

174 £1.69/53/11

# FOUNDRY

EST. 1902

TRADE JOURNAL

VOL. 95  
No. 1933

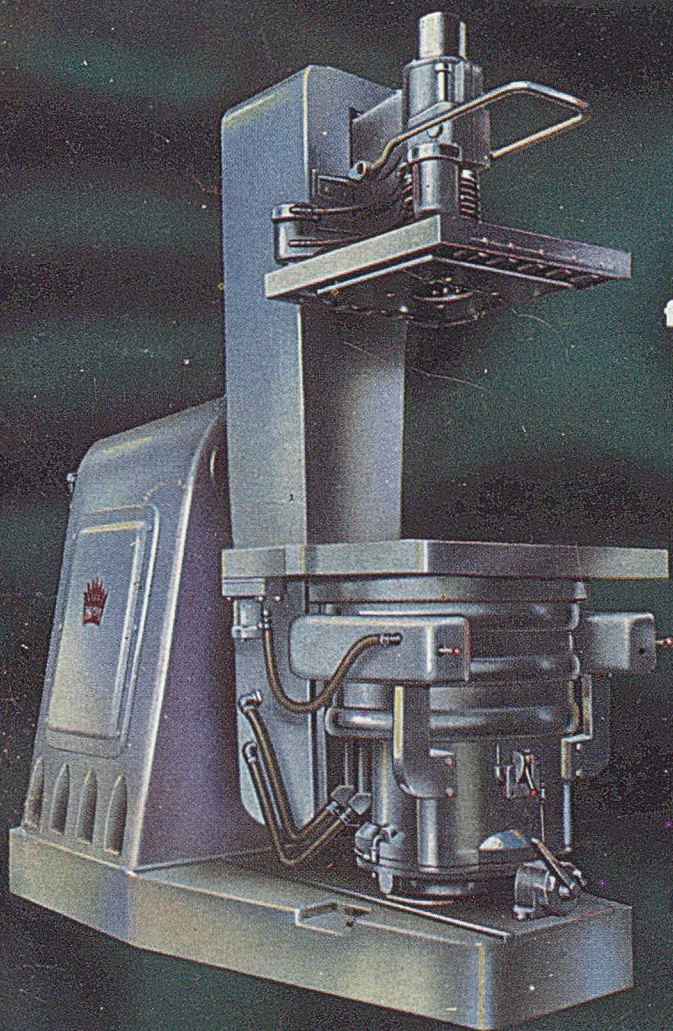
Registered at the G.P.O. as a Newspaper

WITH WHICH IS INCORPORATED THE IRON AND STEEL TRADES JOURNAL

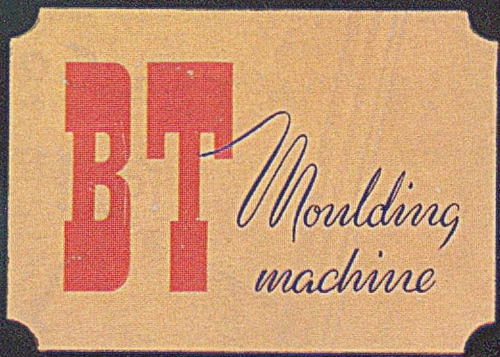
SEPTEMBER 17, 1953

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

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



famous throughout the world



BRITISH MOULDING MACHINE CO LTD

FAVERSHAM KENT

COMB YOUR SAND WITH A **ROYER**

Built in England by  
PNEULEC LTD., SMETHWICK, Nr. BIRMINGHAM

“BENEFLUX”

MEANS

BETTER CASTINGS

BENTLEY - LAYFIELD LTD  
21 SKINNERGATE · DARLINGTON

# NO. 10 PREPARED BLACKING

• The Core and Mould Wash  
for **IRON CASTINGS**

•  
**STEELMOL** for STEEL and SPECIAL IRON CASTINGS

HIGH CARBON BLACKING · CEYLON PLUMBAGO  
TERRA FLAKE · COAL DUST · GANISTER AND  
"ALUMISH" FOR ALUMINIUM

Non-Silica **PARTING POWDER**

**JAMES DURRANS & SONS LTD**

PHENIX WORKS & PLUMPTON MILLS, PENISTONE, near SHEFFIELD  
Telephone: PENISTONE 21 and 57  
Telegrams: BLACKING, PENISTONE



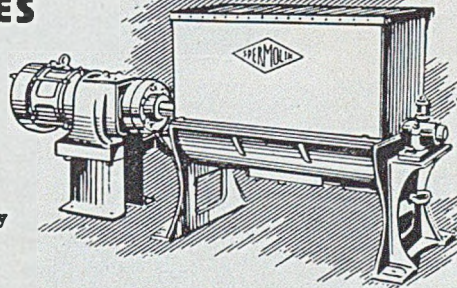
**Ensure  
sound  
consistent  
CASTINGS**

**WRITE FOR FULL INFORMATION OF  
the Spermolin range  
OF FOUNDRY SPECIALITIES**

*Photograph by courtesy of  
Messrs. John Stirk & Sons Ltd.,  
Halifax*

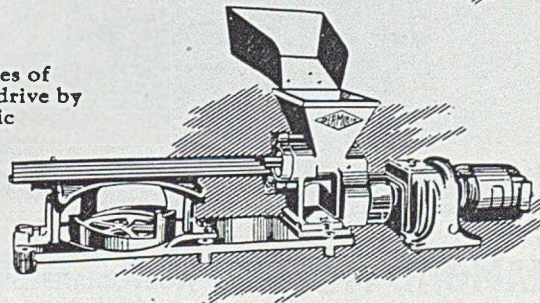
**CORE OILS & BINDERS FOR EVERY TYPE OF CASTING**

The cores shown above are used in the casting of 12 ton planing machine beds. A good green bond and dry strength are required for this type of core and it is essential that no distortion takes place. This modern foundry employs similar cores for all types of castings, from 5 to 20 tons and these are made entirely with SPERMOLIN Core Oils and Binders. The cores break down easily when castings reach the fettling shop, thereby saving time and labour costs.



**SAND MIXING MACHINES**

The SPERMOLIN Major thoroughly mixes batches of sand and oil in 4 minutes. Supplied with direct drive by 5 H.P. motor or belt drive and provides automatic discharge. Machine stops when safety grid is open.



**ROTARY CORE MACHINES**

This SPERMOLIN Rotary Core Maker is simple, efficient and economical in operation and offers a wider scope than any similar machine.

