chambers is served by a 10 ft. dia. turntable with two 4 ft. dia. auxiliary tables so arranged that a number of castings may be treated on one half while the other half is outside the chamber for unloading and re-loading. The other chamber, 28 ft. by 15 ft. 6 in., accommodates larger work and is loaded by bogie. The plant is fully equipped for the reclamation of sand which is re-used in the foundry, approximately 6 tons being made available each day. The washing plant is also used independently for treating old floor sand. Unfortunately, due to electricity loading-shedding requirements, this plant can only be operated at night for the time being. While it is early yet to pronounce full judgment on the economics of the Hydro-blast plant at Bathgate, the reduction of dust in the fettling shop is considerable and sand recovery represents a worthwhile saving.

Other equipment in the cleaning area includes two shot-blast chambers by St. George's Engineers, Limited, and a Lloyd gas-cutting-off machine for the removal of headers, etc. This latter machine utilises two turntable-type jigs for holding the casting and an arrangement whereby the oxygen cutter head is controlled as to speed and direction. Considerable savings in subsequent grinding of the riser stub are effected by the use of this machine.

The light dressing shop (Fig. 5) is equipped principally with a batch-like airless Wheelabrator and





FIGS. 8 AND 9.—*Exterior and Interior Views of the Canteen seating about* 150; *the Facilities are shared with another Local Firm.*

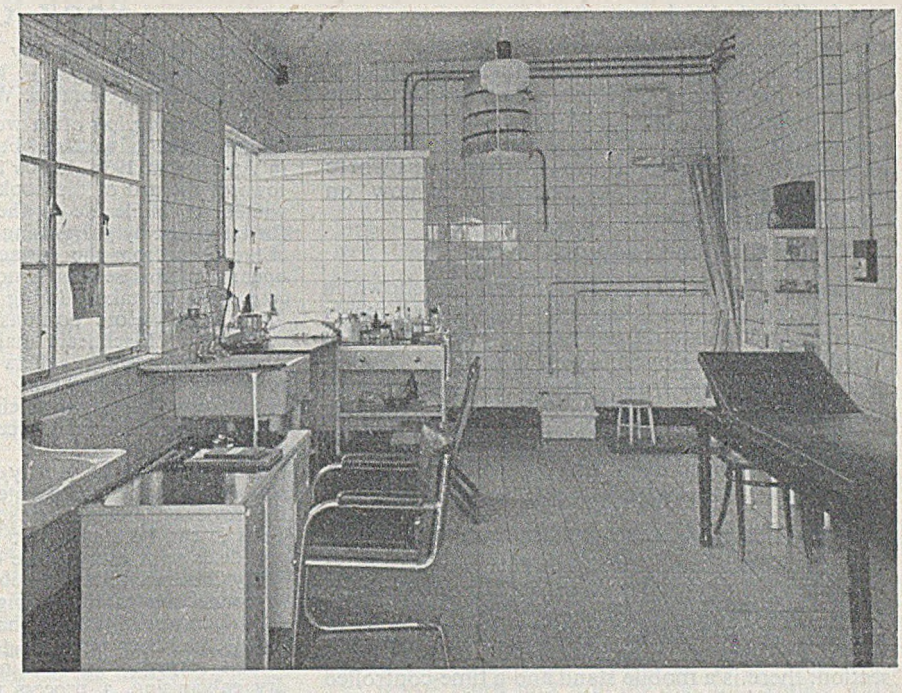


FIG. 10.—*Well-equipped Ambulance Room, the Walls are faced with Glazed Tiles from Floor to Ceiling.*

duplex grinding wheels, while the heavy dressing shop (Fig. 6) includes Hi-cycle grinders, swing-frame and duplex grinders and shielded arc-welding booths equipped with bogies. The heavy shop also accommodates the Wellman heat-treatment furnace, and it will be noted, by reference to Fig. 1, that it has been sited to line up with the possible future extension of the existing buildings as 50 ft. and 60 ft. wide bays. The height of the new shop is 35 ft. to eaves and 28 ft. to crane rail.

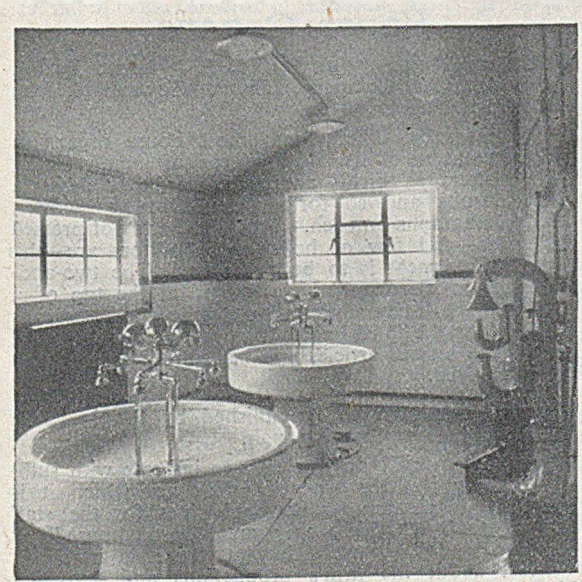


FIG. 11.—*Part of the Washing Facilities for Foundry Personnel, these have now been in Use for Some Considerable Time.*

Heat-treatment of Castings

The heat-treatment of the usual run of castings is a normalising procedure, although at Bathgate, on the new furnace, facilities are available also for quenching and provision is left for other modifications which may later be required to this plant. The newly-installed plant is a Wellman-Smith, double-bogie, coal-fired furnace, shown in Fig. 6. The chamber is 10 ft. wide by 14 ft. long by 6 ft. to the bottom of the arch roof. Coal "doubles" is the fuel used in an automatic stoker of advanced design which gives positive air/fuel control on a pre-set thermostatically-regulated cycle. To some extent, also, atmosphere control is possible. This furnace is operated each week on two 24-hr. cycles; four bogies are available. The heat-treatment cycle normally followed is that suggested in the British standards specifications for the various grades of castings and includes a soaking time of, roughly, 1½ hr. per in. of section.

Additionally, there is a smaller coal-fired, batch-type normalising furnace. This has a chamber 9 by 8½ by 4 ft. high over the bogie and is used mainly for mine-car wheels.

Patternshop

The patternshop (Fig. 7) is in a separate, well-lighted and well-equipped bay and is kept busy mainly in providing all the patterns for the company's own production lines (but including also some for the associated foundries) and on repairs and alterations to customers' patterns. The pattern-making machinery normally to be found in shops of this size—planing machines, band saws, and the like—is provided in convenient locations. Additionally, some of the smaller machines are fitted with wheeled carriages so that they can be

North British Steel Foundry

moved about the shop—electric "points" being available for plugging-in the machines. As with the whole of the factory, line-belt driven machines are being replaced by individual-drive machines in a progressive manner. This provision applies most importantly, of course, to the machine shops where over 90 per cent. of the machinery is now on individual-drive systems.

Amenities

Views of the well-equipped canteen are shown in Figs. 8 and 9; there is capacity for 240 full meals per day and about 40 per cent. of the 500 or so North British employees use it regularly. Admittance to employees from adjacent works is granted. Fig. 10 shows a view of the fine ambulance room, and Fig. 11 part of the washing facilities. Locker accommodation is shortly to be provided.

Laboratories

Laboratory facilities are provided on an adequate scale. In addition to the normal requirements of physical and chemical testing there is available gamma-ray equipment for radiographic work. The apparatus is a 200 milligram radium source which in 12 hr. will permit a radiograph of a 6-in. thick section; there is a mobile stand and a time-controlled exposure unit included with the equipment. The metallographic section is served by a Reichardt microscope. The sand laboratory is well supplied with the usual permeability, green- and dry-compression testing and sieve-shaking equipment and there is a small August's experimental mixer and a Buchanan-pattern drying oven. A "Speedy" equipment is used in the foundry for moisture determinations on the moulding sands.

Publication Received

Driving of Large Aluminium-alloy Rivets. Issued by the Aluminium Development Association, 33, Grosvenor Street, London, W.1.

This new handbook is the result of research initiated by the Association in 1947. The increasing use of aluminium plates and sections for structural purposes has created a need for aluminium rivets of ½ in. dia. and over. While the aircraft industry has many years' experience of aluminium rivets up to ⅜ in. dia., there has been a lack of data on the larger sizes, and the present investigations into manufacture, properties and driving characteristics were designed to fill that gap in knowledge.

This publication contains tentative recommendations on the selection of suitable alloys for large rivets, the methods of driving them, and the merits of various point shapes. Driving practice is given for squeeze and pneumatic hammer riveting (as appropriate) of snap, pan, C.S.K., N.A. cone and flat points; and for hot-closing. The modified pan, recessed and annular rivets are dealt with separately and their relative dimensions are given. Concluding notes are on hole clearance and edge distances.

THE MINISTER OF FOOD announces that during the period from March 4 to 24, the price of linseed oil to bulk purchasers will be increased from £144 to £160 per ton naked ex works.

Book Review

Galvanising (Hot Dip). By Heinz Bablik. 3rd Edition. Published by E. & F. N. Spon, Limited, 22, Henrietta Street, London, W.C.2. Price 70s.

The reviewer has often wondered to what extent iron castings were galvanised. From Table III we learn that in America in 1939, 15,606 tons were so treated. Now towards the end of the book (page 472) it is stated that whiteheart malleable is the favourite ferrous casting for treatment by galvanising because annealing removes the carbon from the surface. The translation of the opening of this section is not quite satisfactory. Then care must be taken during pickling because an over-attack may expose portions of the surface containing graphite. Blackheart malleable, translated as "all black," apparently suffers embrittlement and some reasoning is given for this. Yet the physical properties given for whiteheart are such as would not pass to-day's specification. This section certainly needs rewriting and modernising.

Now it would be grossly unfair to judge a book of 500 pages on the two devoted to a section about which the reviewer pretends to some specialised knowledge. Thus it can be stated that the book is comprehensive and deals with every phase of the subject. It is excellently illustrated and the objection the reviewer raised in connection with the original German edition, that manufacturers' literature had been drawn upon too largely, has been attended to. It is now well-balanced in this respect. There is much information given on dry galvanising, a process not much practised in this country, but nevertheless interesting. Finally, the Author is looked upon by those best qualified to judge as the outstanding authority on the subject and this volume is regarded as the standard work of reference on the subject. The cost of this type of book is getting progressively heavier and must be eating into the grants made to University students. One book is now costing as much as a complete range when the reviewer was a student.

V. C. F.

House Organs

Cracks and Crazes, Vol. 2, No. 3. Issued by M. Cockburn & Company, Limited, Gowanbank Iron Works, Falkirk.

This magazine differs from most house organs in the presentation of its news; instead of merely listing such matters as births and marriages, new arrivals, sports results and so forth, the Editor has written chatty paragraphs on each. Provided he is not pressed for space—and few of house-organ editors are—this form of treatment is to be welcomed. The two-and-half-page article should have started at the top of a page and the funny stories—some quite good—used as a fill-up for the third page. The reviewer is appreciative of the serious articles and news-briefs which have been included.

Group Autumn, 1950. Published by the Marshall Organisation, Gainsborough.

A study of this magazine fails to indicate with sufficient clarity just the type of public for which it is intended. There are no personal notes for the staff and of their activities, only an "open house" is included. For overseas buyers, there is much of interest about the firm's productions and activities. Yet in the main the articles are of a general character such as one would expect to find in a magazine. At any rate, it is nicely produced, well edited and illustrated, and pleasurable to read.

Gas-turbine Steels and Alloys

Iron and Steel Institute Symposium in London

SOME 650 MEMBERS AND GUESTS of the Iron and Steel Institute attended each session of the two-day Symposium on high-temperature steels and alloys for gas turbines in the Great Hall of the Institution of Civil Engineers in London on February 21 and 22. Forty technical papers were presented and discussed by Britain's leading metallurgists.

On the first day, an audience filled the Great Hall of the Institution of Civil Engineers to hear SIR FRANK WHITTLE deliver the fifth Hatfield Memorial Lecture and speak on "Turbine Problems in the Development of the Whittle Engine." He paid eloquent tribute to the part played by Dr. Hatfield and his team in helping to develop steels which eventually made the first jet engines possible and traced the development of the engine to the present day, dwelling mainly on the engineering aspects of the problem encountered and solved.

SIR ANDREW McCANCE opened the metallurgical sessions of the symposium on the morning of February 21, welcoming delegates from home and overseas. Despite the wettest February on record, over 600 people attended and again filled the Great Hall. Sir Andrew pointed out that the subject matter of the conference was of vital importance in these days. Owing to the scarcity of fuel, it was essential to develop higher thermal efficiency in engines. This inevitably introduced difficulties with regard to materials capable of withstanding and operating at high temperatures. Sir Andrew then installed MR. D. A. OLIVER, director of research, B.S.A. group and chairman of the organising committee, as chairman for the remainder of the symposium.

Mr. Oliver said the symposium had been proposed by the Council of the Iron and Steel Institute over two years ago, in order to gain a cross-section of work carried out in the last 10 years on materials for use at high temperatures, especially from the metallurgical viewpoint. Part of the work in the past 10 years had been hitherto veiled by security measures in wartime. The current shortage of alloying elements had much influenced the choice of metals, making the study of substitute alloys very important. He regretted that no Papers from overseas sources could be included, but hoped that the discussion would be enriched by comments from overseas delegates.

The Papers and discussions will eventually be published as Iron and Steel Institute Special Report No. 43—this should become an invaluable reference book.

Papers were presented in groups by rapporteurs, discussion taking place immediately afterwards. DR. N. P. ALLEN (National Physical Laboratory), in an introductory talk, gave an able appraisement of the world development of creep-resisting alloys.

DR. H. SUTTON (director, Research and Development of Materials, Ministry of Supply) then followed as rapporteur for Papers dealing with supplier aspects, which were covered by nine contributions on nickel-base alloys and the austenitic and ferritic steels now being produced in this country for use in gas turbines. The development of the nickel-base Nimonic 80 type of alloy was traced in detail in the Paper by DR. L. B. PFEIL and his colleagues of the Mond Nickel Company, Limited. The G.18B and other gas-turbine steels of Jessops, the Firth-Brown Cr/Ni/Nb austenitic steels, and products of Hadfields, Limited, English Steel Corporation, Limited, and the United Steel Companies, Limited, were well described in papers by authors from these firms.

SIR WILLIAM GRIFFITHS, late chairman of the Mond Nickel Company, Limited, stressed the need for metallurgists to keep abreast, and even ahead, of aeronautical and power plant requirements in the field of high-temperature alloys. He paid tribute to authors who endeavoured to speak "the truth, the whole truth and nothing but the truth," while intimating that developments had not progressed as smoothly as one might assume from reading the Papers. Much fruitless research was not reported. And, at this time, although secrecy bans had been lifted, much could still not be discussed. Great advances had already been made far beyond the research described in the Papers.

Special Casting Techniques

A separate section of the symposium was devoted to special casting techniques. Brief synopses of the papers presented in this group are:—

A paper entitled "Centri-spun High-alloy-steel Aero-engine Components," divided into two sections covering the process and properties of the castings respectively, was given by MR. A. E. THORNTON and MR. J. I. MORLEY, of Firth-Vickers Stainless Steels, Limited, who described the manufacture of Centrispun high-alloy steel aero-engine components. Centrispinning consists essentially of the introduction of liquid metal into a rapidly rotating mould in such a way that the metal is directed under centrifugal force to take up the shape of the mould into which it is being poured. It can, therefore, be safely assumed that, within certain limitations, centrispinning can be applied to all metals.

Centri-die castings of 25 per cent. chromium/12 per cent. nickel/tungsten steel, if highly duplex in structure, are susceptible to marked sigma embrittlement and have inferior creep resistance at 700 and 800 deg. C. The Authors suggest that castings of this composition are therefore to be avoided.

The higher-nickel, fully austenitic steel, by comparison, has excellent creep properties at 700 and 800 deg. C., but its room-temperature ductility is governed by the section thickness of the casting. Large cast sections have lower ductility, owing to an

Gas-turbine Steels and Alloys

intense precipitation of carbides in the grain boundaries.

The composition of H.R. Crown Max (Type III) is an improvement in one direction and a compromise in the other. The nominal percentage analysis of this alloy is:—C, 0.22; Si, 1.00; Mn, 1.00; Cr, 23.5; Ni, 12.0; W, 2.7. It is almost completely austenitic at room temperature, yet has some transient high-temperature ferrite, which serves the useful purpose of dispersing the carbide precipitation. The result is a highly ductile casting. However, since the composition is so close to the ferrite boundary, its creep resistance, though adequate for most purposes, does not quite equal that of the fully austenitic steel; on the other hand, its ductility in the rupture test is higher. The choice of steel depends on the application in view.

Centrifugal steel castings for gas turbines were described by MR. J. TAYLOR and MR. D. H. ARMITAGE, of David Brown Foundries.*

A paper entitled "Investment-casting of Nozzle Guide Vanes," by MR. H. E. GRESHAM, B.SC., and MR. A. DUNLOP, A.I.M., describes the modern development of the old lost-wax process of casting as applied to the manufacture of nozzle guide vanes for gas turbines. Factors affecting dimensional accuracy are discussed and some of the creep properties of investment-cast alloys suitable for nozzle guide vanes are given. It will be remembered that Mr. Dunlop was responsible for one of the early papers on this subject given to the Institute of British Foundrymen.†

A further contribution dealing with the lost-wax process was given at the Symposium by MR. E. R. GADD. This was entitled "Precision Casting of Turbine Blades," and described briefly the methods used in a particular foundry. Emphasis was placed on the need for precise control at all stages and particularly in the preparation of the wax model. The casting defects likely to be met with, and their causes were detailed and, finally, some information was given on the high-temperature fatigue properties of cast alloys, and a laboratory method for determining the resistance to thermal shock was outlined.

Sweat Cooling

The performance of gas turbines can be improved by raising the maximum temperature in the cycle. A considerable increase in the operating temperature can be accepted when the components most exposed are cooled. Various methods of cooling have been proposed. In a Paper by MR. P. GROOTENHUIS and MR. N. P. W. MOORE (City and Guilds College), the method of sweat-cooling is discussed, and the literature on its mechanism and its application to the gas turbine is reviewed. Some design considerations for sweat-cooled components are examined. A component is sweat-cooled when the cooling fluid is forced through the pores of the component towards the surface exposed to the heat source.

* Abstract printed on the adjoining pages of this issue.

† A. Dunlop. Proc. Inst. Brit. Foundrymen, 1944-45, vol. 38, p. B.1.

Research and Development

It is, of course, impossible in this summary of the Symposium to fully cover all the papers, but the paper, by MR. C. A. BRISTOW and DR. H. SUTTON (Ministry of Supply), on "Research and Development on High-temperature Materials," in itself effectively places on record the present and future position of metals for gas-turbine metallurgy. They discuss the problem from the aspects of availability of metals and their metallurgical value. Basic metallurgical information on the constitution of alloy systems is required not only in connection with research and development towards better high-temperature alloys, but also for improvement and further development of known types. Work in hand in Great Britain to improve the position in this field includes studies of the following systems:—

Cr-Mn Co-Mn Ni-Mn Ni-V	Dr. W. Hume-Rothery Oxford University).
Fe-Cr-Ni (and added elements)	Dr. N. P. Allen (National Physical Laboratory).
Fe-Cr-Mo Fe-Cr-W Cr-Co-W Cr-Co-Mo	Mr. D. A. Oliver, Mr. H. J. Goldschmidt (B.S.A. Group Research Laboratories).
Co-Ti Co-Be Ni-Cr-W Cr-Co-W Cr-Co-Mo	Dr. T. Raine (Metropolitan-Vickers Research Laboratory).
Co-Cr-Mo	Prof. G. W. Austin, Mr. A. G. Metcalfe (Cambridge University).
Ni-Cr-Al Ni-Cr-Ti Ni-Al-Ti Ni-Cr-Co	Dr. L. B. Pfeil, Mr. H. W. G. Hignett (Development and Research Department Laboratory of the Mond Nickel Company, Limited).

This symposium has gone a long way to giving clarity and colour to the study of gas-turbine metallurgy, and all those interested in the subject as users or producers of metals will feel grateful to the Iron and Steel Institute for having arranged the symposium and to the authors of the individual Papers for the trouble they have taken.

Symposium Dinner

A special dinner for members and guests of the Iron and Steel Institute attending the symposium was held at the Hyde Park Hotel, London, on February 21. The toast to the guests and overseas visitors was proposed by Sir Andrew McCance, who paid tribute to the tenacity of purpose and personal courage of Sir Frank Whittle in developing the gas-turbine engine; the response was by Dr. H. Roxbee-Cox, of the Ministry of Fuel and Power. Mr. E. W. Senior, of the British Iron and Steel Federation, congratulated the organising committee for the excellent efforts, Mr. D. A. Oliver replying.

A SHORTAGE OF DRUM CONTAINERS, occasioned by a scarcity of sheet steel, has temporarily reduced production of chemicals at some of the factories of Imperial Chemical Industries, Limited.

Centrifugal Steel Castings for Gas Turbines*

By J. Taylor, A.Met., F.I.M., A.I.Mech,E., and D. H. Armitage

[ABRIDGED]

The evolution of the production of centrifugal castings is briefly described, and the fields of application of the horizontal and vertical-axis methods are outlined. A complete description is given of the method of manufacture and of the stringent inspection procedure applied in order to attain the high standards that are essential for production of gas-turbine components. The results of mechanical tests on the castings substantiate the claim that they are at least equal to those of the highest grade wrought products.

THE APPLICATION of the gas turbine to the propulsion of aircraft gave rise to problems of production because essential components of this type of power plant were generally in materials that were neither easy to machine nor easy to forge or roll. To overcome this difficulty, cast components, having contours closely approaching the finished form, were used. Castings equal in quality to wrought products could be produced, provided the necessary care was taken in their manufacture, by a development of the technique for structural castings for aircraft already in use at the David Brown Foundries, Penistone.

An essential requirement is that not only shall these castings be free from unsoundness even of a microscopic order, but that the crystal structure shall be such that the inherent qualities of the material are developed to the fullest extent. It had been found by manufacturers of highly-stressed gears that cast bronze rims, produced by carefully-controlled vertical-axis centrifugal methods, were greatly superior in service to those manufactured by the more orthodox means, and it was on this experience that the production of the high-grade steel castings was based. There is a marked difference metallurgically between the plain rings produced in steel moulds, and those in which the more complicated forms are cast in sand. In the former, freezing proceeds inwards in a radial direction; in the latter this tendency is not so pronounced. This desirable feature is present to a far greater degree, however, than in the normal gravity-fed type of casting.

Alloy Steel Castings

The gas turbine utilises components that are essentially rings of diverse sectional form, and it is more economical to produce these by the horizontal or vertical-axis method of centrifugal casting, or "centri-spinning," in which a metal mould forming the external limiting surface of the casting is rotated at a pre-determined speed and the metal is poured into this from a trough or "launder." The friction between the mould and the metal results in the latter being "picked up" by the mould, and hence a ring-section casting is formed. Since there is no containing face on the interior of the casting, the thickness of the ring is controlled by the amount of molten metal introduced into the mould. From these castings the requisite shape of the ring is machined.

By this method it has been found possible readily to manufacture large quantities of these rings in materials having high alloy contents, which would have been extremely difficult to make by forging.

In addition to the plain ring type of casting there was a need for large thin-walled castings of extremely complex design in similar materials. It is essential that the complex castings should be perfectly sound and that they should have a close dimensional tolerance to finished size over large surface areas, which are impossible or extremely difficult to machine.

It was considered that these castings could be satisfactorily produced by the vertical-axis method of centrifugal casting in sand moulds that had been developed for the production of high-tensile steel castings to specifications D.T.D. 666 and 705.* The development of this method presented many more foundry problems than did that for the production of plain rings. The coreless casting of plain rings in steel was possible after modification of the die design used in the production of bronze rings.

The outstanding founding difficulties experienced with the centrifugal casting of steel into sand moulds initially arose from the need for a suitably-bonded sand which would not break down at the temperatures involved, erode with the passage of metal, nor be so hard as to cause hot-tearing. Various sands were tried and an oil-bonded silica sand painted with a refractory wash was finally found to give satisfactory results.

Following the initial development work, a foundry unit was laid down and subsequently approved by the Aeronautical Inspection Department for the production of alloy steel castings for use in aircraft.

Manufacturing Operations

A strict control over all manufacturing operations is needed to maintain the necessary quality. An outline of the process and the control at each stage now operated at the works with which the Authors are associated is as follows:

On receipt, drawings are passed to the methods section, and any proposed modifications that would facilitate the production of a satisfactory casting

* A Paper included in the Symposium on "High Temperature Steels and Alloys for Gas Turbines" organised by the Iron and Steel Institute; the Authors are at the David Brown Foundries, Penistone, near Sheffield.

* Specifications D.T.D. 666 and 705 relate to heat-treated low-alloy steel castings for use on aircraft as structural components. Respective minimum ultimate tensile strengths are 60 and 76 tons per sq. in.

are discussed with the designer. In many cases it has been possible to offer suggestions that have saved weight or alternatively have avoided difficult machining operations. A sketch showing the finished contour with an indication of runners, heads, brackets, etc., is then passed to the pattern-shop and a master copy retained in the methods section for record purposes; should alterations in the details of production subsequently be found to be necessary they are recorded on the master copy.

The patternshop breaks down the parts into fairly simple shapes (as used in the all-core process), which can be moulded on a repetition basis. In the moulding shop samples are taken regularly from the sand to ascertain the grading, permeability, transverse and tensile strength. The moulds are dried in a thermostatically-controlled stove and are then painted with a standard refractory wash. They are dried finally under infra-red lamps to remove any moisture which may have accumulated because of the hygroscopic nature of the paint.

The moulds are now ready for assembly, the sections interlocking within the casting boxes to give the required dimensional accuracy. The spinning speeds are usually lower than with the coreless castings, and a peripheral speed of 1,000 ft. per min. is normally used. The spinning is controlled, according to the diameter of the casting, by variable-speed motors driving the casting machines. The steel is melted in a high-frequency furnace melting unit, and tapping temperatures for all heats are controlled by an immersion pyrometer. After the moulds are stripped, a reference number is stamped on all castings.

To ensure that the actual castings produced to specifications D.T.D. 666 and 705 exhibit the optimum properties of which the material is capable, "cut-up" tests are carried out on specimen castings before production is commenced and when any modification in the method of casting is invoked. The cut-up test consists of maximum sectioning of the casting for macro-examinations, and tensile and impact determinations, as far as practicable on every portion of the casting. Should even one characteristic be below the specification requirements the foundry method is altered and a further cut-up test or tests are carried out until the casting is satisfactory.

To remove the slightest discontinuity which could act as a stress raiser, the skin is removed from all surfaces. This requirement, which is incorporated in specifications D.T.D. 666 and 705, applies equally to heat-resisting castings where normally large surface areas are unmachined, and very careful dressing is therefore required. The castings are inspected after dressing. A complete X-ray examination and crack detection to approved techniques is carried out on all castings. The inspection procedure laid down for the examination of castings to specifications D.T.D. 666 and 705, was extended to include the complex heat-resisting castings; 400-kv. and 220-kv. X-ray plants are available solely for the examination of aircraft steel castings. In addition, radium, radon, and, recently, radioactive isotopes are being utilised. The selection of the particular method is governed by the thickness of the casting at the area under consideration. The electromagnetic method (direct and alternating current) is used for crack detection of magnetic materials and the fluorescent method has proved to be satisfactory for the non-magnetic materials.

The results of these examinations are recorded, together with an analysis, heat-treatment, and dimensional inspection.

Materials

The materials constituting these centrifugal castings are essentially of two types:

(1) Castings operating at normal atmospheric temperature, but which are produced in high-tensile steel for weight reduction.

(2) Castings operating at high temperatures, up to 800 deg. C., where strength at elevated temperatures and resistance to scaling are of primary importance. In such castings imperviousness to gases is an essential requirement, and in certain instances satisfactory weldability is made necessary by the method of construction.

The high-tensile steels are of the low-alloy type containing generally up to 1½ per cent. of chromium, 2 per cent. of nickel, and about ½ per cent. of molybdenum, with 0.3 per cent. of carbon. The limits of impurities imposed by the relevant Air Board specifications D.T.D. 666 and 705 demand that the sulphur content shall not exceed 0.020 per cent., and the phosphorus content 0.025 per cent., so that the ductility and toughness should be fully developed. The mechanical properties obtained by the cut-up test are given in Table I.

TABLE I.—*Mechanical Properties of Engine Mounting Cone Casting.*

Position	0.1 per cent. proof stress, tons per sq. in.	Y.P. tons per sq. in.	U.T.S. tons per sq. in.	Elongation, per cent.	Reduction in area, per cent.	Izod, ft.-lb.
1	52.0	56.0	60.9	16	39	—
2	—	—	—	—	—	62, 62
3	52.2	56.1	61.0	17	45	—
4	—	—	—	—	—	55, 55, 56
5	50.9	55.0	60.0	16	36	—
6	—	—	—	—	—	62, 61, 61
7	—	—	—	—	—	60, 60, 59
8	52.5	56.7	61.5	18	42	—
9	—	—	—	—	—	62, 61
10	50.8	54.4	60.0	16	42	—
11	—	—	—	—	—	58, 56
12	51.7	55.2	60.8	17	47	—
D.T.D. 666	45	—	60.0 (min.)	12 (min.)	30 (min.)	30 (min.)

The castings, which operate at elevated temperatures, are produced in materials of rather widely differing compositions. The three types most widely used are (*a*) 18 per cent. chromium, 8 per cent. nickel, 1 per cent. niobium, (*b*) 25 per cent. chromium, 12 per cent. nickel, 3 per cent. tungsten, and (*c*) 80 per cent. nickel, 15 per cent. chromium.

Certain standards are laid down for the mechanical properties at normal temperatures, but at elevated temperatures the high-temperature properties are even more important, and although inspection tests are not generally demanded, composition

(*Continued on page* 265)

Notes on Productivity

THE REPORT of the Grey Ironfounders' Productivity team has been discussed in many centres. Below we have culled abstracts of reports received from meeting held in Bradford under the ægis of the Institute of British Foundrymen and the West Riding Ironfounders' Association.