**WRITE TO SPERMOLIN LIMITED, HALIFAX, ENGLAND**

Telephone: Halifax 4197

Telegrams: Spermolin, Halifax

# FOUR POINTS TO EFFICIENCY

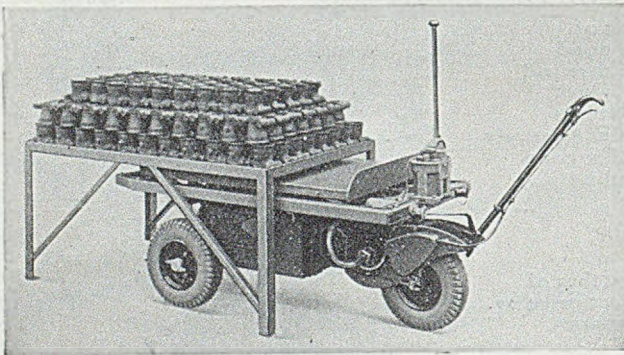
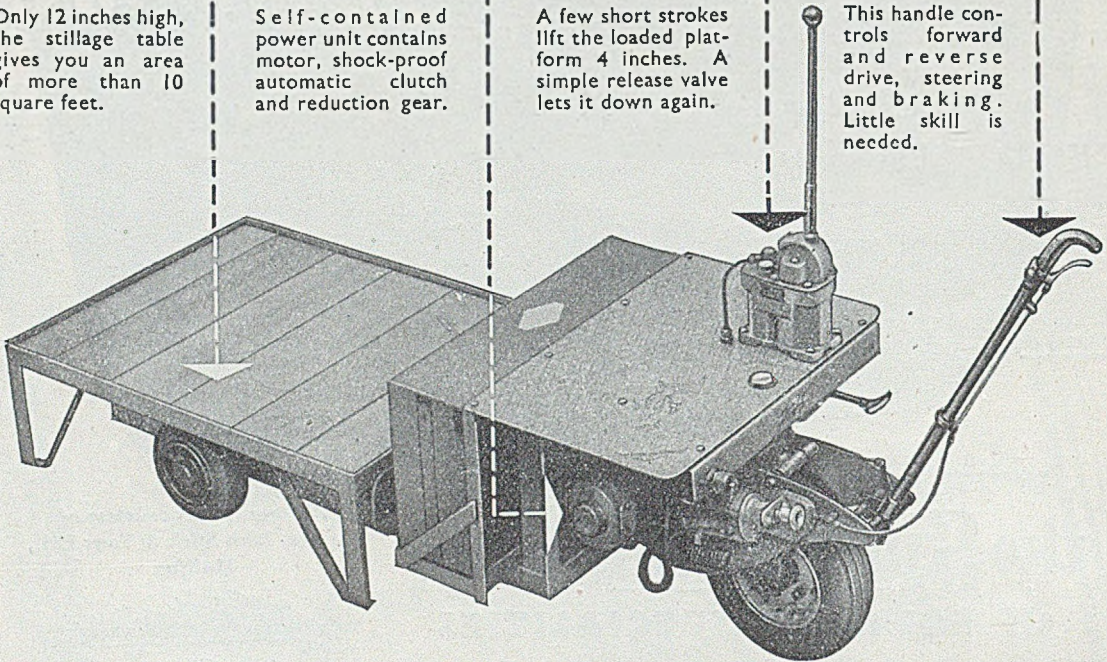
*— and economy too*

Only 12 inches high, the stillage table gives you an area of more than 10 square feet.

Self-contained power unit contains motor, shock-proof automatic clutch and reduction gear.

A few short strokes lift the loaded platform 4 inches. A simple release valve lets it down again.

This handle controls forward and reverse drive, steering and braking. Little skill is needed.



For those who prefer a high stillage. The table has an area of 13½ square feet and stands 27 inches high.

**DIAMOND MOTORS (WOLVERHAMPTON) LTD**  
**UPPER VILLIERS STREET · WOLVERHAMPTON**

TELEPHONE: WOLVERHAMPTON 22951

**G**RAISELEY stillage trucks will carry 20 cwt. at a time, work all day up inclines, round corners and in and out of confined spaces. After 8 or 10 miles they need recharging with about 4 units of electricity. That's economy for you. At night they simply plug into the charger which automatically switches off when they are ready for the next day's work. Delivery is good at present. May we arrange a demonstration with your nearest service depot.



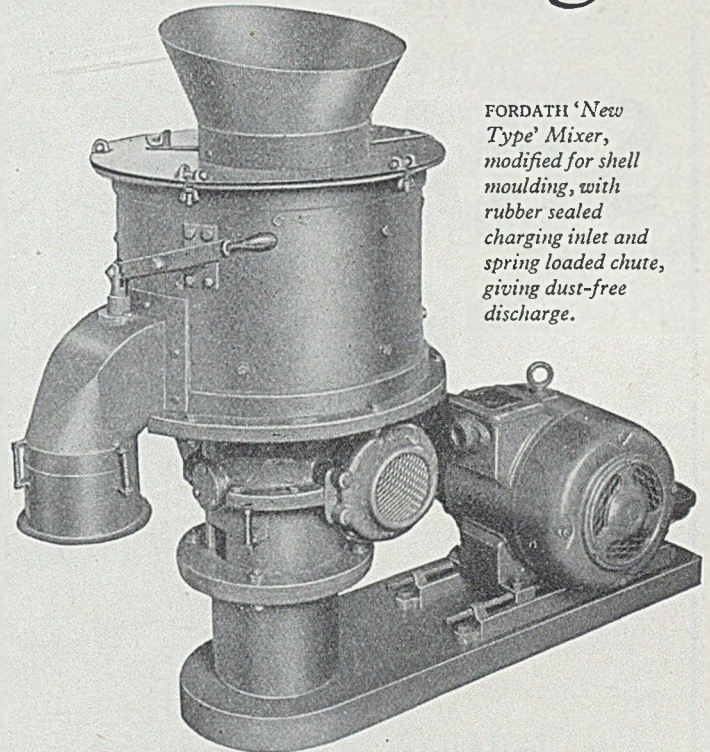
# Fordath Mixers Aid Shell Moulding

## PERFECT HOMOGENEITY OF THE SAND/RESIN MIX

EVERYONE in the foundry trade—and many in other industries—knows of the high efficiency of the Fordath 'New Type' Mixing Machine in mixing sands and powders of all kinds, with or without liquid bonding material.

Long proved in the core shop, the Fordath Mixer has now been adapted (and is rapidly being adopted) for work in the shell moulding process. Alongside technological advances in the foundry—and shell moulding is undoubtedly the most interesting technical development since the war—come associated problems and hazards.

Fine powders make fine dust—which is anything but fine for the operatives unless . . . unless by careful design the dust can be kept where it belongs: in the sand/resin mixture!



FORDATH 'New Type' Mixer, modified for shell moulding, with rubber sealed charging inlet and spring loaded chute, giving dust-free discharge.

Modified by additional components providing perfect protection for operatives, the Fordath Mixer has all the advantages:

- 1 Swift preparation of the batch by intensive mixing action with vigorous turbulence inside the machine.
- 2 The intensity of the mixing action ensures perfect distribution of any WETTING AGENTS which are to be embodied in the sand/resin mix.
- 3 Rubber sealed dust cover embodies butterfly valve charging inlet.
- 4 Spring loaded discharge chute giving dust-free attachment to dump-box.
- 5 Enclosed motor drives through V-ropes to vertical worm reduction gear, totally enclosed and sealed from mixing chamber.
- 6 Every batch of sand/resin mix is sealed and delivered quickly and dustlessly.
- 7 Units complete, mounted on bedplate, are available for 80lb, 150lb, 300lb, 550lb, 1000lb batch-sizes.

Think of your shell moulding plant and get in touch with

**THE FORDATH ENGINEERING CO. LTD.**

SOLE  MAKERS

HAMBLET WORKS, WEST BROMWICH, STAFFS. Telephone: West Bromwich 0549, 0540, 1692. Telegrams: Metallical, West Bromwich