MR. JUDD, referring to the requisition of new plant, said the Report urged foundry owners to buy more machinery. One of the adverse factors was the high rate of taxation. In America they had a Corporation duty which took 38 per cent. of the Company's profits. In Britain it could be anything up to 65 per cent. of a Company's profits. The unfortunate foundry owner found it quite impossible to retain sufficient of the profits to buy new plant, and if taxation of companies continued in Britain at its present level there would not be the finance available for this purpose. It could be obtained by borrowing money, but that would not solve the problem in the end. But money was diminishing because the Inland Revenue was taking so much away One thing that would have to be done was that accountants were realising and beginning to recognise more and more that it was not sufficient to charge depreciation on the cost of the plant bought five or ten years ago, but one should charge something as well to take care of the fact that the plant bought ten years ago would cost twice as much to replace. A Committee called the "Tucker Committee" had been told this was happening and the Inland Revenue ought to permit firms to calculate on profits in this fashion. It was hoped that firms would soon start to prepare their accounts in this new way to take care of the inflated cost of replacement.

Plant Reserve

MR. NICHOLLS asked whether Mr. Judd could confirm that if at the end of the financial year a firm decided to create a reserve to spend on plant over the next three years they would be able to claim it as "tax free" profit provided it was proved that they had spent the amount on new plant.

MR. JUBB said that was not quite the position. In Britain there was taxation and super-taxation on individuals. In America, those who owned foundries took care not to distribute profits to themselves, so that their income was not high. The Government recognised that it must be allowed to withhold from distribution so much of the profits. What they would hold attracted Company tax but it would not attract surtax.

MR. F. K. NEATH asked whether it was found the practice in America to charge castings out at so many cents per pound or so much per piece, and was there any definite view in that direction? Did the team find a chart which the American steel foundries drew up which stated the price to charge each per casting dependent upon the number off. He recalled that when there was one off or say 15 or 20 it was charged by the dollar, and it came down somewhat as the number increased. When it came to say a thousand off it became cents. The reduction was really great once the quantities off became large, and the point they were trying to drive home was—"Do not take on odd jobs for a very low figure because the man next door is making thousands off at a lower price."

MR. JUDD said the majority of foundries visited were actually charging in terms of a price per each casting. He did not think that was widespread because the journal of the Gray Iron Founders' Society was publicising articles supporting the pricing of each casting individually.

MR. JOHNSON: Any complete costing system should have some scale on which to measure the actual cost of castings. If foundries have a complete costing system of that sort, how is it got across to the foundry personnel?

MR. JUDD, referring to costing, said one American firm took the foreman out to dinner once a month, and after dinner they discussed costing for the rest of the evening.

MR. NICHOLLS, referring to production, said that of the 24 foundries visited, in the machine tool foundries they split casting weights into four sections, one section up to 14 lb., another up to about 1 cwt., a third section up to 3 cwt., and the fourth up to about 11 tons. On one of these the pattern changes were 2½ thousand per month. They were turning out 11 thousand per year and they were not working to capacity. The largest casting was 11 tons and the smallest was a matter of pounds.

Returned Scrap

MR. THORNTON: What was the method in American foundries with regard to returned scrap? Did they charge it back as scrap from outside?

MR. JUDD: They just took the cost of the metal from outside and divided that by the weight of good castings produced. This was going round and round in a circle, what we gain on the swings we lose on the roundabouts. If there was any depreciation in yield, one could overcost where the yield was high and undercost where the yield was low. You reckon up the amount of metal consumed during a period. You take one from the other and then you work out the metal that has gone into the cupola and then you arrive at the metal poured. After that you have two things to do, you have to reckon up the cost of the ingredients going into the cupola, and from that the cost of the metal poured, and then take it from the value of the scrap, and you value that scrap on the average price of the ingredients in that mix. You charge every casting with the cost of the metal and the cost of melting the metal that has gone into it, and the cost of melting the metal that has not gone into it.

MR. ILLINGWORTH was interested regarding this question of quoting per piece, was there any safeguard taken when doing that as regards the weight of the individual casting. If when one was

Notes on Productivity

quoting per piece from a weight worked out for that piece, it did not always follow that that weight would be correct. Therefore if you have quoted per piece and the casting has come out less what safeguard is taken against that.

MR. JUDD: Before an American quotes per piece he makes sure that everything upon which he has based his costing is correct. He runs off a sample casting.

MR. ILLINGWORTH: What if there was only one off?

MR. JUDD: If there was only one off he charges a high price.

MR. NICHOLLS: We did note that the principle was thoughout the industry if there was only one off the cost was higher, the founder had to do this to cover himself.

MR. BERWICK: Was it not usual when selling a casting per piece to over-estimate the weight and when selling a casting by weight to attempt to under-estimate weight?

MR. NICHOLLS said that he invariably found that the difference of weight from designer to founder was usually between 10 to 20 per cent. It was quite normal for the foundry to assume that if a casting was calculated at 10 tons on the drawing, it could be taken as 14 tons.

MR. NEATH: Mr. Kirkham mentioned how much care was taken of the boxes. Did he have occasion to get to know the pin clearance allowance, was it 2 thou. or $\frac{1}{2}$ in.?

Plant Design and Use

MR. KIRKHAM, replying to Mr. Neath on the subject of moulding boxes, said they did not use bushes in the usual sense of the word but a V-slot with a pin between them with a 2 thousandths. in. allowance. These bushes were secured to the moulding box by two screws which could be readjusted immediately.

MR. JOHNSON, in connection with that, he wondered if there was any regular inspection system instituted. In the report there was a description of the refractory gun. He would be very interested to have information as to how it could be applied to a similar diameter of cupola.

MR. NICHOLLS, referring to the refractory spraying gun, said the operator needed at least 36 in. diameter, below which figure it would be difficult to operate the gun nozzle, because of the intense bounce back, when the operator on leaving the cupola might have nearly as much patching on himself as on the cupola. From the information received at two foundries using the gun it was learnt that one could prepare the lining to a more uniform diameter and therefore obtain better conditions. In one plant they had already recovered the cost in 12 or 16 weeks, the machine had paid for itself in labour and material. It was possible to line a furnace regularly to a standard diameter; better melting conditions were obtained.

MR. KIRKHAM said that in this country in many plants are utilised units such as Sandslingers but they were only working a small percentage of production hours. Sandslingers were perhaps used for two or three hours per day, but in America if that unit was not being used all the time during an eight-hour shift it was taken from the floor. Every square foot must be productive or it could not be occupied. Spare parts for the conveyor were being prepared and were quite capable of being dropped in at a few minutes' notice.

MR. NICHOLLS said one foundry used the method of pattern changing on a spare table top. All pattern changes were carried out in the patternshop and then the table top was taken back again.

In reply to a vote of thanks MR. THORNTON, after thanking the proposer and seconder, said referring to Mr. Blakiston's remarks regarding his long association with the Institute, he could claim to be the only active member who was present at the formation of the West Riding branch, some 28 years ago. Due to ill-health he had resigned from the General Council at the end of last session, having served 25 years. On doctor's orders he was resigning all his honorary offices, and just recently he had vacated the Chair of the West Riding Ironfounders' Association, so this was his swan-song, but it did not mean that he would not participate in meetings, but for the time being he was advised to take things easier.

Machine Tools in Schools

Plans to enable boys to use machine tools before they leave school are being considered by the Secretary of State for Scotland, Mr. Hector McNeil. Experts believe that if boys were able to get the feel of power-driven tools and other machinery, it would give them confidence and be of great benefit when they went into industry. The Scottish Education Department is circulating a memorandum to all secondary schools recommending a considerable expansion in technical education. "The ability to investigate independently," said Mr. McNeil, "is one of the highest virtues in the traditional Scottish educational system. A robust, and even disrespectful, curiosity should be found in every boy leaving school."

A.I. Apprentice School

Allied Ironfounders' apprentice training school for moulders in Castle Laurie Works, Falkirk, continues to expand and another class of boys started work at the beginning of this year. Continuing their policy of keeping close contact with the parents of the boys, the firm are holding a parents' and friends' open day on March 10, at which parents and friends of the boys attending the school will be given an opportunity of seeing the type of work on which the boys are engaged and working conditions, and will have any of their queries answered.

This training scheme, which is the only one of its kind as far as is known in the light castings industry, has the full support of the trade unions. It is an extremely interesting experiment and the management are confident that the standard of craftsmanship of the boys, once they have completed their training, will be high. It is hoped also that the steps being taken to build the character of the boys will also meet with success.

Stress Relief and Allied Problems in Magnesium-alloy Castings*

By R. J. M. Payne, B.Sc. F.I.M.

[ABRIDGED]

A METHOD is described by which the degree of stress relief resulting from any given annealing treatment may conveniently be assessed. The method is capable of general application to stress-relief annealing problems and has been used to establish suitable conditions of treatment for a number of magnesium- and aluminium-base casting alloys.

The problems associated with the heat-treatment of the following four Elektron casting alloys for purposes of stress removal are discussed in detail: (1) the magnesium/aluminium alloy AZ91; (2) the magnesium/aluminium alloy A8; (3) the magnesium/zinc/zirconium alloy Z5Z; (4) the magnesium/ rare-earth/zirconium alloy MCZ. It is shown that with (3) the relief of casting stresses and the precipitation-hardening of the alloy can be carried out simultaneously in a single heat-treatment. The problem of the magnesium/rare-earth/ zirconium alloy is of special interest, as annealing at the temperatures customarily used for the removal of casting stresses is detrimental to the creep-resisting qualities of the alloy, which are its principal attraction.

The work was carried out to provide information urgently needed by the production foundry, and has some shortcomings if viewed as a scientific study of stress removal. The results are, nevertheless, thought to be of interest, and the Paper has been written with a two-fold objective: (1) to describe a very convenient method of establishing suitable annealing conditions for castings which is capable of general application,† and (2) to place on record the results obtained with a number of magnesium-base alloys; it may be noted here that the annealing conditions which emerged as most satisfactory for the standard magnesium/aluminium alloys have been used industrially over the past five years.

Method of Assessing Stress Relief

Magnesium castings are most widely used in industry in the as-cast and in the solution-heat-treated conditions. Castings subjected to solution heat-treatment (at 415 deg. C.) are cooled in air after removal from the furnace and are substantially free from stress. Problems of stress removal are, therefore, confined to castings which have not been solution heat-treated.

A supply of castings stressed to a uniform degree is a first requisite for a systematic study in which the efficacy of any one annealing treatment is to be compared with that of any other. A direct method of attack would be to produce test castings so shaped as to develop internal stress on cooling in the mould. It was, however, thought very unlikely that any such method would yield consistent results, as the initial values of stress (which would be affected by variations in mould and casting conditions) would not be sufficiently under control and not be ascertainable in the castings actually used for stress-relief tests. It was considered preferable to take initially stress-free sand castings and to impose the required stresses upon them by straining to a controlled degree. The extent to which the known strain was subsequently relieved by annealing would be taken as a measure of the suitability of the heat-treatment conditions for the intended purpose. It was assumed that any observations and conclusions based upon test specimens artificially stressed in this way would hold equally well for castings in which the stresses had been developed by unbalanced contraction in the mould.

The form of test-casting adopted is shown in Fig. 1. In carrying out tests a stock of ring castings was first prepared, the metal being cast in green-sand moulds under careful control. After the removal of runners and risers the test rings were cut with a circular saw (see Fig. 1), particular care being taken to avoid distortion in clamping the castings to the table of the milling machine. Castings made in this way are substantially stress-free or, at least, in stress equilibrium, as is proved by the fact that no appreciable movement occurs on sawing through the ring.

Gauge marks were scribed upon the two sides of the casting at the points shown. The pieces were then stressed by the forcible insertion into the gap of a "wedge" [actually a piece of steel $\frac{3}{16}$ (± 0.0005 in.) thick, tapered at one end]. The magnitude of the stresses developed in this way is not accurately known,* but this was not a cause for any deep concern, as subsequent tests showed that residual

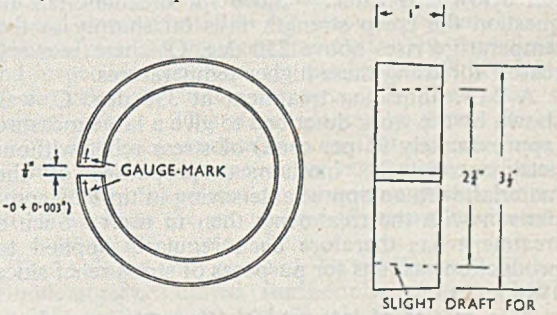


FIG. 1.—*Ring-test Casting.*

* A Paper presented to the Institute of Metals. The Author is research metallurgist, J. Stone & Company, Limited, London.

† The same principle has recently been used by Hallett and Wing[2] for studying stress-relief problems in cast iron. (FOUNDRY TRADE JOURNAL, 1949, 87 (1719), 177).

* At a later date the skin stresses developed in a ring casting by the insertion of a ☆-in. wedge were evaluated, using an electric-resistance strain-gauge. A strain of 0.093 per cent., corresponding in the A8 alloy to an applied stress of 2.3 tons per sq. in., was deduced from these measurements.

stresses were largely independent of initial stresses. It was, however, observed that the insertion of the $\frac{1}{8}$-in. wedge caused a very small permanent set, and from this it was deduced that the skin stress at the point of maximum bending moment must have been greater than that corresponding to the limit of proportionality of the material (approximately 1.6 tons per sq. in. for the standard casting alloys).

Sets of rings were annealed in a tubular electric furnace at the required temperatures with the steel "wedges" in place, then carefully removed and allowed to cool in still air with the wedges in position. When cold, the distance between the gauge marks was measured using a Cambridge travelling microscope. The wedges were then removed and a further measurement made. The "spring-back" was taken as a measure of the remanent stress in the ring, and it is with this remanent stress (a point of principal interest to the user of castings) that the Author was mainly concerned. In some circumstances it was, however, of interest to express the degree to which stress was relieved by a given annealing treatment, and a value for percentage stress removal was deduced from the initial and final strains, an allowance being made for the small permanent set which occurred through stressing the material beyond the elastic limit.

Casting Alloys AZ91 and A8

The measurements of stress in ring test castings of A8 (Al 8.29; Zn 0.66; Mn 0.22; Cu 0.05; Si 0.02; Fe 0.06; Mg remainder) and AZ91 (Al 9.78; Zn 0.51; Mn 0.22; Cu 0.01; Si 0.05; Fe 0.03; Mg remainder) have indicated the general relationship between initial stress, annealing time and temperature, and remanent stress. The degree of stress relaxation that will occur when a self-stressed casting is annealed will be determined by the creep behaviour of the material. For any annealing temperature chosen, the material will possess a limiting value for creep stress and, however long the annealing may be continued, the remanent stress can never fall below this value. Since for the materials in question the creep strength falls off sharply as the temperature rises above 250 deg. C., there is every reason for using these higher temperatures.

A 2-hr. annealing treatment at 330 deg. C. was shown by the work described to give a large measure (approximately 95 per cent.) of stress relief without detriment to the mechanical properties of the material, with an appreciable saving in time by comparison with the treatments then in use.* Such a treatment has therefore been regularly applied to production castings for purposes of stress relief since 1944.

As a matter of interest, an attempt was made to evaluate the stresses left in a ring casting after such an annealing treatment. By attaching an E.R. strain-gauge to a ring casting at a point diametrically opposite to the gap, the surface strains occurring when the gap was forced open by known amounts were determined experimentally. From these observations and a knowledge of stress/strain characteristics of the material it was concluded that the value for spring-back obtained after annealing A8 and AZ91 for 2 hr. at 330 deg. C. (roughly 0.08 mm.) corresponded to skin stresses of about 0.13 tons per sq. in.; this value therefore represents the maximum stress likely to be found in an annealed casting.

Magnesium Alloys Containing Zirconium

Magnesium/Zinc/Zirconium Alloy (Elektron Z5Z).