FOUNDRY FACINGS

FOUNDRY FURNISHINGS

# SHALAGO BONDED BLACKING

MIX ONLY WITH CLEAR WATER  
FOR  
DRY SAND MOULDS  
AND COREWASH

## W<sup>M</sup> CUMMING & CO LTD

GLASGOW

FALKIRK

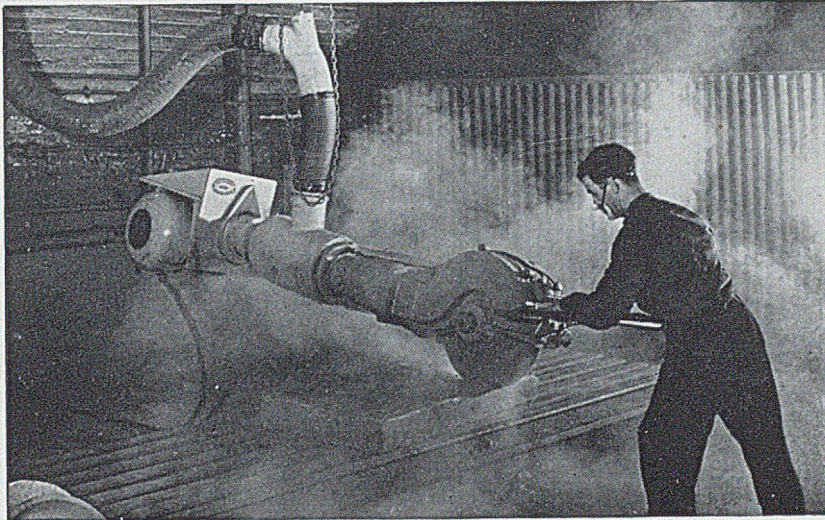
CHESTERFIELD

DEEPFIELDS near BILSTON

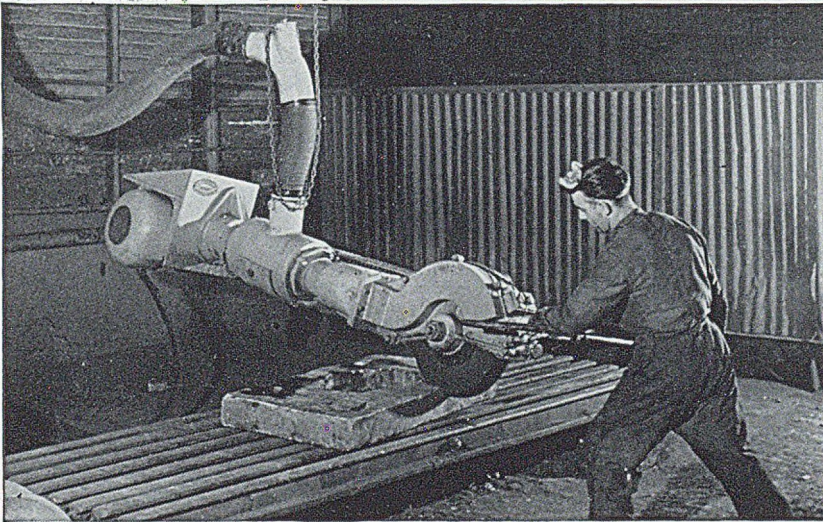
&amp; MIDDLESBROUGH

# A NEW 20" SWING FRAME GRINDER

which completely solves one of the worst problems in the foundry



GRINDING  
WOOD  
WITH  
EXHAUST  
**OFF**



GRINDING  
WOOD  
WITH  
EXHAUST  
**ON**

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

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

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

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

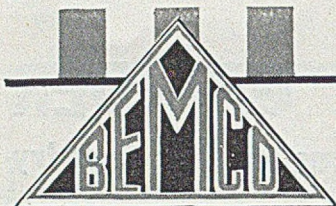
In your own and your operators' interests write to us for full details.

## LUKE & SPENCER LTD.

Viaduct Works, Broadheath, Altrincham, Cheshire

Phone: Altrincham 3281

Grams "Emery, Altrincham"

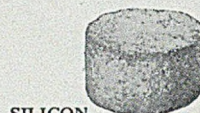


# BRIQUETTED ALLOYS

## PROVIDE CUPOLA ECONOMY

- Uniform in size
- Regular and consistent recovery obtained
- No mechanical loss of alloy
- Weighing is avoided
- Greater convenience in use
- ● ● Allow the use of a higher proportion of scrap in the charge

Type	Manganese		Silicon (Standard)			Silicon (Special)		Zirconium (+ Silicon)		Chrome
Weight of Briquette (lbs.) ...	3	1½	5	2½	1¼	3½	1¾	5	2½	1¾
Weight of Contained Alloy (lbs.)	2	1	2	1	½	2	1	2	1	1



SILICON



MANGANESE

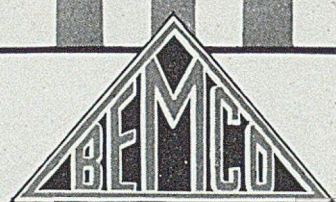


CHROME



ZIRCONIUM

## GRADED ALLOYS FOR LADLE ADDITION



### GREATLY IMPROVE THE STRUCTURES OF CAST IRONS

#### 75/80% FERROSILICON

To reduce chill and improve machinability.

#### 6% ZIRCONIUM FERROSILICON

To improve machinability and increase strength.

#### SMZ ALLOY

To improve strength and balance section thickness variations.

#### FOUNDRY GRADE FERROCHROME

To increase chill, refine structure and improve strength.

All Silicon bearing alloys are supplied FREE FROM DUST because fines give uncertain recovery, high oxidation loss and dirty ladles.

#### GRADINGS :

75/80% Ferrosilicon  $\frac{1}{2} \times \frac{1}{4}$  :  $\frac{1}{2} \times \frac{1}{2}$  : 100, 120 & 200 Meshes.

6% Zirconium Ferrosilicon  $\frac{1}{2} \times \frac{1}{2}$  :  $\frac{1}{2} \times \frac{1}{4}$ .

SMZ Alloy  $\frac{1}{2} \times 32$  Mesh.

Foundry Grade Ferrochrome (65% Cr. - 6/8% Si) 20 Mesh.