The casting alloy Elektron Z5Z, containing 4.5 per cent. zinc and 0.7 per cent. zirconium is generally used in the heat-treated condition, as this yields the high value for proof stress which makes the material attractive to designers; sand-cast D.T.D. test-bars thus treated show the following values in a tensile test:

0·1 per cent. proof stress	8·5 tons per sq. in.
Ultimate stress	15 „ „ „ „
Elongation	5 per cent.

This alloy was first made available in production quantities in 1946, a heat-treatment of 24 hours' duration at 180 deg. C. being recommended for the development of the full properties.

Creep tests made earlier had shown that the behaviour of a magnesium/zinc/zirconium alloy containing 3 per cent. zinc at 200 deg. C. was comparable with that of the standard magnesium/aluminium alloy A8, and there were no reasons for expecting that Z5Z, with its higher zinc content, would behave very differently. The tests undertaken had proved that 250 deg. C. was too low a temperature for effective stress removal with A8, and it could not, therefore, be expected that heat-treatment of Z5Z at 180 deg. C. (as recommended for the development of the optimum mechanical properties), would do much to relieve stresses present in castings as a result of unbalanced contraction. It was apparent, therefore, that if components were to be supplied in a stress-free condition, other conditions of heat-treatment had to be found. A further incentive arose from the need of the production foundry for a method of "setting" castings by heating.*

It was known that the heat-treatment of magnesium/zinc/zirconium alloy at temperatures of the order of 415 deg. C. (as ordinarily used for setting castings) was prejudical to the development of the highest proof stress, and some lower temperature had to be sought. The possibility of carrying out

* Provided that a furnace capable of raising the casting quickly to the annealing temperature is available. Gas-heated furnaces of the type in which the combustion gases circulate over the furnace charge fulfil this requirement.

* With certain classes of work of medium or large size but of thin wall-section, *e.g.*, aircraft window and door frames, close limits of dimensional accuracy are difficult to attain in castings as taken from the mould. In such cases it may be expedient to heat-treat the part on an accurately-shaped jig, at a temperature such as will cause the casting to yield plastically under applied weights; in this way the part may be made to assume the shape of the jig and troublesome warpage corrected. With the ordinary alloys this "setting" of castings is usually carried out in a solution-heat-treatment operation at 415 deg. C., as the type of work to which it is applied is generally called for in the homogenised condition.

the operation in the furnace used for the stress-relief annealing of castings in the standard magnesium/aluminium alloys was attractive, and the effect of annealing Z5Z at 330 deg. C. was accordingly investigated. The mechanical properties of sand-cast test-bars, heat-treated for 1 to 6 hr. at that temperature are given in Table I. It will be seen that the full proof stress of the material is developed in a heat-treatment of 2 hr., *i.e.*, the same duration as for the stress-relief annealing of the standard alloys. Practical tests with shaped castings showed that components could be "set" using a 2-hr. treatment at 330 deg. C., and stress-relief tests with ring specimens confirmed that the same process was effective for stress-removal purposes, some 97.5

TABLE I.—*Mechanical Properties of Z5Z Sand-Cast D.T.D. Test-bars Heat-treated at 330 deg. C.*

Time of treatment, hr.	0.1 per cent. proof stress,* tons per sq. in.	Ultimate tensile stress,* tons per sq. in.	Elongation, per cent.
1	9.1	17.6	10
1½	9.1	17.9	11
2	9.6	17.7	9.5
4	8.7	17.5	10
6	8.8	17.5	11

* The figures represent the mean value for two or more test-bars.

per cent. of the initial strain being removed. The 2-hr. treatment at 330 deg. C. was therefore adopted for use in the foundry on production castings†

Magnesium/Rare-Earth/Zirconium Alloy (Elektron MCZ).

The conclusions drawn from the work on the MCZ alloy (Mischmetall, 3.0; Zn, 0.6 per cent.) may be summarised as follows:

(1) Where the shape of the castings is such that they would not be expected to contain large locked-up stresses, and for those applications where small dimensional changes resulting from the release of internal stress could be tolerated, the alloy is best left in the as-cast condition.

(2) A small measure of stress relief can be secured by annealing castings for about 10 hr. at 250 deg. C., and such treatment will have no detrimental effect on creep behaviour at 200 deg. C. Stresses will not be reduced to a particularly low value by annealing at 250 deg. C., and the treatment may not prevent some distortion occurring on machining the component. The finished casting will, nevertheless, have been stabilised, and no further changes of dimensions should occur in service at 200 deg. C. Annealing at temperatures higher than 250 deg. C. seriously affects creep strength at 200 deg. C., and temperatures lower than 250 deg. C. are ineffective in removing internal stress.

(3) Where it is imperative that castings should be free from locked-up stresses, a high-temperature solution-treatment (at 570 deg. C.) is possible; the castings would be cooled in air at the conclusion of the solution-treatment to avoid the re-introduction of stress (through unbalanced cooling) which would occur in a quenching operation. From the present tests there would appear to be some but not much advantage in heat-treating castings at 200 deg. C. following the solution-treatment, but further experience is required to show whether either the solution-treatment or the double-stage heat-treatment, with the additional trouble, expense, and risk of distortion involved, could justifiably be applied to castings for stress-removal purposes. It may be added that earlier work has shown that the mechanical properties of MCZ are not appreciably changed by heat-treatment.

† At a later date, Magnesium Electron, Limited, pointed out some advantages in a two-stage heat-treatment. By heating the castings to 180 deg. C. for 24 hr. after annealing at 330 deg. C., slightly better mechanical properties can be secured than are obtainable by any single treatment. The low-temperature treatment does not re-introduce stresses, and castings dealt with in this way are therefore substantially stress-free. The two-stage heat-treatment is now standard practice.

Centrifugal Castings for Gas Turbines

(*Continued from page* 260)

limits are imposed to ensure that the mechanical properties are maintained. Type (*a*) steel is used where temperatures and/or stresses are not excessive; (*b*) is employed where conditions are more severe. The choice of material depends upon both the temperature and the stresses likely to be met in practice. Difficulty is experienced in machining both these materials, and free-machining varieties have been developed that possess equally good properties.

The third material (*c*) has a more limited application. It has good scaling resistance and strength at elevated temperatures, and has the advantage of a lower coefficient of thermal expansion than materials (*a*) and (*b*). It presents special production difficulties, however, when cast by certain methods, and a considerable amount of investigation was carried out before the desired standard was attained.

Summary

In certain instances these high-grade castings can also be successfully produced by the static method under similar foundry conditions. There is, however, a definite field of application for each method, and an attempt has been made in this Paper to indicate the steps that have been taken to produce the highest-quality casting for a specific application.

The casting of components for gas turbines to be used as prime movers for generating plant, locomotives, etc., has not been included. The founding and inspection problems are less specialised because of the relatively minor importance of the power/weight ratio. This does not imply that a high standard is not maintained or that extreme care in production is unnecessary, but, owing to the dimensional characteristics, foundry methods more closely allied to the production of general engineering castings are employed.

The Authors wish to thank David Brown & Sons (Huddersfield), Limited, for permission to publish the information contained in this Paper.

THERE WERE 12,000 guests at last Friday's annual staff ball of Thos. W. Ward, Limited, held at the Cutler's Hall, Sheffield. Among them was Mr. A. E. Wernly, managing director of the firm's Stockholm branch, who travelled especially for the event.

Canadian International Trade Fair

Several British trade associations are organising large group displays of their member-firms' products for the forthcoming Canadian International Trade Fair, to be held in Toronto from May 28 to June 8. United Kingdom manufacturers, with an eye to Britain's drive for dollars, are backing this venture whole-heartedly, realising that the C.I.T.F. is an ideal introduction to the Canadian market.

The British machine-tool industry, whose record-size stand was one of the outstanding features of the 1950 Fair, will have an exhibit covering approximately 32,000 sq. ft. in the new Industry Building. The member-firms of three associations, Machine-tool Trades Association, National Federation of Engineers-tool Manufacturers, and Federation of British Hand-tool Manufacturers are aiming to prove that British tool makers, despite the demands of rearmament, are willing and able to deliver the goods. The British industrial truck equipment group, exhibiting under the auspices of the Industrial Truck Manufacturers' Association, will display the products of six British manufacturers of industrial trucks in the Automotive Building, together with a large display out-of-doors where the trucks will be demonstrated. The British mechanical handling group comprises four firms capable of manufacturing and installing conveying and other equipment for such widely different needs as mining, lumber working, chemical plant and general engineering. It includes a display of aerial ropeways never before seen in Toronto.

Research in Germany Reports

The results of research sponsored by Department of Scientific and Industrial Research in Germany after the war are now available. The results are given in Reports issued under the title "Sponsored Reseach (Germany)." The Reports now ready are of importance mainly to designers and users of gear-wheels, though metallurgists will find some of interest. These Reports are available to industrial research departments, universities and individual research workers and can be obtained only from the D.S.I.R., 5-11, Regent Street, London, S.W.1.

Report No. 1 gives the results of a practical investigation of the relation between surface roughness and the bending strength of steel. Preliminary experiments indicate the probable existence of a simple connection between the two.

Report No. 2 is a description of equipment used to investigate the rolling strength of different steels. The prime objective of this research was to find the causes of the phenomenon known as "pitting." The machine, its use and the difficulties encountered are described in detail.

Reports Nos. 3, 4, 5, 6, 11 and 13 are of special interest to makers of gears and bearings. The issue of other reports will be announced later.

AN ATOMIC ENERGY SCHOOL for the instruction of industrial and medical laboratory workers in the use of radioactive materials has been set up by the Ministry of Supply at the Atomic Energy Research Establishment at Harwell. It will give students of graduate level detailed instruction in the fundamental, practical, and theoretical problems encountered when radioactive materials are used in the quantities employed in an ordinary laboratory, and it is hoped that students will gain sufficient knowledge of the principles underlying work with radio isotopes to qualify them to begin work in their own fields or to undertake research calling for specialised techniques.

Obituary

CAPT. THOMAS MOFFATT, late marine superintendent of the British Iron and Steel Corporation, died at Clydebank on February 20.

MR. WALTER FINNIE, north-east coast manager of J. & E. Hall, Limited, engineers and ironfounders, etc., of Dartford (Kent), until his retirement in 1938, died recently at the age of 79. He was with the company for 37 years.

MR. PETER PURDIE, assistant manager of William Broady & Son, Limited, coppersmiths, brassfounders, etc., of Hull, has died at the age of 36. He served his apprenticeship with William Doxford & Sons, Limited, shipbuilders and engineers, of Sunderland, of whom his father, Mr. W. H. Purdie, is engineering director.

Wills

FOSTER, F. H., of the Butterley Company, Limited, Ripley (Derby) £5,166

FRANCIS, HERBERT, a former director of Kayser, Ellison & Company, Limited, steelmakers, of Sheffield £16,495

WILLIS, SLATER, chairman and managing director of Tinsley Rolling Mills Company, Limited, Sheffield £26,181

GOOD, PERCY, director of the British Standards Institution and late president of the Institution of Electrical Engineers £17,676

YOUNG, SIR A. S. L., MP for the Scotstoun Division of Glasgow, and a former director of Glasgow Royal Technical College £487,108

CORDEN, JOSEPH, for many years chief representative for the Birmingham area of the English Steel Corporation, Limited, Sheffield, and at one time in the research department of Cammell, Laird & Company, Limited, at Barnsley £15,779

CHRISTIE, J. D., a former chairman of Swan, Hunter & Wigham Richardson, Limited, shipbuilders, of Wallsend, and a director of Barclay Curle & Company, Limited, shipbuilders, of Glasgow, and a fellow of the North-East Coast Institution of Engineers and Shipbuilders ... £102,664

DAVIS, J. D. D., secretary of the Swansea Metal Exchange, the Welsh Engineers' and Founders' Association, and the South Wales and Monmouthshire Association of Tinplate, Iron, Steel, Metals Scrap Merchants, proprietor of William Davis & Sons, scrap-iron merchants, of Swansea £2,241

Contracts Open

The dates given are the latest on which tenders will be accepted. The addresses are those from which forms of tender may be obtained. Details of tenders with the reference B.P.D. or C.R.E. can be obtained from the Commercial Relations and Exports Department, Board of Trade, Thames House North, Millbank, London, S.W.1.

COSELEY, March 9—Gully grates, etc., for the Urban District Council. Mr. J. C. Roper, clerk of the council, Council House, Coseley.

GREAT HARWOOD, March 17—Street ironwork, for the Urban District Council. The Surveyor, Town Hall, Great Harwood.

MANCHESTER, April 2—Air valves, discharge valves, etc., for the Corporation Waterworks. The Secretary, Waterworks Offices, Town Hall, Manchester, 2.

ROWLEY REGIS, March 14—Cast-iron work, etc., for the Borough Council. Mr. R. Hegan, town clerk, Municipal Buildings, Old Hill (Staffs).

ST. ALBANS, March 14—Iron castings, for the City Council. The City Engineer and Surveyor, 16, St. Peter's Street, St. Albans.

SUTTON-IN-ASHFIELD, March 17—Gully grids and frames, for the Urban District Council. Mr. I. L. McCallum, engineer and surveyor, Council Offices, Forest Lodge, Station Road, Sutton-in-Ashfield.

TODMORDEN, March 10—Manhole and gully grates and frames, for the Borough Council. Mr. W. W. Garner, borough engineer, Rise Lane, Todmorden.

WEST HARTLEPOOL, March 12—Metal castings, for the Borough Council. The Borough Engineer, Municipal Buildings, West Hartlepool.

Nationalised Subsidiary Steel Companies

A list of 137 companies which, in addition to the 80 companies which were vested in the Iron and Steel Corporation of Great Britain on February 15, became publicly-owned on the same day has been issued by the Corporation. These are wholly-owned subsidiaries which remain under the control of the parent company, but since the shares of these companies are entirely owned directly or indirectly by the corporation they bring the number of publicly-owned steel concerns to 217.

The subsidiaries concerned are:—

Appleby-Frodingham Steel Company, Limited; Archibald Russell, Limited; Arthur Lee & Sons (Cold Strip), Limited.

W. A. Baker & Company, Limited; Beardmore Overseas Corporation, Limited; Beckermet Mining Company, Limited; Birmingham Corrugated Iron Company, Limited; Bowesfield Steel Company, Limited; Browne & Shaw, Limited; British Basic Slag, Limited; British Coated Sheets, Limited; Briton Ferry Steel & Tinplate Agency, Limited; Briton Ferry Works, Limited; Buckley Colliery Company, Limited.

Carnlough Lime Company, Limited; Clayton Tin Plate Company, Limited; Clyde Alloy Steel Company, Limited; Clydeside Tube Company, Limited; Cochranes (Middlesbro') Foundry, Limited; Coking Company, Limited; Colville Constructional Company, Limited; Consett Marketing Company, Limited; Cribbwr Fawr Collieries, Limited; Crumlin Valley Collieries, Limited; Cumberland Storing Company, Limited.

Dalmuir & West of Scotland Estates Company, Limited; Darlington Forge, Limited; Darlington Rolling Mills Company (1946), Limited; Darwen Realisation Company, Limited; Denford Quarries, Limited; Distington Engineering Company, Limited; Dorman, Long Holdings Trust, Limited; Dowlais Collieries, Limited; Dowlais Iron, Steel & Coal Company, Limited; Dunston Iron Company, Limited.