**BRITISH ELECTRO METALLURGICAL COMPANY LTD.**  
WINCObANK SHEFFIELD ENGLAND

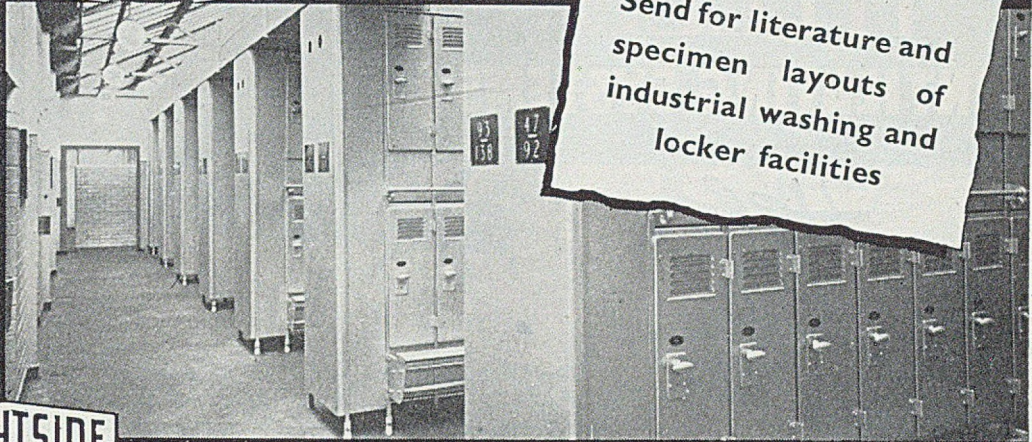
TELEPHONE: ROTHERHAM 4257 TELEGRAMS: "BEMCO" SHEFFIELD



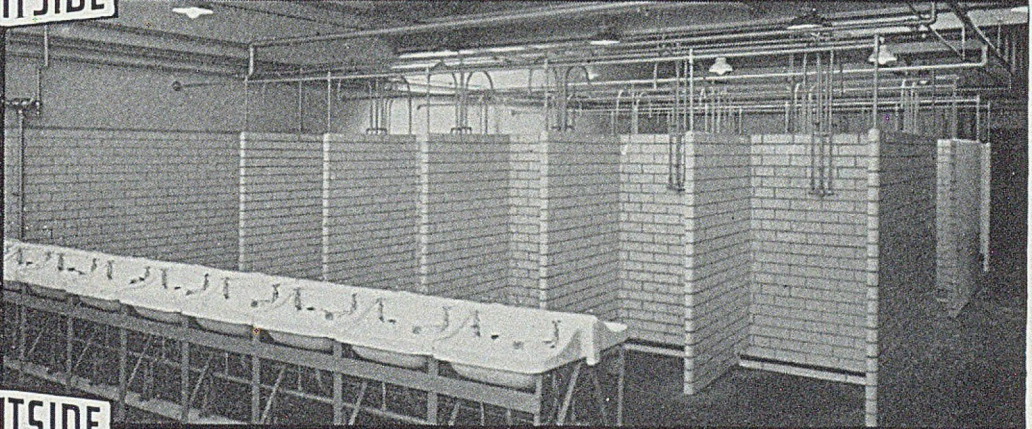
# BRIGHTSIDE

## ABLUTIONS

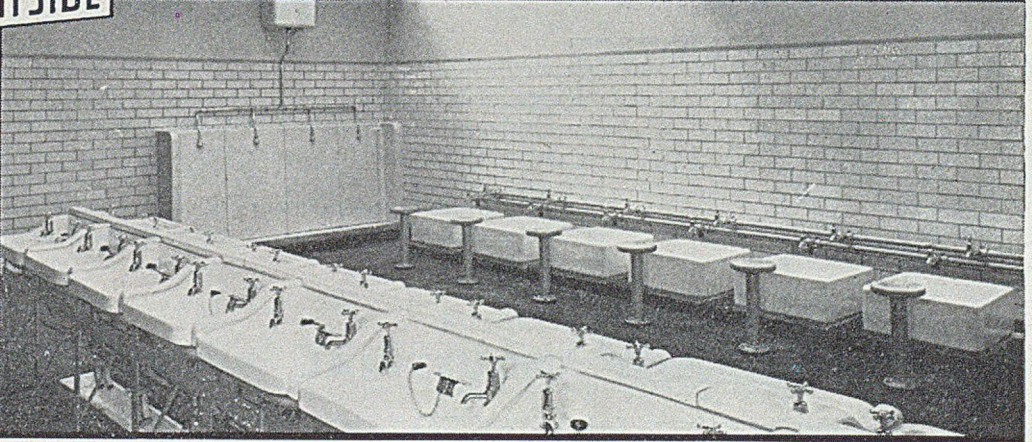
*Send for literature and specimen layouts of industrial washing and locker facilities*



# BRIGHTSIDE



# BRIGHTSIDE



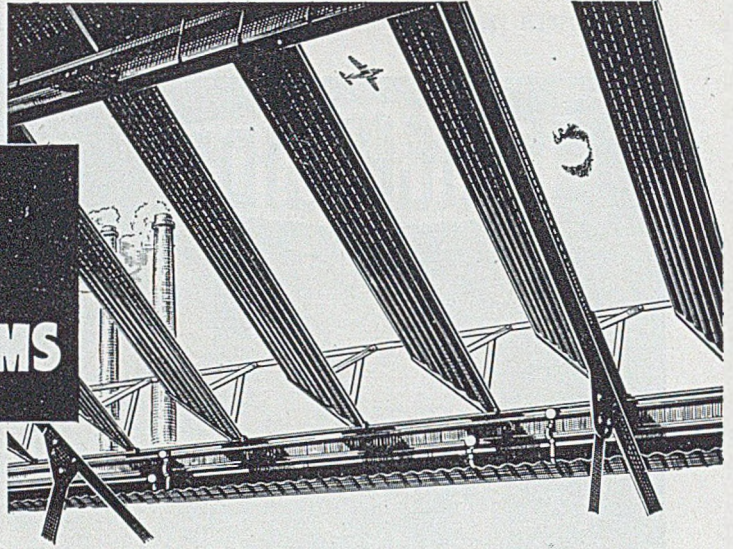
**THE BRIGHTSIDE FOUNDRY & ENGINEERING CO. LTD. • SHEFFIELD**  
and at BELFAST BIRMINGHAM BRADFORD BRISTOL EDINBURGH GLASGOW LIVERPOOL  
LONDON MANCHESTER NEWCASTLE PORTSMOUTH

How

# HILLS

## VENTILATING SYSTEMS

Help...



### THE WORKER



Where fumes, smoke, steam and excessive heat result from manufacturing processes—in Foundries, Retort Houses and Furnace Buildings—the great thing from the workers' point of view is to clear the air rapidly. No other system offers such rapid and efficient ventilation as Hill's Patent Roof Ventilating Shutters. They provide what is virtually a moveable roof to the building, and at the touch of a button they can be opened up to an angle of 65 degrees in 60 seconds—drawing off heat and fumes, and letting in fresh air and unobstructed daylight—a great and immediate relief to workers in hot or humid shops.

### THE MANAGEMENT



Good ventilation is a sound investment on the part of the management, because good working conditions are conducive to good workmanship, and efficient ventilation reduces fatigue and absenteeism and leads to increased production. In addition to their greater efficiency, Hill's Ventilating Shutters offer the most economical system of ventilation, require negligible maintenance, effect a considerable saving in artificial lighting and glass-cleaning and can be installed in old or new buildings.

### THE ARCHITECT



Architects who specify, and builders who install, industrial ventilating systems must obviously insist on those of proved efficiency and reliability. Proof of the high reputation of Hill's Ventilating Shutters is to be found in the fact that they have been installed in many of the best-known organizations throughout the country. Architects and Builders are assured of the whole-hearted co-operation of our Technical Advisory Department at all times.

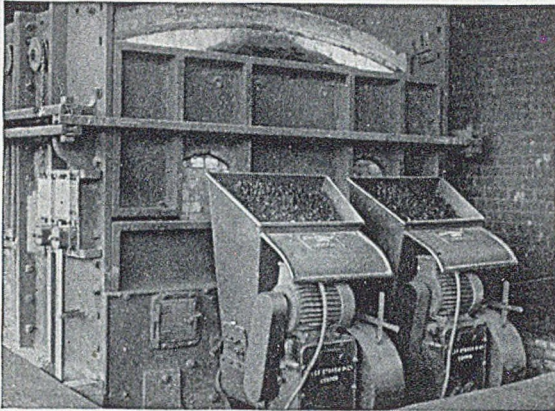
# HILLS

## INDUSTRIAL VENTILATORS

In addition to Ventilating Shutters, Hills INDUSTRIAL VENTILATORS include STACK ROOF VENTILATORS and WALL-TYPE AIR INLET VENTILATORS. For expert advice on installing efficient ventilation in a new or existing building, we invite you to consult our Technical Advisory Department. Literature gladly sent on request.

HILLS (WEST BROMWICH) LIMITED, ALBION ROAD, WEST BROMWICH. Tel.: WEST Bromwich 1025 (7 lines)  
London: 125 High Holborn, W.C.1. Tel.: HOLborn 8005/6

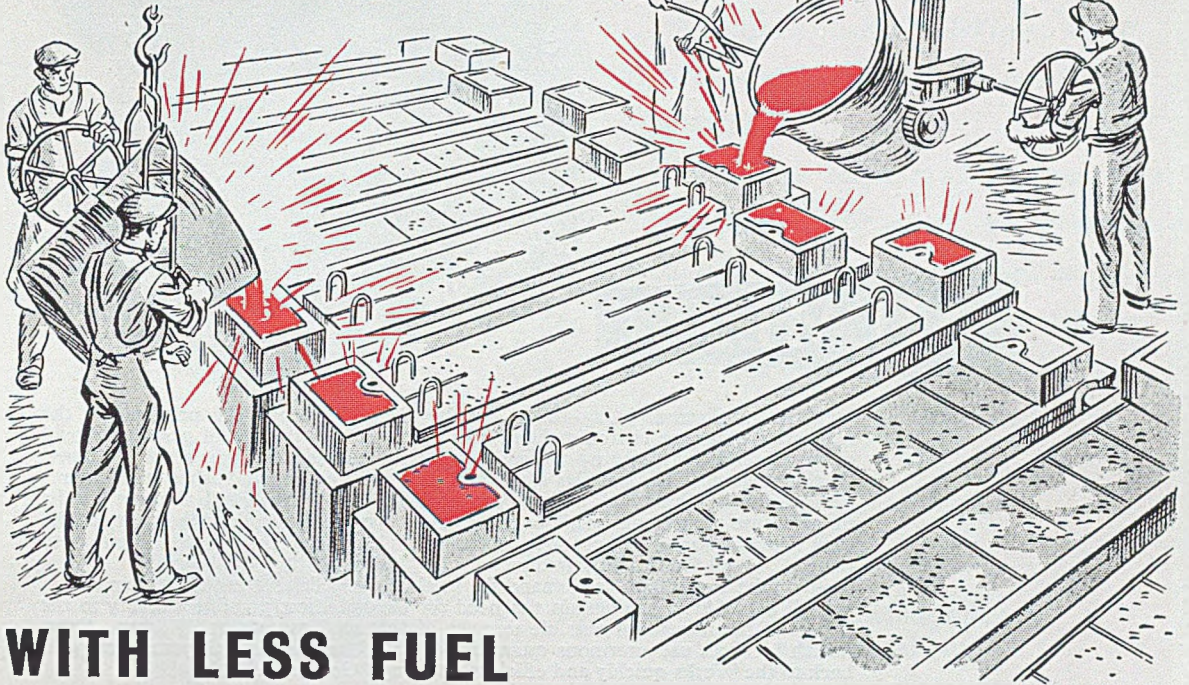
Branches at Birmingham • Bristol • Manchester • Newcastle-on-Tyne • Glasgow and Belfast



Riley Stokers firing a 40-ton air furnace.