Edmonton Steel Strip Company, Limited; Excelsior Limestone Company, Limited; Export Agency Company, Limited.

F.B. Engineers, Limited; Firth Vickers Stainless Steels, Limited; Fleming & Company (Warrington), Limited; Frodingham Iron & Steel (Foreign & Colonial) Company, Limited; F. R. Simpson & Company (1946), Limited; Fullwood Foundry Company, Limited.

Geo. L. Scott & Company, Limited; Glasgow Railway Engineering Company, Limited; Godins "The Rollers of Steel Sections," Limited; Great Northern Transport, Limited.

Hadfields Foundry & Engineering Company, Limited; Hadfields Steels, Limited; H. F. Spencer & Company, Limited; Holditch Mines, Limited; Holwell Iron Company, Limited.

Industrial Steels, Limited; Industrial Tools, Limited; Irchester Ironstone Company, Limited; Islip Iron Company, Limited.

James Pain, Limited; James Russell & Sons, Limited; J. & G. Wells, Limited; John Russell & Company, Limited; John Spencer, Limited.

Kiveton Park Coal Company, Limited.

Lancashire & Corby Steel Manufacturing Company, Limited; Lancashire & Corby Steel Selling Company, Limited; Lloyd & Lloyd, Limited; London Works (Barlows), Limited; Low Moor Iron Company (Successors), Limited.

Manganese Steel Company, Limited; Metal-Gas Company, Limited; Middlesbrough Exchange Company, Limited; Monmouthshire Transport Company, Limited; Moresby Coal Company, Limited.

New Acid Company, Limited; New Brancepeth Colliery Company, Limited; Nitralloy, Limited; North Lincolnshire Iron Company, Limited; Nutbrook (No. 1) Company, Limited; Nutbrook (No. 2) Company, Limited.

Ormesby Rolling Mills, Limited; Oxfordshire Ironstone Company, Limited.

Patent File & Tool Company, Limited; Pearson & Knowles Engineering Company, Limited; Penfold Fencing & Engineering, Limited; Polmaise Patent Fuel Company, Limited; Prothero Steel Tube Company, Limited.

Risehow Colliery, Coking & By-Product Company, Limited; Rother Vale Collieries, Limited; RTSC Exports, Limited; Rylands Bros., Limited.

St. David's Tinplate Company (1927), Limited; Scottish Tube Company, Limited; Scunthorpe Rod Mill, Limited; Scaland District Transport Company, Limited; Sheffield Coal Company, Limited; Shepcote Lane Rolling Mills, Limited; Shireoaks Colliery Company, Limited; S. J. Burrell Prior, Limited; South Bank Chemical Company, Limited; South Bank Basic Slag Company, Limited; South Wales Tinplate Corporation, Limited; Staffordshire Chemical Company (1917), Limited; Stainless & Rustless Steel Company, Limited; Stanton Housing Company, Limited; Staveley Estates, Limited; Steel Company of Scotland, Limited; Steel Company of Wales (Lysaght Works), Limited; Steel, Peech & Tozer, Limited; Stewarts and Lloyds and Stanton Wagons, Limited; Stewarts and Lloyds Minerals, Limited; Swansea Navigation Collieries, Limited.

Taylor Bros. & Company, Limited; Tees Import Company, Limited; Tees Side Bridge & Engineering Works, Limited; Tir Pentwys "Black Vein" Steam Coal & Coke Company, Limited; Trimdon Coal Company, Limited; Tubewrights, Limited.

United Coke & Chemicals Company, Limited; United Steel Structural Company, Limited; Unit Superheater & Pipe Company, Limited.

Wellingboro' Iron Company, Limited; Welsh Shipping Agency, Limited; Wensley Lime Company, Limited; Whitecross Company, Limited; Whitehead, Hill & Company, Limited; Whitehead Thomas Bar & Strip Company, Limited; Widmet, Limited; William Firth & Company, Limited; William Robertson, Limited; Wingate Coal Company, Limited; Wolverhampton Corrugated Iron Company, Limited; Workington Iron & Steel Company, Limited; Workington Welfare Hall, Limited; W. T. Beesley & Company, Limited.

Yorkshire Engine Company, Limited.

Zetland Road Trust Company, Limited.

(*Continued at foot of column two*)

King and Queen to open Steelworks

The £60,000,000 Abbey works of the Steel Company of Wales, Limited, will be inaugurated by the King and Queen when they visit Port Talbot on July 17. This was announced by Mr. E. H. Lever, chairman of the company, when he spoke at the annual dinner of Port Talbot (Incorporated) Chamber of Commerce and Shipping recently. Making the announcement, Mr. Lever asked: "Could there be any better evidence of the importance attached by those in authority to the contribution the Steel Company of Wales is making to the country's economic recovery?" He warned, however, that a steelworks was of no use without such essential raw materials as coking coal, iron ore, and scrap.

Mr. Lever expressed the hope that those now in charge of the affairs of the Iron and Steel Corporation would put the national interest first and see that those who had so far run the industry with success would be allowed to continue to have the power to make decisions and make them promptly. Those were the only conditions upon which any self-respecting administrator could be expected to accept responsibility.

He referred to the intimation of Mr. S. J. L. Hardie, chairman of the Corporation, that his board would have a say in the appointment of senior executives to the publicly-owned companies. Mr. Lever stated that if this was carried into effect it would cut right across avowed intentions to allow the companies to run their own affairs and could quickly create an intolerable position.

Iron and Steel Values

A further list of iron and steel securities for which values have been agreed with stockholders' representatives was made public last Thursday. Previous lists were published in the JOURNAL'S of February 8 and 22.

Out of 146 securities, the number now agreed is 114, of which 55 are quoted and 59 unquoted. The remaining 32 securities are all unquoted. The total compensation value in respect of the 114 agreed securities is £221,000,000. The value of the compensation stock to be issued in respect of the present batch of eight securities is just over £8,000,000. The new list is as follows:—

PREFERENCE STOCKS AND SHARES

Bynea Steel Works 7% cumulative £100, £150.

ORDINARY STOCKS AND SHARES (£1 UNLESS OTHERWISE STATED)

Bynea Steel Works £100, £1,120.
Darwen & Mostyn Iron 41s.
John Lysaght's Scunthorpe Works 20s.
New Cransley Iron & Steel 20s. (1945).
Pease & Partners Normanby Iron Works 17s. 6d.
Steel Company of Wales 25s.; £1 (1s. paid), 6s.

News in Brief

THE EIGHTH ANNUAL EXHIBITION of British radio and electronic components will be held at Grosvenor House, London, from April 10 to 12.

LAST YEAR, Gowanbank Iron Works, Falkirk, had a record output of 50,354 baths, of which no less than 30 per cent. went to export markets, compared with 13 per cent. in 1938.

A FIRE, WHICH WAS EXTINGUISHED after three hours by the use of nitrogen gas, broke out on the night of February 21 at the Sunderland works of the Saturn Oxygen Company, Limited, following a series of 15 explosions.

DURING 1950, the export sales of the A.B.O.E. group were 65 per cent. greater than those of 1949, and amounted to more than six and a half million pounds. In 1950 the group produced one third of Britain's export total of Diesel engines.

TREASURY CONSENT has been obtained by Metal Industries, Limited, for an issue to the company's ordinary stockholders of 623,588 £1 shares at 32s. 6d. a share in the proportion of one for each complete £4 of ordinary stock held.

SINCE ITS FORMATION six years ago, the North-East Engineering Bureau, Newcastle-upon-Tyne, had indirectly brought orders worth millions of pounds to firms in the area, said the chairman, Mr. R. W. Mann, speaking at the bureau's annual meeting.

A MACHINE-TOOL EXHIBITION is being organised by Continental makers and will take place at the Porte de Versailles, Paris, from September 1 to 10 this year. It will clash to some extent with the Marine, Engineering and Foundry Exhibition at Olympia, London.

CHAMBERLAIN INDUSTRIES LIMITED of Staffa Road, Leyton, London, E.10., have designed and placed on the market a range of three models (10 in. by 1 in.; 16 in. by 2 in. and 24 in. by 3 in.) of double-headed grinding machines of attractive appearance; they conform to the latest "factory regulations."

AN INCREASE of the ordinary authorised capital to £400,000, and the capitalisation of £50,000 of the general reserve by a bonus issue of one fully paid ordinary share of 5s. for every two ordinary shares held, has been recommended by the directors of Beans Industries, Limited, engineers and ironfounders, etc., of Tipton (Staffs).

ONE HUNDRED AND FIFTY THOUSAND ordinary shares of S. Russell & Sons, Limited, engineers, brass and ironfounders, of Leicester, which is distributing 200,000 ordinary 5s. shares as a bonus *pro rata* among ordinary shareholders, are to be made available to the market, with a view to having the shares quoted on the London Stock Exchange.

A CONFERENCE on "The Use of the Film in Training for Industry" organised by the Scientific Film Association will be held at the Hotel Majestic at St. Anne's-on-Sea (Lancs) from March 30 to April 1. Further details can be obtained from the association's secretary at 4, Great Russell Street, London, W.C.1.

ON AND FROM March 19 until March 28, inclusive, British Railways will restore the principal main-line trains and their connecting services, which were recently withdrawn. Relief trains will also be run as required. The usual holiday programme of excursion trains will be provided on Good Friday, Easter Sunday, and Monday.

A RE-ROOFING SCHEME at Grahamston Iron Works, Falkirk, is to cost £7,100. The Falkirk Iron Company, Limited, are to erect a roof over the open yard leading to the loading bank at an estimated cost of £2,250, and Walker Hunter & Company, Limited, Port Downie Iron Works, Camelon, are to convert an existing building for use for workers' spray baths, at a cost of about £800.

COLONEL H. C. SMITH, C.B.E., D.L., deputy-chairman of the Gas Council, at the pre-view of the gas industry's exhibit at the Ideal Home Exhibition, Olympia, stated that there must be well over 2 million obsolete gas cookers in use in this country to-day. The replacement of these cookers by modern cookers to give the same cooking service would result in a saving of over 700,000 tons of coal per annum.

THE BRITISH IRON AND STEEL RESEARCH ASSOCIATION announces that Dr. U. R. Evans, F.R.S., of the Department of Metallurgy, Cambridge University, will give a public lecture on "Fundamental Studies of Corrosion and their Importance to the Engineer" on Wednesday, March 28, at the Institution of Civil Engineers, London, at 5.30 p.m. Mr. T. M. Herbert, director of research, of the Railway Executive, will be in the chair. Tea will be served from 4.45 p.m.

THREE FILMS, "Flawless and British," "And Now" and "All Star Casting," dealing with work in progress at the iron and steel foundries of F. H. Lloyd and Company, Limited, were exhibited to the Woolwich branch of the Purchasing Officers' Association on February 27. The programme represented a rearrangement at short notice but there was a good attendance. Mr. A. R. Parkes answered general questions about the foundry industry which arose in the ensuing discussion.

Personal

MR. MILES COVERDALE, general manager and secretary of Charles W. Taylor & Son, Limited, ironfounders, of South Shields, has been presented with a silver salver to mark his 50 years' service with the firm.

ONE OF OUR READERS, and also a valued contributor, Mr. W. Gudgeon, of 67, Acregate Lane, South Preston, is retiring after 50 years' employment as an iron moulder. We wish him every happiness on his retirement.

DR. J. H. CHESTERS, assistant director of research for the United Steel Companies, Limited, Sheffield, is to make a six-week visit to the United States, during which he will lecture to the American Institute of Metallurgical Engineers in Cleveland on April 4.

BRIGHTSIDE FOUNDRY & ENGINEERING COMPANY, LIMITED., (heating and air-treatment division) announce the appointment, as from March 1, of Mr. J. G. Johnson as manager of their Manchester Office at Palatine House, 76, Victoria Street, Manchester 3. Mr. Howard S. Crump is the manager of the Liverpool branch of this Company.

MR. J. D. PENN, general manager of Repco-Kirkstall, Limited, Melbourne, left Australia for the U.K. and U.S.A. during February to examine foundry practices and the operation of machinery for the manufacture of front axles, beams, steering levers, etc. His address in this country will be c/o Kirkstall Forge, Limited, Leeds, Yorks.

J. & R. FLEMING LIMITED, the manufacturing opticians of 146, Clerkenwell Road, E.C.1., announce that Miss B. P. Park has been appointed secretary of their safety goggle division. Miss Park recently resigned from the board of Safety Products Limited and also relinquished the secretaryship of that company which she had held since 1935. As honorary secretary of the Central Metropolitan Group and of the London industrial co-ordinating committee affiliated to the Royal Society for the Prevention of Accidents, Miss Park has for many years been active in the campaign to reduce the number and mitigate the severity of all kinds of industrial accidents.

Pig-iron and Steel Production

STATISTICAL SUMMARY

The following particulars of pig-iron and steel produced in Great Britain have been extracted from the Statistical Bulletin for January, issued by the British Iron and Steel Federation. Table I gives the production of pig-iron and ferro-alloys in December, 1950, and number of furnaces in blast; Table II, production of steel ingots and castings in December, and Table III, deliveries of finished steel. Table IV summarises activities during the previous six months.

TABLE I.—*Weekly Average Production of Pig-iron and Ferro-alloy during December, 1950. (Thousands of Tons.)*

District.	Furnaces in blast 12.12.50	Hematite.	Basic.	Foundry.	Forge.	Ferro-alloys.	Total.
Derby, Leics., Notts., Northants, Essex	25	—	17.6	24.6	0.9	—	43.1
Lancs. (excl. N.W. Coast), Denbigh, Flints. and Cheshire	7	—	7.5	—	—	1.2	8.7
Yorkshire (incl. Sheffield, excl. N.E. Coast)	14	—	23.5	—	—	—	23.5
Lincolnshire	23	8.1	35.1	0.3	—	1.5	45.0
North-East Coast	9	0.8	12.2	2.9	—	—	15.9
Scotland							
Staffs., Shrops., Worcs., and Warwick	9	—	8.9	1.4	—	—	10.3
S. Wales and Monmouthshire	8	4.1	21.8	—	—	—	25.9
North-West Coast	7	15.5	—	0.2	—	0.3	16.0
Total	102	28.5	126.6	29.4	0.9	3.0	188.4‡
November, 1950*	102	30.0	129.9	29.1	1.1	2.7	193.1
December, 1949	102	27.9	122.6	30.1	1.8	3.3	185.7

‡ Including 100 tons of direct castings.

TABLE III.—*Weekly Average Deliveries of Non-alloy and Alloy Finished Steel. (Thousands of Tons.)*

Product.	1949.	1950.	1950.		
			Oct.	Nov.*	Dec.
Non-alloy Steel:—					
Ingots, blooms, billets and slabs‡	4.5	3.6	4.0	4.3	3.5
Heavy rails and sleepers, etc.	9.8	11.3	11.3	12.3	10.0
Plates ⅛ in. and over	39.2	40.0	41.3	43.1	40.1
Other heavy prod.	36.1	38.7	40.0	43.6	38.6
Light rolled prod.‡	46.4	47.6	52.6	53.8	44.5
Hot-rolled strip	17.1	19.4	22.1	21.1	19.1
Wire rods	15.1	16.0	17.8	18.4	15.9
Cold-rolled strip	4.9	5.5	5.9	6.4	5.4
Bright steel bars	5.8	6.5	7.3	7.6	6.3
Sheets, coated and uncoated	27.6	30.5	32.4	32.1	29.0
Tin, terne and blackplate	13.7	14.3	14.2	14.5	15.9
Tubes, pipes and fittings	18.5	20.0	21.4	21.9	22.3
Wire	15.0	15.8	17.7	17.1	15.3
Tyres, wheels and axles	4.1	3.5	3.0	4.0	3.0
Steel forgings**	2.4	2.2	2.3	2.4	2.3
Steel castings	3.6	3.5	3.8	3.8	3.2
Total	263.8	278.4	297.1	306.4	274.4
Alloy steel	10.4	10.6	11.3	11.7	11.0
Total deliveries from U.K. prod.‡‡	274.2	289.0	308.4	318.1	285.4
Add imported finished steel	9.5	3.8	2.3	3.5	2.5
	283.7	292.8	310.7	321.6	287.9
Deduct intra-industry conversion‖	51.0	53.5	59.4	60.8	54.7
Total deliveries	232.7	239.3	251.3	260.8	233.2

‡ Other than for conversion into any form of finished steel listed above.

‡‡ Includes finished steel produced in the U.K. from imported ingots and semi-finished steel.

‖ *i.e.*, Material for conversion into other products also listed in this table.

** Excl. drop forgings.

TABLE II.—*Weekly Average Production of Steel Ingots and Castings in December, 1950*

District.	Open-hearth		Bessemer.	Electric.	All other.	Total.		Total ingots and castings.
	Acid.	Basic.				Ingots.	Castings.	
Derby, Leics., Notts., Northants and Essex	—	2.6	11·1 (basic)	1.1	0.2	14.4	0.6	15.0
Lancs. (excl. N.W. Coast), Denbigh, Flints., and Cheshire; Yorkshire (excl. N.E. Coast and Sheffield)	1.4	19.8	—	1.4	0.4	22.1	0.9	23.0
Lincolnshire	—	31.0	—	—	0.1	31.0	0.1	31.1
North-East Coast	1.0	60.6	—	0.8	0.4	61.4	1.4	62.8
Scotland	4.6	39.7	—	1.1	0.7	44.4	1.7	46.1
Staffs., Shrops., Worcs. and Warwick	—	12.6	—	0.6	0.5	12.6	1.1	13.7
South Wales and Monmouthshire	9.6	44.6	5.8 (basic)	0.8	0.1	60.5	0.4	60.9
Sheffield (incl. small quantity in Manchester)	6.3	21.9	—	7.7	0.6	34.8	1.7	36.5
North-West Coast	0.1	2.4	4.6 (acid)	—	0.1	7.1	0.1	7.2
Total	21.0	235.2	21.5	13.5	3.1	288.3	8.0	288.3
November, 1950	27.3	268.0	21.6	15.7	3.4	326.8	9.2	336.0
December, 1949	23.6	230.8	21.5	12.3	3.2	283.4	8.0	291.4

TABLE IV.—*General Summary of Pig-iron and Steel Production (Weekly Average in Thousands of Tons.*

Period.	Iron-ore output.	Imported ore consumed.	Coke receipts by blast-furnace owners.	Output of pig-iron and ferro-alloys.	Scrap used in steel-making.	Steel (incl. alloy).			
						Imports.§	Output of ingots and castings.	Deliveries of finished steel.	Stocks.†
1949	258	169	199	183	188	17	299	233	1,275
1950	249	174	197	185	197	9	313	239	997
1949—December	249	170	197	186	181	12	291	231	1,275
1950—July	243	166	191	175	176	13	276	226	1,152‖
August*	239	175	194	177	181	5	279	199	1,187
September	229	179	198	187	207	8	326	256	1,160
October	266	183	201	194	202	5	328	251	1,097
November*	260	179	200	193	206	6	336	261	1,060
December	249	171	198	188	175	5	296	233	997

† Stocks at the end of the years and months shown. § Weekly average of calendar month. ‡Mainly ingots and semi-finished steel.
‖ From July, 1950 the stocks of wire for reinforcement, material for drop forgings and bolt, nut and washer material, are excluded.
* Five weeks (all tables)

Raw Material Markets

Iron and Steel

In varying measure, all grades of pig-iron are in short supply. Apart from the diversion of production from high-phosphorus to basic pig-iron, British blast furnaces are operating below capacity on account of the scarcity of fuel and foreign ore, and foundrymen who are unable to obtain their usual deliveries of pig-iron look askance at the trade figures for January, which revealed a small increase in the shipments of iron to oversea destinations. When home consumers are so badly in need, it would appear to be common prudence to reserve all available tonnages for home consumption. Low- and medium-phosphorus grades have been difficult for months past; now the production of hematite is down and prices are up. Quotations for hematite iron have been advanced by 7s. per ton, and in the case of foundry forge and basic iron the rise amounts to 7s. 6d.

If there has been no improvement in the distribution of semi-finished steel, the position has not suffered further deterioration. There has been a slight increase in the shipments from Belgium, but the great bulk of the steel delivered to the re-rolling mills is of British manufacture. The shortage of billets is mainly confined to the smaller sizes. On the other hand, deliveries of slabs and sheet bars are fairly regular. Re-rollers have extensive programmes in hand, and their orders include considerable tonnages for export.

All classes of steel are meeting with a demand well in excess of current production. Later in the year developments in South Wales promise substantial easement of the famine conditions in regard to strip and steel sheet. But present difficulties are acute. For steel plates delivery dates six months ahead are not uncommonly indicated, and rail mills have big export orders to execute in addition to supplying normal tonnages to home railways and collieries.

Non-ferrous Metals

The Board of Trade and the Ministry of Supply announced recently that from March 1 the production of various goods made from copper and zinc and their alloys would be prohibited. Arrangements have now been made for certain exemptions from this prohibition —particularly for goods for export. Applications to manufacture for export goods on the prohibited list should be made by the manufacturer who is either himself an established exporter of the goods or who seeks permission to produce the goods to the order of an established exporter. Applications for licences to manufacture should be made in writing to the regional offices of the Board of Trade or of the Ministry of Supply, depending under which Order the goods concerned are included.

The lists of prohibited uses were printed on page 241 of our last issue.

Raw material supplies have been very much in the news since last week's debate in the House of Commons, when Mr. Harold Wilson, President of the Board of Trade, put the facts and figures before the country. Perhaps the greatest single threat to British industry comes from the shortage of sulphur, which, of course, affects the supply of sulphuric acid. Hopes were expressed by Mr. Wilson that it would not prove necessary to put into force the emergency plan that has been prepared, but everything depends upon the extent to which the United States feels able to respond to our plea for a mitigation of the present reduced rate of exports.

The International Materials Conference is now in session and last week saw the first meeting of the Copper, Zinc, and Lead Committee. It was decided that lead and zinc should be considered jointly, copper, however, being taken alone. These talks in Washington are naturally of the utmost importance to the United Kingdom, and the non-ferrous industry here will hope very much that in zinc, at any rate, if not in copper, additional supplies will be forthcoming. It should, however, be remembered that one of the trade's worst headaches arises from the cut in shipments of copper shapes from Canada. Were that cut restored, or even half of it only, the situation in the U.K. would be much improved.

Demand for tin continues at a fair rate, but consumers appear to be securing all the metal they want, even though they must pay a big price for their supplies. By now users have grown somewhat accustomed to the vagaries of the tin market and are fully alive to the importance of buying on "soft" days so far as this is possible.

The decision of the United States Government to suspend all purchases of tin for the national stockpile until the price falls to a reasonable level was announced in Washington on Tuesday by Mr. Jess Larson, General Services Administrator, who said that the Government also intended to hold down the buying of tin for industrial use to the barest possible minimum. A report on tin, drawn up by the Preparedness Subcommittee of the Senate Armed Services Committee, published last Sunday, maintained that American taxpayers were being "gouged" by some allies who were selling raw materials. The countries principally involved were stated to be Britain, Belgium, the Netherlands, and Bolivia.

Official tin quotations were as follow:—

Cash—Thursday, £1,445 to £1,450; Friday, £1,515 to £1,520; Monday, £1,430 to £1,440; Tuesday, £1,420 to £1,430; Wednesday, £1,365 to £1,375.

Three Months—Thursday, £1,375 to £1,380; Friday, £1,425 to £1,430; Monday, £1,335 to £1,340; Tuesday, £1,285 to £1,290; Wednesday, £1,220 to £1,230.

No important development has occurred in the scrap situation, which remains, it must be confessed, in a most unsatisfactory condition. Virtually nothing is being offered for sale, and until the amendment expected to the present Order is published, it is probably hopeless to expect any let-up in the position. Consumers are naturally very concerned at the lack of supplies.

Changes of Name

The undermentioned companies have recently changed their names. The new titles are given in parentheses.

LVE (ENGINEERS), LIMITED, London, E.C.3 (Fairwest (UK), Limited).

LANCASHIRE DYNAMO & CRYPTO, LIMITED, Manchester (Lancashire Dynamo Holdings, Limited).

RAPID MAGNETTING MACHINE COMPANY, LIMITED, Birmingham (Rapid Magnetic Machines, Limited).

CHRISTY BROS. (CHELMSFORD), LIMITED, mechanical and electrical engineers, etc. (Christy Bros., Limited).

DFS (MANCHESTER), LIMITED, engineers, etc., of Ashton-under-Lyne (Buckley, Myers & Taylor, Limited).

C. H. BROUGHTON (1934), LIMITED, ironfounders, etc., of Brighouse, Yorks (Womersley & Broadbent, Limited).

RODE HEATH AGRICULTURAL ENGINEERING COMPANY, LIMITED, Rode Heath, Stoke-on-Trent (J. Green & Sons (Agricultural Engineers), Limited).

J. STONE & COMPANY, LIMITED, engineers and foundrymen, of Deptford, London, S.E.14 (J. Stone & Company (Holdings), Limited).

INDUSTRIAL RELATIONS SERVICES (A.B.E.), LIMITED, London, S.W.1 (Brush Aboe Group Services, Limited). Brush Electrical Engineering Company, Limited, holds nearly all the issued shares.

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

(Delivered, unless otherwise stated)

March 7, 1951

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2:—Middlesbrough, £10 17s. 9d.; Birmingham, £10 13s.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent P, £12 9s., delivered Birmingham. Staffordshire blast-furnace low-phosphorus foundry iron (0.10 to 0.50 per cent. P, up to 3 per cent. Si)—North Zone, £12 16s. 6d.; South Zone, £12 19s.

Scotch Iron.—No. 3 foundry, £12 7s. 9d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £13 7s. 6d.; South Zone, £13 10s.

Refined Malleable.—P, 0.10 per cent. max.—North Zone, £13 17s. 6d.; South Zone, £14.

Cold Blast.—South Staffs, £16 10s. 6d.

Hematite.—Si up to 2½ per cent., S. & P. over 0.03 to 0.05 per cent.:—N.-E. Coast and N.-W. Coast of England, £12 7s. 6d.; Scotland, £12 14s.; Sheffield, £13 2s. 6d.; Birmingham, £13 9s.; Wales (Welsh iron), £12 7s. 6d.

Spiegeleisen.—20 per cent. Mn, £18 3s.

Basic Pig-iron.—£10 19s. all districts.

FERRO-ALLOYS

(Per ton unless otherwise stated, delivered.)

Ferro-silicon (6-ton lots).—40/55 per cent., £37 15s., basis 45% Si, scale 14s. per unit; 70/84 per cent., £52, basis 75% Si, scale 14s. 6d. per unit.

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

Ferro-molybdenum.—65/75 per cent., carbon-free, 8s. 9d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., carbon-free, £120; ditto, copper free, £142.

Ferro-tungsten.—80/85 per cent., 41s. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 43s. per lb. of W.

Ferro-chrome (6-ton lots).—4/6 per cent. C, £66, basis 60% Cr, scale 22s. per unit; 6/8 per cent. C, £61, basis 60% Cr, scale 21s. per unit; max. 2 per cent. C. 1s. 6½d. per lb. Cr; max. 1 per cent. C, 1s. 7½d. per lb. Cr; max. 0.15 per cent. C 1s. 8d. per lb. Cr; max. 0.10 per cent. C, 1s. 8½d. per lb. Cr.

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

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

Ferro-manganese (blast-furnace). — 78 per cent., £32 3s. 7d.

Metallic Manganese.—96/98 per cent., carbon-free, £186 per ton.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft, u.t., £17 4s.; tested, up to 0.25 per cent. C (100-ton lots), £17 9s.; hard (0.42 to 0.60 per cent. C), £19 4s.; silico-manganese, £24 6s. 6d.; free-cutting, £20 9s. SIEMENS MARTIN ACID: Up to 0.25 per cent. C, £22 11s. 6d.; case-hardening, £23 9s.; silico-manganese, £26 14s.

Billets, Blooms, and Slabs for Forging and Stamping.—Basic, soft, up to 0.25 per cent. C, £20 4s.; basic, hard, over 0.41 up to 0.60 per cent. C, £21 9s.; acid, up to 0.25 per cent. C, £23 9s.

Sheet and Tinplate Bars.—£17 6s. 6d.

FINISHED STEEL

Heavy Plates and Sections.—Ship plates (N.-E. Coast), £21 3s.; boiler plates (N.-E. Coast), £22 10s. 6d.; chequer plates (N.-E. Coast), £23 8s.; heavy joists, sections, and bars (angle basis), N.-E. Coast, £20 1s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., untested, £22 15s.; flats, 5 in. wide and under, £22 15s.; hoop and strip, £23 10s.; black sheets, 17/20 g., £29 13s. galvanised corrugated sheets, 17/20 g., £43 6s.

Alloy Steel Bars.—1-in. dia. and up: Nickel, £37 19s. 3d.; nickel-chrome, £56 6s.; nickel-chrome-molybdenum, £63 1s.

Tinplates.—I.C. cokes, 20 × 14, per box, 42s. 7½d. f.o.t. makers' works.

NON-FERROUS METALS

Copper.—Electrolytic, £202; high-grade fire-refined, £201 10s.; fire-refined of not less than 99.7 per cent., £201; ditto, 99.2 per cent., £200 10s.; black hot-rolled wire rods, £211 12s. 6d.

Tin.—Cash, £1,365 to £1,375; three months, £1,220 to £1,230; settlement, £1,375.

Zinc.—G.O.B. (foreign) (duty paid), £151; ditto (domestic), £151; "Prime Western," £151; electrolytic, £155; not less than 99.99 per cent., £157.

Lead.—Good soft pig-lead (foreign) (duty paid), £136; ditto (Empire and domestic), £136; "English," £137 10s.

Zinc Sheets, etc.—Sheets, 10g. and thicker, all English destinations, £170 17s. 6d.; rolled zinc (boiler plates), all English destinations, £168 17s. 6d.; zinc oxide (Red Seal), d/d buyers' premises, £170.

Other Metals.—Aluminium, ingots, £124; antimony, English, 99 per cent., £360; quicksilver, ex warehouse, £73 10s. to £74; nickel, £406.

Brass.—Solid-drawn tubes, 21½d. per lb.; rods, drawn, 29½d.; sheets to 10 w.g., 26⅝d.; wire, 27½d.; rolled metal, 25⅝d.

Copper Tubes, etc.—Solid-drawn tubes, 23½d. per lb. wire, 226s. 6d. per cwt. basis; 20 s.w.g., 254s. per cwt.

Gunmetal.—Ingots to BS. 1400—LG2—1 (85/5/5/5), £240; BS. 1400—LG3—1 (86/7/5/2), £255; BS. 1400—G1—1 (88/10/2), — ; Admiralty GM (88/10/2), virgin quality, — , per ton, delivered.