R.34

# UNWAVERING HEAT...



# WITH LESS FUEL

**RILEY STOKERS** for arduous tasks—billet and ingot re-heating; plate heating; annealing, sheet mill and forging furnaces; foundry core ovens.

*The Riley underfeed stoker gives a regular and automatic supply of coal and air to the centre of the combustion zone.*

Correct furnace temperatures and heat "in the right place" are essential in the firing of large 'air' furnaces, for only then can a high quality output be maintained. Both features are readily obtained with the Riley Industrial Stoker, which will also effect substantial saving in fuel consumption over hand firing methods, and will function with practically no attention during the furnace operating periods.

Riley Stokers are specially made to operate continuously under arduous conditions—and there is a model for every purpose. Write for booklet R513.

## RILEY STOKER CO. LTD

(Mechanical Stokers · Syntron Electric Vibratory Equipment)  
NINETEEN WOBURN PLACE · LONDON · WC1

Member of the International Combustion Organisation

# GREAT NAMES in STEEL



## SIEMENS

Sir William Siemens (1823-1883) had, by 1857, developed the principle of the regenerative furnace in iron making. His next step was the use of gaseous instead of solid fuel in his furnace—the gas being generated separately in a gas producer. By this invention, the troubles associated with solid carbon and ashes at high temperatures were eliminated, and his conception of the open hearth furnace for the manufacture of steel was made possible. As a matter of interest, the quality of the steel Siemens was able to produce overcame the long reluctance of the Admiralty to the use of steel for British warships.

To-day, the overwhelming demand for steel in every field of industrial expansion, as well as defence, emphasises the need for the speediest possible delivery to the Works of the maximum possible tonnage of that vital raw material, Scrap. Open hearth furnaces use enormous quantities of it. Make sure that all your Scrap gets back to the Works quickly and efficiently through George Cohen's.

**GEORGE**  **COHEN**  
SONS AND COMPANY LIMITED

*Established in  
the Year 1834*

## ...the greatest name in SCRAP

**BROADWAY CHAMBERS · HAMMERSMITH · LONDON · W.6**

*Telephone* : Riverside 4141

*Telegrams* : Coborn, Telex, London

And at 600 Commercial Road, E.14 · Bidder Street, Canning Town, E.16

Bath · Belfast · Birmingham · Hebburn-on-Tyne · Leeds

Luton · Manchester · Morrision, Swansea · Sheffield

FTJ/538/X118



# A POUND to a PENNY . . .

*... the higher quality metal from which Crown Pieces are made come from CRUCIBLE furnaces.*

Coins of the realm are but a few of the multitudinous products which stay in circulation because they are well made—and made well because someone knew the value of “CRUCIBLE MELTING . . . the Morgan way”. Please write for literature.

With acknowledgements to the Royal Mint.

## CRUCIBLE MELTING ... the Morgan way

# ORDER

*Your*

# SUPPLIES

*and*

# SUNDRIES

*from*

# WARDS

*WARD'S Foundry Supplies Department can provide everything for the modern foundry.*

## THOS. W. WARD LTD

ALBION WORKS • SHEFFIELD

TELEPHONE: 26311 (22 LINES) • TELEGRAMS: "FORWARD-SHEFFIELD"

LONDON OFFICE: BRETTENHAM HOUSE • LANCASTER PLACE • STRAND • W.C.2.

ES/16



**3-14 May**

**BIF 1954**

**London and Birmingham**

Bookings are now open for the 1954 BIF and—*this year exhibitors who apply early will be able to choose the site they prefer.*

**New opportunities  
in the greatest  
of all National  
Trade Fairs**

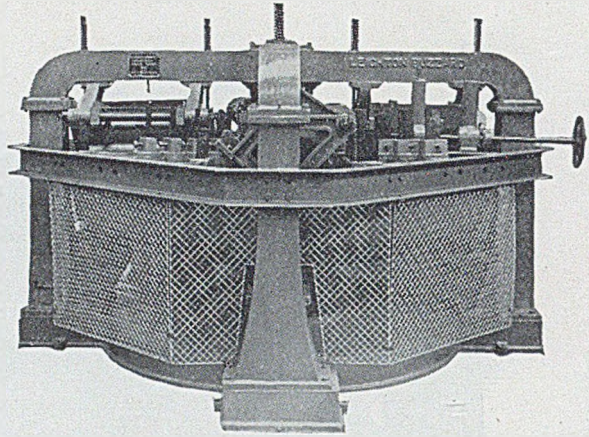
More—the earlier you book the surer you are of getting into the advance catalogues; world-wide publicity to 25,000 business men before they travel to Britain.

Apply now to your Regional Office of the Board of Trade for space at the London sections of the Fair and for full information about exhibiting. If you have not exhibited before, they can tell you what the Fair can now offer to your particular business. For space in the Engineering and Hardware Section at Castle Bromwich apply to Chamber of Commerce, 95 New Street, Birmingham.