Phosphor-bronze Ingots.—P.Bl, — ; L.P.Bl, — per ton.

Phosphor Bronze.—Strip, 38½d. per lb.; sheets to 10 w.g., 40⅜d.; wire, 41½d.; rods, 38d.; tubes, 43½d.; chill cast bars: solids, —, cored, —. (C. CLIFFORD & SON, LIMITED.)

Nickel Silver, etc.—Ingots for raising, 2s. 3½d. per lb. (7%) to 3s. 2½d. (30%); rolled metal, 3 in. to 9 in. wide × .056, 2s. 9½d. (7%) to 3s. 8½d. (30%); to 12 in. wide × .056, 2s. 9½d. to 3s. 8½d.; to 25 in. wide × .056, 2s. 11½d. to 3s. 10½d. Spoon and fork metal, unsheared, 2s. 6½d. to 3s. 5½d. Wire, 10g., in coils, 3s. 3d. (10%) to 4s. 2½d. (30%). Special quality turning rod, 10%, 3s. 2d.; 15%, 3s. 6½d.; 18%, 3s. 11d. All prices are net.

Forthcoming Events

MARCH 12

Institution of Production Engineers

Derby Sub-section :—Annual General Meeting, followed by "Noise and Vibration in Machinery," by Dr. W. A. Tuplin, 7 p.m., at the School of Art, Green Lane, Derby.

Yorkshire Section :—Annual General Meeting, 7 p.m., at the Hotel Metropole, King Street, Leeds, 1.

MARCH 13, 14 and 15

Institute of Metals

Annual General Meeting at Park Lane Hotel, Piccadilly, London, W.1.

MARCH 13

Institute of British Foundrymen

Slough Section :—Annual General Meeting and "The Economics of Foundry Mechanisation," by J. Blakiston, M.I.MECH.E., 7.30 p.m., in the Lecture Theatre, High Duty Alloys, Limited, Buckingham Avenue, Trading Estate, Slough.

Incorporated Plant Engineers

East Lancashire Branch :—"Installation and Maintenance of Fluorescent Lighting in Industry," by F. C. Tyrrell, 7.15 p.m., at the Engineers' Club, Albert Square, Manchester.

MARCH 14

Institute of Metals

Symposium on "Metallurgical Aspects of the Cold-working of Non-ferrous Metals and Alloys," at Park Lane Hotel, Piccadilly, London, W.1.

Manchester Metallurgical Society

Meeting at the Engineers' Club, Albert Square, Manchester, at 6.30 p.m. Paper, "Precious Metals in Industry," by H. G. Dale, F.R.I.C.

Institution of Production Engineers

Liverpool Section :—"Laboratory Control in Production Engineering," by J. Pardoe, 7.15 p.m., at Radiant House, Bold Street, Liverpool.

Institution of Production Engineers

Western Section :—"Industrial Applications of the Lost-wax Process," by A. Short, 7.15 p.m., at the Grand Hotel, Broad Street, Bristol.

MARCH 14, 15 and 16

British Cast Iron Research Association

Conference on Malleable Cast Iron at Ashorne Hill, near Leamington Spa. (Details published in the JOURNAL, February 22.)

MARCH 15

The Chemical Society.

Joint Meeting with the Royal Institute of Chemistry and the Society of Chemical Industry at The University, Bristol, at 7 p.m. Paper, "Recent Progress in the Study of Metal Oxidation and Corrosion," by Dr. W. H. J. Vernon, O.B.E.

MARCH 16

Institute of Marine Engineers

Annual General Meeting of the Education Group, to be held at 85, Minories, London, E.C.3, at 6 p.m. Discussion following official business, "The Future Development of Higher Technological Education and its Effect on the Professional Engineering Society," opened by Mr. C. W. Tonkin.

Institute of British Foundrymen

East Midlands Branch :—Annual Dinner and Dance, at Derby. Details to be circulated by the Secretary.

Institute of British Foundrymen

London Branch :—"Men Only" Dinner, 7 for 7.30 p.m., at the Horse Shoe Hotel and Restaurant, Tottenham Court Road, London, W.1.

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

MOULDER requires position. 23 years' practical experience in "green" and "dry" sand, also machine work. Able to supervise and control labour. House required.—Box 700, FOUNDRY TRADE JOURNAL.

FOREMAN PATTERNMAKER, fully experienced in all branches of the trade, desires change to similar position with prospects.—Box 674, FOUNDRY TRADE JOURNAL.

FOUNDRYMAN/METALLURGIST (41), thoroughly conversant castings production, seeks position as FOUNDRY MANAGER. Grey or whiteheart malleable; mechanisation; good disciplinarian.—Box 694, FOUNDRY TRADE JOURNAL.

VITREOUS ENAMELLING MANAGER. New appointment desired by advertiser who has first-class knowledge of both technical and practical application of enamels for the domestic field from frit making to the finished ware, also extensive knowledge of the sign trade, including screen work. Capable organiser of mixed labour.—Box 648, FOUNDRY TRADE JOURNAL.

FOUNDRY FOREMAN (42) desires change to similar position. 28 years' practical experience floor, machine, plate moulding. Willing to train unskilled men if necessary.—Box 716, FOUNDRY TRADE JOURNAL.

FOUNDRY MANAGER (41), A.M.I.B.F., desires change. 25 years' practical and executive experience in production of grey iron castings for engineering, machine tool and motor trade, also builders' castings. Wide experience mechanised plants. Methods, design, patternmaking wood, metal, plaster, etc. Practical and technically trained. Sheffield area preferred. Would consider position as Representative.—Box 722, FOUNDRY TRADE JOURNAL.

GENERAL / WORKS FOUNDRY MANAGER (age 45) seeks change. Fully experienced in production of marine, electrical, engineering castings 45 tons each; loam, green and dry sand; mechanised plant layout for light, auto, and diesel engine castings. Commercial and technical control, capable administrator, accustomed complete control and full responsibility. Free June/July. Min. salary £1,200.—Box 704, FOUNDRY TRADE JOURNAL.

ADVERTISER seeks Representation in London and surrounding Counties area for progressive Iron Foundry. Good connection available with grades of work suitable for a foundry producing jobbing, repetition and loam work in normal and high duty cast irons. Contacts established are with leading engineering companies in the above area. Object is to create, on a commission basis, a steady trade of mutual benefit to both parties. Advertiser has had experience of running an iron foundry producing the above range of work and is conversant with up-to-date prices.—Box 684, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT

WANTED. — ALUMINIUM FLOOR MOULDERS, for Foundry in South Midlands area. Piece Work Rates.—Write, giving age, experience, to Box 714, FOUNDRY TRADE JOURNAL.

EXPERIENCED CUPOLA MAN wanted for Iron Foundry. S.E. London area. Good wages and prospects.—Box 718, FOUNDRY TRADE JOURNAL.

ANALYTICAL CHEMIST required for routine chemical analysis. Preferably experienced in analysis of ferrous metals. Male or female. Assistant Experimental Officer grade : salary £330-£475 p.a. male and £330-£430 p.a. female. State age, experience, and qualifications.—BRITISH CAST IRON RESEARCH ASSOCIATION, Alvechurch, Birmingham.

FOUNDRY MANAGER required for Grey Iron Foundry, West Riding, Yorkshire, with labour force about 50. Must be experienced in production medium to heavy engineering and machine tool castings, also repetition light work.—Reply in confidence, Box 706, FOUNDRY TRADE JOURNAL.

ADVERTISERS, developing recently modernised Foundry, West Riding, Yorkshire, invite application full-time WORKING DIRECTOR, fully experienced foundry management. Amount of capital secondary importance to ability and experience.—Reply in confidence, Box 708, FOUNDRY TRADE JOURNAL.

METALLURGIST (Practical). Opportunity exists for first-class man, South of England Foundry. Must be capable of acting on own initiative, with sound knowledge of cupola practice, sand control, etc.—Apply to the EAST SUSSEX ENGINEERING CO., LTD., Phoenix Ironworks, Lewes, Sussex.

MANAGER (40/45) wanted for Machine Shop and Grey Iron Foundry on Tyneside. Combined staff 60/70. General engineering with foundry products in loam, dry and green sand. 20 tons per week, partly mechanised. Pension scheme.—Full details, experience, etc., to Box 702, FOUNDRY TRADE JOURNAL.

INDIA.—Wanted experienced FOUNDRY FOREMAN, for Steel Foundry in Calcutta producing variety of Steel Castings from few lbs. to 5 tons in weight, chiefly Railway Rolling Stock Components.

Candidates should have had 10 years' experience in such a foundry, 5 years sole charge.

Experience in working mechanised foundry desirable. Appointment for three years. Free passage.

Salary Rs. 1,300 per month (Rupee = 1s. 6d.).

Free furnished quarters.

Applications, with details of experience and copies of testimonials, to Box 698, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT—*Contd.*

SKILLED MOULDERS, PATTERN MAKERS, PLATERS, TURNERS, BORERS, etc., required by DISTINGTON ENGINEERING CO., LTD., Workington, Cumberland. For further details apply to the Labour Manager.

DRAUGHTSMAN for highly mechanised foundry plant. Knowledge of electricity, hydraulics, and having practical workshop experience an advantage.—Apply in writing, stating experience and salary required, to ALLIED IRONFOUNDERS, LTD., R.W.S. Department, Ketley, Shropshire.

ALUMINIUM, Bronze and Stainless Steel Founders, moving to Crawley New Town a year hence, have vacancies for skilled and semi-skilled MOULDERS and TRIMMERS. Must be members of Trade Union and prepared to work day and night shifts. Good wages and conditions.—Apply in writing to the FOUNDRY FOREMAN, The A.P.V. Co., Ltd., Wandsworth Park, London, S.W.18.

FOUNDRY FOREMAN, aged between 30 and 40 years, required for foundry producing machine tool castings. This is a permanent position, and carries an adequate salary, with staff conditions.—Applications, stating qualifications, experience, and salary expected, to the WORKS' MANAGER, Thomas Robinson & Son, Ltd., Railway Works, Rochdale.

A STEEL FOUNDRY in Yorkshire requires a FOREMAN to take charge of the loose pattern section of the foundry. The applicant must have experience of loose pattern production up to a casting weight of 5 tons, and possess initiative to develop productivity. After a satisfactory period of 6 months housing accommodation will be found. The salary offered is £550 per annum.—Write, giving full details of age and experience to date, with available references, Box 686, FOUNDRY TRADE JOURNAL.

FOUNDRY SUPERINTENDENT, South Lancs. area. "Loam," "dry" and "green" sand. Jobbing Iron Foundry, weekly average 40 tons. 90 employees. Able to produce 15-ton castings to close analysis. To be responsible to the Managing Director for Foundry and Pattern Shop. Preference to M.I.B.F. State salary required. Three-bedroom semi, garden, garage, in residential district. Vacant early April.—Box 638, FOUNDRY TRADE JOURNAL.

A STEEL FOUNDRY in Yorkshire requires an experienced FOREMAN, to take charge of machine moulding. The applicant should possess initiative and a sense of organisation, together with the ability to train and control green labour. Technical knowledge is secondary to these, and on completion of a satisfactory period of 6 months housing accommodation will be found. The salary offered is £600 per annum.—Write, giving details of age, experience and references, Box 688, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT—*Contd.*

YOUNG Man, with experience of metal analysis and cupola practice, to train to take charge of small Laboratory. Good prospects for suitable applicant.—Apply, stating age and salary required, to Box 680, FOUNDRY TRADE JOURNAL.

AN experienced FOUNDRY MANAGER required for Light/Medium Foundry in Lancashire producing 200 tons finished castings weekly. Experience of mechanised plants essential. Good house available. Salary £1,000 to £1,200, according to experience. Non-contributory pension scheme in force.—Applications in confidence, stating previous experience and qualifications, to Box 682, FOUNDRY TRADE JOURNAL.

MANAGER wanted for Steel Foundry on East of Scotland. Present output approximately 100 tons of metal per week by electric furnace process. Average types of castings produced weigh from a few pounds to 20 cwts. Both dry and green sand methods are in operation. Applicant must have experience in floor moulding and semi-mechanised methods. An exceptionally well appointed house is available.—Apply in writing, stating age, details of experience, references, and salary required, to Box 632, FOUNDRY TRADE JOURNAL.

FOREMAN required for Iron Foundry producing Builders' Castings. Knowledge of semi-mechanisation. Staff of 30. Pension scheme. House available. South Yorkshire town.—Box 634, FOUNDRY TRADE JOURNAL.

FOUNDRY MANAGER required for Clydeside Mechanised Non-ferrous Foundry, producing up to 30 tons per week. Non-ferrous experience essential. Applicants should be good organisers, capable of taking complete charge. Staff and pensionable prospects.—Please state full details of experience and salary required to Box 664, FOUNDRY TRADE JOURNAL.

WORK WANTED

WORK wanted for deep moulding boxes 44 in. long by 30 in. wide by 18 in. top by 18 in. depth. Machine moulding. Large pipe fittings or other cylindrical horizontal work. Low phos. iron. Location Clyde area.—Box 532, FOUNDRY TRADE JOURNAL.

FINANCIAL

ADVERTISERS would consider purchasing part or whole interest in an established concern of Engineers (any sphere) or Iron Founders. Amount of capital involved secondary consideration, provided justifiable by profit earning record. Continuity of management and personnel desirable. Brief particulars invited to Box 670, FOUNDRY TRADE JOURNAL.

AGENCY WANTED

AGENCY required for Midland Counties, with reputable Company, for Repetition Grey Iron Castings. Can build up very substantial weekly tonnage immediately for permanent work. Commission basis. Please state full details.—Box 666, FOUNDRY TRADE JOURNAL.

MACHINERY WANTED

WANTED.—Stock Converter Plant, 25/45 cwts. capacity.—Box 662, FOUNDRY TRADE JOURNAL.

WANTED.—One Rotary Sand or Gravel Drier urgently.—Box 710, FOUNDRY TRADE JOURNA.

WANTED.—Cupolette, with fan, capable of melting approximately 15-20 cwt. per hour. Condition not important, and state where can be seen.—Box 712, FOUNDRY TRADE JOURNAL.

OFFER YOUR SURPLUS PLANT TO
FRANK SALT & CO., LTD.,
Station Road, Blackheath, Birmingham.
BLA. 1635.

WANTED.—Reasonably modern Electric Arc Melting Furnace, about 3-tons capacity; with or without transformer.—Box 720, FOUNDRY TRADE JOURNAL.

MACHINERY FOR SALE

ONE No. 2 Continuous Blast Cleaning Barrel, complete with motors, bucket elevator, exhaust fan and dust arrester, by St. George's Engineers, Ltd. Can be seen working in Manchester by appointment.—Box 692, FOUNDRY TRADE JOURNAL.

TITAN Core Blowing Machine, by Constructional Engineering Co. 75 lb. capacity. Takes coreboxes up to 18 in. long, 12 in. wide, 24 in. high. Motorised, 400/440 volts to cycles, 3-phase. In perfect working order. Vibration Table, 20 in. by 28 in. by 32 in. high, complete with knee valve and attachments.—Apply DIECASTINGS, LTD., 41, Highgate Square, Birmingham, 12.

IN STOCK AT SLOUGH FOR IMMEDIATE DELIVERY.

SIX only brand new 10-cwt. FOUNDRY LADLES. £25 each to clear.

Brand new SAND DRYER; 1 ton per hr. £48.

Two complete small CUPOLAS, 30 in. diam., £150 each, including Keith Blackman Fans, etc.

25 practically new BALE-OUT FURNACES, cheap.

31 in. CUPOLA complete, by "Constructional," with spark arrester, Keith Blackman Blower and new lining—all at £250.

48 in. ditto complete, for £375.

ADAPTABLE MOULDING MACHINES. £45 each.

SAND MILLS, by Jas. Evans. 4 ft. diam., £48; 5 ft. diam., £120.

TITAN CORE BLOWER, as new, 150 lbs. £285.

Several WEIGHING MACHINES, by Avery. Type 282, as new, cheap.

Large stock new Broomwade Compressors, new. A.C. Motors and Keith Blackman Fans.

ELECTROGENERATORS LTD.
Australia Road, Slough
Telephone: Slough 22877.

MACHINERY FOR SALE—*Contd.*

HOOKER

50 PAIRS Steel Moulding Boxes for Sale. 16 in. by 14 in. by 4 in. by 4 in.

W. HOOKER, LTD.
4, Midland Crescent, London, N.W.3.

FOR SALE.

2 BRAND NEW 2-Ton Electric Overhead Travelling Cranes. 30 ft. Span. Electric Hoist and Cross Travel, and Hand Long Travel.

From Stock.

FRANK SALT & CO., LTD.,
Station Road, Blackheath, Birmingham.
BLA. 1635.

FOR SALE.

LANCASHIRE BOILER FLUES, suitable for Cupolas; can be inspected at our works; cheap.

MARKLAND SCOWCROFT, LTD.,
Cox Green Works, Bromley Cross, near Bolton.
Tel. No. Eagley 600/1/2

FOR SALE

NO. 16 ATRITOR CRUSHER by Alfred Herbert, complete with Feed Hopper, overhauled and with a quantity of spares. Also a No. 12 Atritor by Alfred Herbert, for which we have available about 6 tons of spares. Both these machines are offered at extremely low prices for quick clearance.

SAVILLE-CALVERT (MACHINERY), LIMITED
BIRMINGHAM ROAD,
STRATFORD-ON-AVON.
Tel.: Stratford-on-Avon 3681.

LADLES IN STOCK AT BLACKHEATH.

15-CWT. Geared Ladle, by Alldays & Onions. Brand New.
3-Ton Geared Ladle.
5-Ton Ditto.
12-Ton Ditto.

FRANK SALT & CO., LTD.,
Station Road, Blackheath, Birmingham.
BLA. 1635.

DELIVERY EX STOCK

New shot blast cabinets complete with Dust Extractors, etc., size 5ft. × 3ft. Also new 8ft. cube room Plants Low prices.

Please send for our NEW Illustrated catalogue on request

ELECTROGENERATORS LTD.
14 AUSTRALIA RD., SLOUGH
Telephone: SLOUGH 22877
BUY FROM US AND SAVE MONEY

MACHINERY FOR SALE—*Contd.*

MOULDING MACHINES. — Two Coleman No. 24A Davenport Type Machines. Jarr, Roll-over. Pattern draw 12 in.; 1,100 lbs. working capacity. Suitable for boxes up to 40 in. by 24 in. Price £350 each.—Box 288, FOUNDRY TRADE JOURNAL.

600

AIR COMPRESSORS.

490-c.f.m. BROOM & WADE, maker's No. 23022, vert., 3 cyl., single stage, water cooled, 30 lb. w.p., 323 r.p.m., direct coupled 55-h.p. auto. synch. Crompton motor 400/3/50.

400-c.f.m. ALLEY & McLELLAN, series 34B, size 7, vert., enclosed, 2 stage, 2 crank, double acting, water cooled, 100 lb. w.p., 975 r.p.m., with vert. F.M. intercooler and aftercooler, vee rope driven by 95-h.p. S.C. motor by L.D.M., 400/3/50.

400-c.f.m. TILGHMAN, type GB3, vert., 2 stage, water cooled, 100 lb. w.p., 320 r.p.m., with intercooler.

250-c.f.m. ALLEY & McLELLAN, Sentinel series 28A, vert., single cyl., water cooled, 100 lb. w.p., 360 r.p.m., belt driven from 50-h.p. L.D.M. S/R motor 440/3/50, 1,460 r.p.m.

GEORGE COHEN
SONS & CO., LTD.
WOOD LANE, LONDON, W.12
Tel: Shepherds Bush 2070
and STANNINGLEY nr. LEEDS
Tel: Pudsey 2241

ALBION WORKS

ROTARY BLOWERS.

ROOTES MOTOR DRIVEN POSITIVE PRESSURE BLOWER. 700 c.f.m. against 45 in. w.g., 7 in. inlet and outlet. Driven by 12 h.p. Motor, 400 volts, 3-phase, 50 cycles, 1,440 r.p.m., through gearing.

MOTOR DRIVEN ROTARY BLOWER, by HICK HARGREAVES. 546 c.f.m., 5-lbs. pressure. Driven by 28 h.p. Motor, 440 volts, 3-phase, 50 cycles. All mounted on combined bedplate.

ONE MOTOR DRIVEN ROTARY BLOWER, by HICK HARGREAVES. 615 c.f.m., 10-lbs. pressure, speed 960 r.p.m., pressure gauge, etc., half coupling—no motor.

"HOLLAND" MOTOR DRIVEN ROTARY BLOWER. Comprising two giving a combined displacement of 2,700 c.f.m. at 60 in. w.g. Mounted in tandem and direct coupled to 125 h.p. Motor, 730 r.p.m., mounted between blowers.

VENTILATING FANS:

ONE 15 in. four-bladed PROPELLOR BLADE EXTRACTION FAN. Fitted with flameproof Motor wound for 440 volts, 3-phase, 50 cycles, speed 1,400 r.p.m., capacity approx. 2,460 c.f.m.

TWO 24 in. MOTOR DRIVEN PROPELLOR BLADE VENTILATING FANS by Keith Blackman. 5-blades capacity, approx. 5,300 c.f.m. Driven by Totally Enclosed S.C. Motor, 400 volts, 3-phase, 50 cycles, 700 r.p.m.

MOTOR DRIVEN 24 in. FLAMEPROOF TYPE PROPELLOR BLADE VENTILATING FAN, with ½ h.p. Motor, 400 volts, 3-phase, 50 cycles.

THOS W. WARD LTD.
ALBION WORKS : SHEFFIELD
Phone 26311 'Grams: "Forward."

Remember . Wards might have It!

MACHINERY FOR SALE—*Contd.*

"SKLENAR" FURNACE. 1-ton capacity. Coke fired. New 1944. Very little used. Price £700.—Box 642, FOUNDRY TRADE JOURNAL.

FOR SALE.—British Furnace, semi rotary. 800 lbs. capacity. Gas or oil fired.—Box 640, FOUNDRY TRADE JOURNAL.

CAPACITY AVAILABLE

NON-FERROUS FOUNDRY.—Capacity available. First-class quality castings, in Aluminium-Bronze, Gunmetals, etc., at competitive prices, including patterns if required.—BEESTON LEE & Co., LTD., 33, Swindon Road, Stratton St. Margaret, Wilts.

SUNDERLAND PATTERN & WOOD WORKING CO., Peacock Street, Sunderland. — Patternmaking; capacity available; plate, light and heavy patterns; keen prices and quick delivery. 'Phone 3979.

FOUNDRY capacity available. For up to 5 cwts. machine moulded; for up to 2 tons floor moulded. Prompt delivery.—LEWIS' FOUNDRY CO., LTD., Ammanford.

CAPACITY, substantial, available immediately, fully mechanised Foundry; high quality Grey Iron and Malleable Castings; boxes up to 28 in. by 16 in. by 5 in.; Patternmaking facilities if required —E. J. WALLACE, 50, Wellington Street, Glasgow, C.2.

CAPACITY available for castings weighing from 1 lb. to 12 tons, including Quasi-Bessermised ingot moulds up to 10,000 tons per annum.—THE CROSS FOUNDRY & ENGINEERING CO., LTD., Gorseinon, near Swansea.

IRON Foundry capacity available for production of C.I. Railway Chairs, or plain castings with flat backs up to a maximum of 16 in. by 16 in. by 6 in. deep and up to 1 cwt. in weight. Competitive prices.—Apply JOSEPH WILLIAMSON & Co., LTD., Midland Foundry, Wellingborough, Northants.

CAPACITY available for Light Castings weighing from 1 lb. to 5 cwts., including Castings for Vitreous Enamelling. —WESTERN LIGHT CASTINGS FOUNDRIES, LTD., Fairwood Foundry, Gowerton, near Swansea, manufacturers of malleable iron castings.

PATTERNMAKING capacity available for all branches of Engineering; for hand or machine moulding. Competitive prices and good delivery.—CHARLES HILL & SONS, LTD., Albion Dockyard, Bristol.

THE Pattern Equipment Co. (Leicester) Ltd., has immediate capacity for all types of wood and metal patterns, equipment for mechanised foundries a speciality.—147, Mount Road, Leicester; Telephone: 23773.

CASTINGS.—We can save your porous castings, ferrous or non-ferrous, by an approved impregnation Process; sample castings treated.—RECUPERO, LTD., Cannon Croft Works, Eastcote Road, Pinner, Middx. 'Phone Pinner 7529.

CAPACITY AVAILABLE—*Contd.*

MODERN Foundry in the South, with capacity 35 tons per week medium light ferrous castings, willing to consider making available half this capacity to large concern requiring regular supplies of castings.—Box 690, FOUNDRY TRADE JOURNAL.

MISCELLANEOUS

METALLURGICAL Microscope, suitable for visual work and micro-photography.—Please give full details and price to Box 696, FOUNDRY TRADE JOURNAL.

WOOD FLOUR for Foundries. 100 mesh; superior quality. 50 tons available; prompt supply.—Box 660, FOUNDRY TRADE JOURNAL.

EX W.D. Steel Storage Bins, ¾ in. gauge, box type; make good stillages, 36 in. by 18 in. by 16 in. and 36 in. by 18 in. by 21 in. 30s.

Keith Blackman 1 h.p. Cyclone Fan, with ducts and hopper. £25.

C. G. NELSON,
118, Anchorway Road, Coventry.

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

CAST IRON chaired sleepers available: North Midlands 3,000, Midlands 6,000, South-West 5,000.—Offers to Box 412, FOUNDRY TRADE JOURNAL.

MOULDING BOXES fabricated from Aluminium Alloy or Steel; for all types of welded fabrication we can give a first-class job and good delivery.—THE GLENMOOR ENG. CO., LTD., Eyre's Avenue, Stanningley Road, Leeds, 12.

WANTED your surplus
STAINLESS STEEL
SHEET · OFFCUTS · BAR · STRIP or TUBE
BOUGHT at best prices or
EXCHANGED for what you now need
SCRAP · STAINLESS or NICKEL
We pay best prices and collect.
Purchase offers by return of post or our Buyer will be pleased to call.
TAYLOR STAINLESS METALS LTD.
Slough, Bucks. Phone: Slough 21361
Grams: Taysteel, Slough

H. C. HOPPER (Kingston) Ltd.
HAMPDEN ROAD, KINGSTON
KIN 0177/8/9
PATTERNS (Wood & Metal)
CASTINGS (Iron & Non-Ferrous)
GEAR CUTTING
GENERAL MACHINING
All at our
KINGSTON WORKS
Good Deliveries

MISCELLANEOUS

BROMSGROVE Red Foundry Moulding Sand at keen prices. Delivered works by road.—HAWLEY, Lydiate Ash, near Bromsgrove, Worcs.

PATTERNS in Wood or Metal; high finish and accuracy maintained; plate and multi-cored work a speciality.—HAYWOOD BROS., Littleborough, Lancs 2543.

MISCELLANEOUS—*Contd.*

S. BATEMAN for Engineers' Wood Patterns.—Bolton's Court, Blackburn. Tel.: Blakewater 42179.

WE buy used or unserviceable Steel Files at good prices, in lots of 2 cwts. or more.
THOS. W. WARD LTD.
R.S. Department,
Albion Works, Sheffield
Phone 26311 'Grams: "Forward."

MISCELLANEOUS—*Contd.*

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

MANURE, especially suitable for Foundry work and as supplied to the trade for over 25 years. Quotations on request.—FRANK GINSTER, Moxley, Wednesbury. 'Phone: 0688 Wednesbury.

CROOKE & CO., LTD. *associated with* **DIXON STACEY & CO.**
Phone: Mansion House 0611 Established 1880 Grams: Kokoal, Bilgate, London
FOUNDRY COKE, SAND, GANISTER and all FOUNDRY SUPPLIES and REQUISITES.
Quotations on rail and lorry, in barge or delivered into works.
Contractors to H.M. Government and British Railways
COAL EXCHANGE, LONDON, E.C.3.

DEPENDABILITY
IN GREAT OR SMALL
IS
ESSENTIAL.
CHAPLETS are the SMALL
things in the FOUNDRY
but the BEST are NEEDED.

WARING BROS.
QUALITY IS DEPENDABLE
TEST THEM
Write—DOCK WORKS, BARNSLEY

KING Bros.
(Stourbridge), Ltd., STOURBRIDGE, England
Telegrams: "KING BROS., STOURBRIDGE."
STOURBRIDGE CLAY.

THE HIGHEST AWARDS for GAS RETORTS and other goods (in Fire Clay) have been awarded to KING BROTHERS for their goods made from their renowned STOURBRIDGE FIRE CLAY.

Manufacturers of CUPOLA BRICKS, Best *QUALITY.* Lessees of *DELPH* and *TINTERN ABBEY BLACK* and *WHITE CLAY. BRICKS FOR REGENERATIVE SETTINGS. BLAST FURNACE LININGS. COWPER* and other *HOT AIR STOVE BRICKS.*

Coke Oven Bricks a speciality.

VITREOUS ENAMELLED CASTINGS

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

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

SCOTTISH FOUNDRY SUPPLIES CO.
55 West Regent Street, GLASGOW C2
DOU 0488/9

Sole Scottish Agents & Stockists for

"SAIRSET"
H. T. Cement
and all other plastics distributed
by Steam Plant Accessories Ltd.

Stockists of Foundry Requisites:—
Straw Rope, Core Gum, Moulders Brads,
Parting Powder, Brushes, Martindale Masks.

DIE SLICK

The only Lubricant and Dressing for Pressure Diecasters which

- Does not carbon up on moving parts.
- Does not stain the casting.
- Prevents sticking and scoring.
- Gives a velvet smooth surface finish.

Standard Grade for Aluminium, Magnesium, Brass, etc., Grade No. 11 for Zinc and Lead.

Genuine Die Slick is only made by G. W. Smith & Son Inc. of Dayton U.S.A. whose sole distributors in Gt. Britain are:—

HOOKER

W. J. HOOKER LTD.
4 MIDLAND CRESCENT, LONDON, N.W.3
Phone: HAMpstead 2495

PATTERNMAKERS' Section

Published by the Proprietors, INDUSTRIAL NEWSPAPERS, LIMITED, 49, Wellington Street, Strand, London, W.C.2, and Printed in Great Britain by HARRISON & SONS, LTD., Printers to His Majesty The King, London, Hayes (Middx) and High Wycombe.

FOUNDRY TRADE JOURNAL

EST. 1902

VOL. 90
No. 1801

WITH WHICH IS INCORPORATED THE IRON AND STEEL TRADES JOURNAL

MARCH 8, 1951

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

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

Single Copy, 6d. By Post, 11d. Annual Subscription, Home 40/-, Abroad 45/- (Prepaid)