**BIF MEANS BUSINESS**

---

# IF



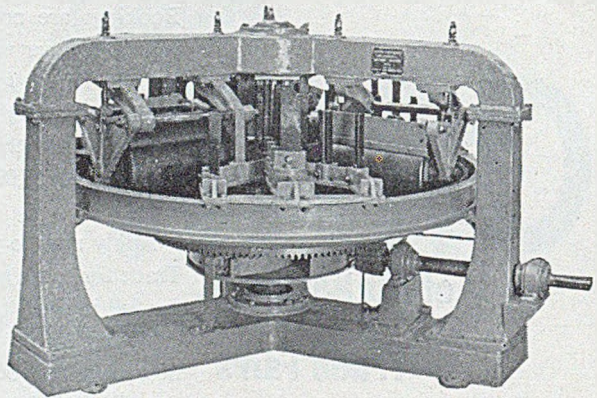
S.B.3. MILL WITH GUARDS

**YOU WANT A CONTINUOUS MILL  
THAT WILL GIVE LONG LIFE AND PRODUCE UP  
TO THIRTY TONS OF MILLED SAND PER HOUR**

*Then a machine by*

**FOUNDRY EQUIPMENT LTD.**

WILL AMPLY  
FULFIL YOUR  
REQUIREMENTS



S.B.2. MILL—GUARDS REMOVED

**FOUNDRY EQUIPMENT LTD**

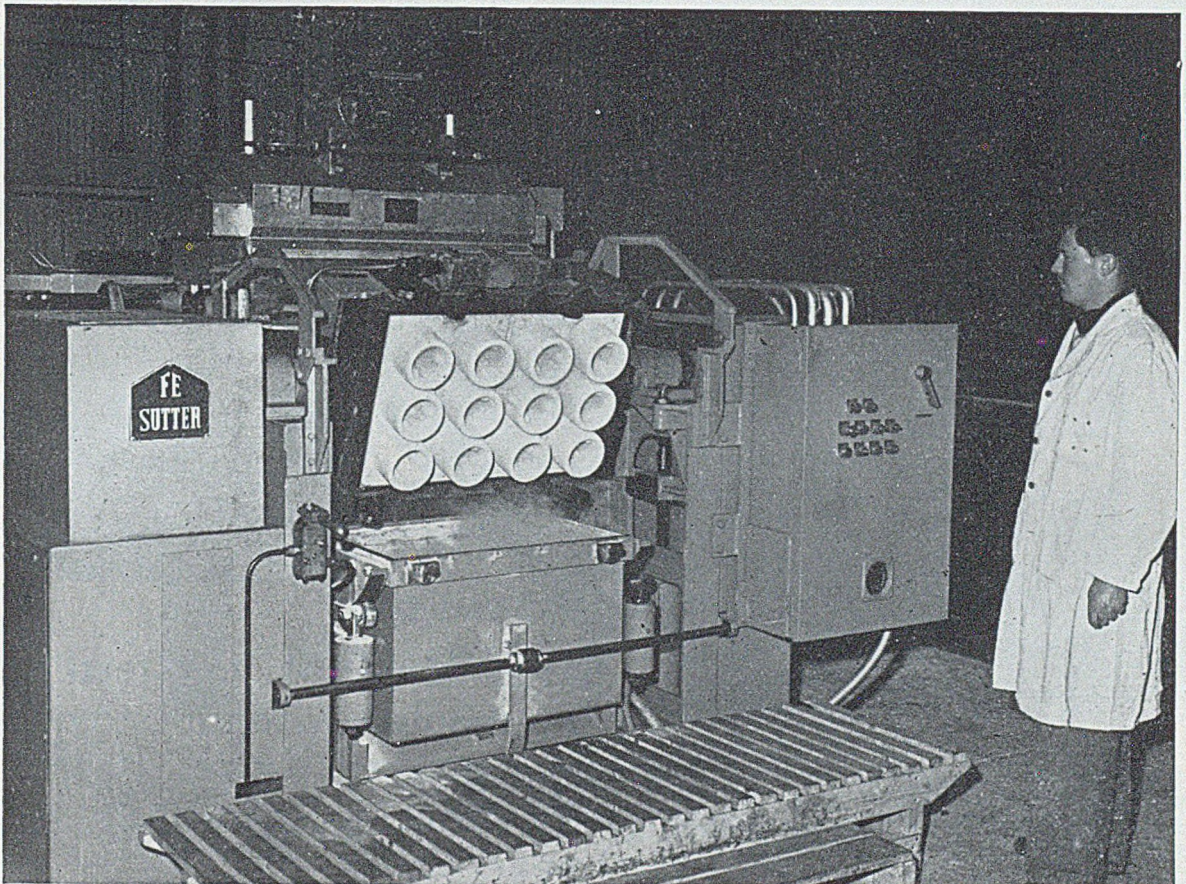
**LEIGHTON BUZZARD, BEDFORDSHIRE, ENGLAND.**

PHONE: LEIGHTON BUZZARD 2206-7. GRAMS: 'EQUIPMENT' LEIGHTON BUZZARD





# THE MACHINE WHICH HAS BEEN POSITIVELY PROVED IN THE PRODUCTION OF LARGE AND SMALL SHELLS



F.E. (SUTTER) S.P. 1,000 Automatic Shell Moulding Machine producing 30" x 20" Shells for conveyor idler-roller castings (4" deep pattern—6 castings per complete shell mould). This illustration shows the invested pattern plate rolling back to the curing position.

*Patents applied for in all Industrial Countries.*



## FOUNDRY EQUIPMENT LTD

LEIGHTON BUZZARD, BEDS, ENGLAND.

PHONE: LEIGHTON BUZZARD 2206-7-8.

GRAMS: "EQUIPMENT" LEIGHTON BUZZARD

# Catalac

## flame-set spray

for better mouldings  
and better castings



Photograph by courtesy of Samuel Csborn & Co. Ltd., Sheffield

**So simple to use  
Try it!**

**Saves time** — less fettling  
—dries moulds without stoving

**Improves quality** — gives cleaner  
castings by reducing sand-wash  
and metal penetration.

Stops striking-back and drying out  
of green sand moulds.

**Increases production** by reducing scrap.

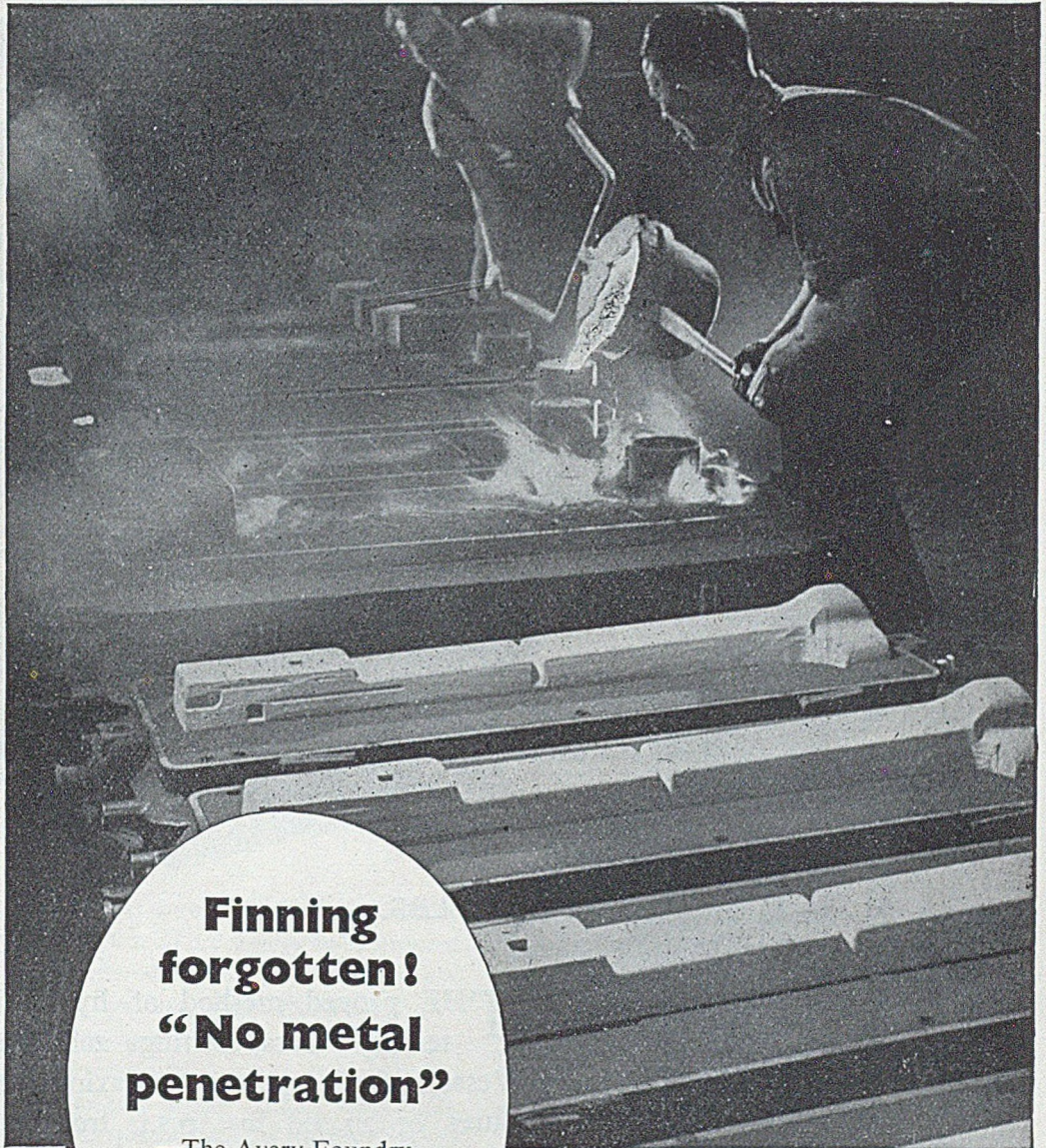
*Apply by low pressure spray and ignite.*

Patent Application No. 12404/53

CATALIN LIMITED, WALTHAM ABBEY, ESSEX · TEL.: WALTHAM CROSS 3344

Manufacturers of Core-bonding and Pattern-making resins for the Foundry

**Beetle  
in use  
No. 26**



**Finning  
forgotten!  
“No metal  
penetration”**

—The Avery Foundry,  
Sherburn-in-  
Elmet.

The Avery foundry finds that Beetle W20 provides stronger, harder cores, increases production. An example is this pillar core, the casting from which is 75 lb. as cast and fettled weight 54 lb. Wall thickness of the casting is  $\frac{1}{4}$  in. to  $\frac{1}{2}$  in. yet the long run of high temperature metal shows no metal penetration. An excellent finish is obtained.



Write for Technical leaflet C.B.1.

**BEETLE RESIN W20 Core-Binder**

BRITISH INDUSTRIAL PLASTICS LIMITED, 1 Argyll Street, London, W.1

Sole agents in Scotland and Northern Ireland for Beetle Foundry resins:

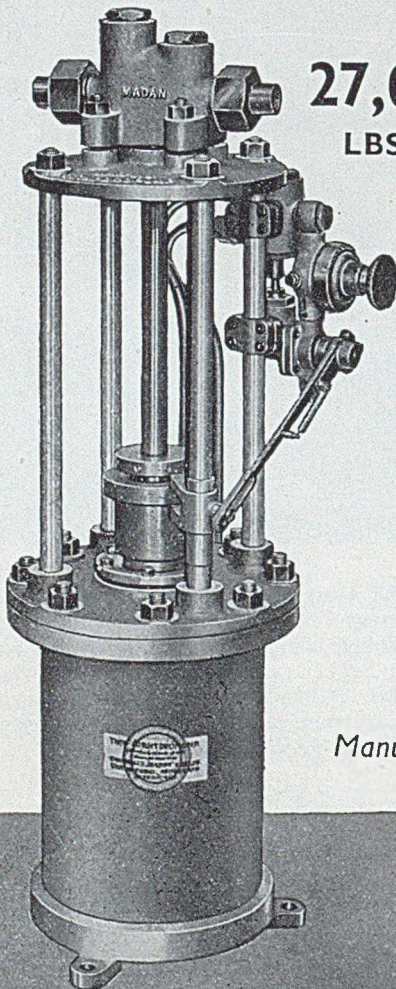
FOUNDRY & ENGINEERING PRODUCTS CO. (GLASGOW) LTD., 1-8 Farm Rd., Glasgow, S.1

\*BEETLE\* is a trade mark registered in Great Britain and in most countries of the world.

If you make **PRESSURE CASTINGS-**

# The AIR HYDRO PUMP

**PROVIDES  
HIGH  
HYDRAULIC PRESSURE  
FROM LOW  
AIR PRESSURE**



**27,000  
LBS. P.S.I.  
FROM  
100**

**LBS. or Less**

**T**HE proved method of hydraulically testing Valves, Castings and Pressure Vessels of all types up to maximum pressures of 27,000 lbs. p.s.i. from an air pressure of 100 lbs. Improved Control Valves give definite controlled pressures. 34 Standard ratios available giving pressure ranges from 20 to 27,000 lbs. p.s.i.

*Manufacturers :*

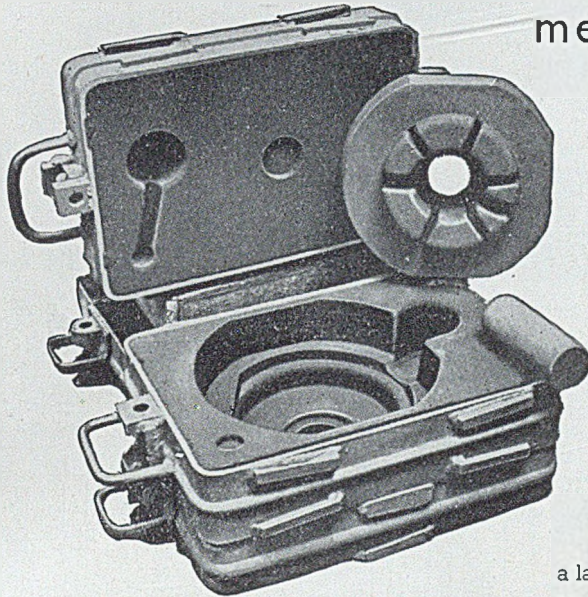
**CHARLES S. MADAN & CO. LTD.**

VORTEX WORKS : BROADHEATH  
ALTRINCHAM : ENGLAND

Telephone :  
ALT 0095

Telegrams :  
"VORTEX"

# KORDEK



means service to  
foundries



THE NAME KORDEK is known throughout the foundry industry. Kordek and Kordol were the first cereal binders ever offered to the industry, and modern cereal-binder practice, with its many great advantages for most classes of foundry work, was built up around them.

Today, the makers of the Kordek and Kordol range are still pioneering the development of new uses for cereal binders. An example is

the use of G.B. Kordek together with synthetic resins, to supply the green bond that the resins lack.

The binders in the Kordek and Kordol range have been widely imitated, but they are still, by a large margin, the most widely used of all cereal binders. Naturally, foundrymen prefer to buy their cereal binders from the firm with the widest experience and the largest resources—the firm that performs and controls every manufacturing operation from the grain to the finished product. And the foundrymen are wise, for beside this reassuring background of experience, resources, and control, the Kordek and Kordol range is backed by a service of technical advice which no other manufacturer of cereal binders can equal.

## KORDEK BINDERS

KORDEK  KORDEK  KORDOL

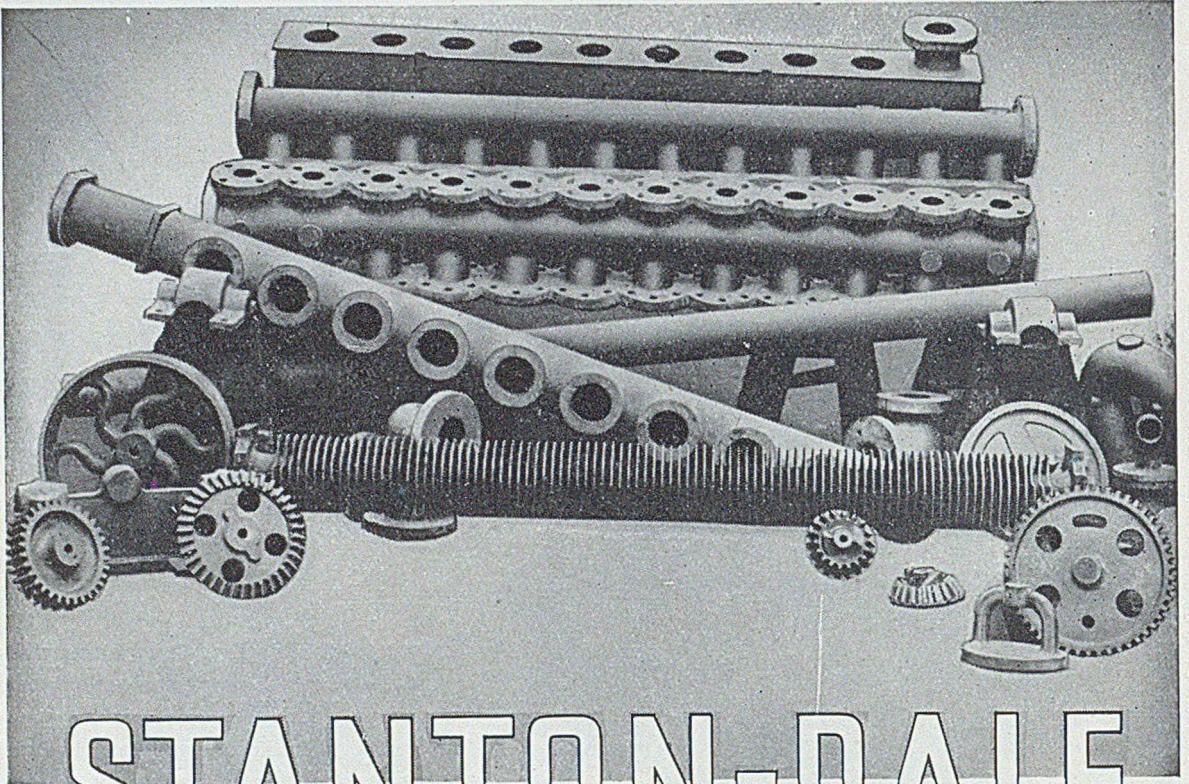
G. B. KORDEK and G. B. KORDOL are Manufactured under British Letters Patent Nos. 515470 & 543202

MADE BY A MEMBER OF THE

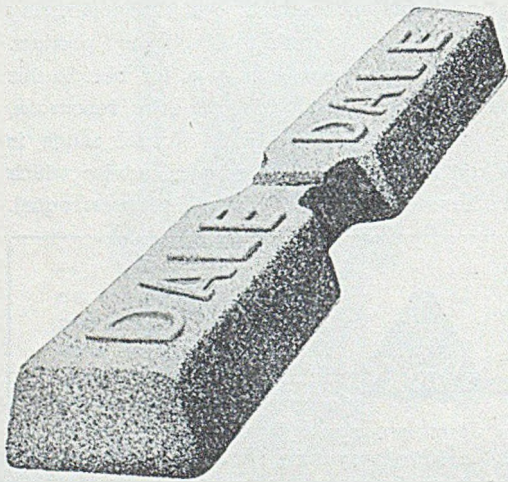
**Brown & Polson  
Group**



*This symbol identifies an advertisement by the Brown & Polson group of companies, whose wide knowledge of industrial uses for starch products is freely available to all who are interested. The Brown & Polson group manufacture some 400 different starch products and supply them to more than 80 different industries.*



# STANTON-DALE



## REFINED PIG IRON

Designed to meet the demands of high-quality castings, which are: strength, machinability, and resistance to wear.

All these can be secured by using Stanton-Dale Refined Pig Iron in your cupolas.

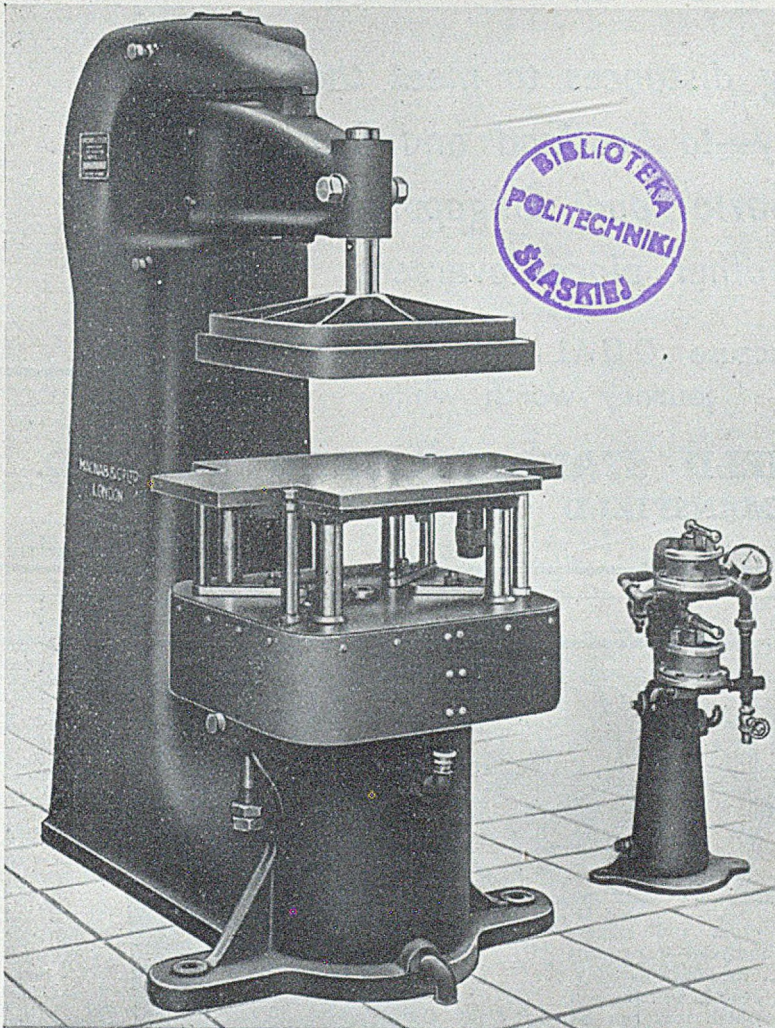
The above illustration shows a group of castings made from this iron by a well-known economiser maker.

P R O M P T D E L I V E R Y

THE STANTON IRONWORKS COMPANY LIMITED NEAR NOTTINGHAM

# MACNAB

## MOULDING MACHINES



### for High Production

#### LATEST "PIN/POST" TYPE JOLT SQUEEZE MOULDING MACHINE

**SPECIAL FEATURES :**

- MASSIVE YET SYMMETRICAL CONSTRUCTION.
- JOLT RAM—A REAL BLOW.
- SQUEEZES TO A SET PRESSURE.
- PATTERN DRAW—STEADY AND SMOOTH.
- AIR ON OIL CONTROL TO DRAW.
- MECHANISM SAND PROTECTED.
- PATENT AIR - LOADED DISC VALVES.

*MACNAB Moulding Machines mean CLEAN, ACCURATE AND WELL FINISHED moulds.*

*We manufacture many other types and sizes of Moulding Machines suitable for economical production of varying classes of work.*

*Catalogues giving full details will be sent on request.*

The Machine which will specially appeal to those Foundries whose work necessitates the use of a variety of different size moulding boxes for small and medium size castings.

## MACNAB and Company Limited

PRESTIGE HOUSE  
235 IMPERIAL DRIVE



HARROW

Telephone : PINNER 600

# MANSFIELD MOULDING SAND

*travels long distances to meet the needs of the Foundry—to Scotland and South Wales, to Scandinavia and Singapore, and many other places overseas.*

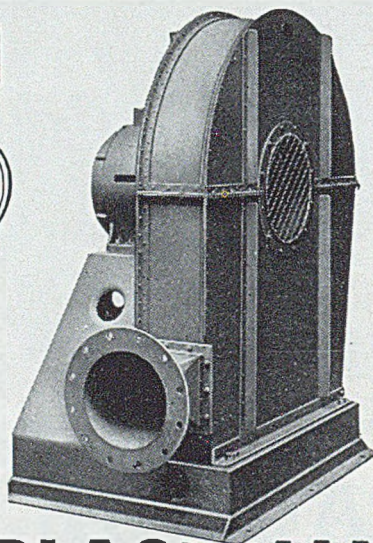
Because *QUALITY* makes its  
journey worth while

**THE MANSFIELD STANDARD SAND CO. LTD.**  
**MANSFIELD · ENGLAND**

Telephone : Mansfield 201.

# FANS

WE make fans of all types and sizes—propeller, centrifugal and axial—for cupola blowing, dust removal, furnace blowing, ventilation, man-cooling, drying, heating—in fact, every purpose for which fans can be profitably employed. We also make all necessary fan ancillaries such as Air Heaters, Air Filters, Air Washers, Suction Hoods, Ducts and Dust Settlers. Also Unit Heaters for use with hot water, steam, gas and electricity.



By **“KEITH-BLACKMAN”**

KEITH-BLACKMAN LTD., MILL MEAD ROAD, LONDON, N.17. TN : TOTTENHAM 4522.

Branch Offices at Manchester, Birmingham, Leeds, Newcastle-on-Tyne, Glasgow, Belfast, and Penarth, nr. Cardiff.



INDEX TO ADVERTISERS

	PAGE NOS.		PAGE NOS.		PAGE NOS.
Aabacs Egg. Co., Ltd.	—	Electromagnets, Ltd.	—	Nitr alloy, Ltd.	—
Adaptable Moulding Machine Co., Ltd.	—	Elliott, Theo. & Son, Ltd.	35	Norton Aluminium Products, Ltd.	—
Aerograph, The, Co., Ltd.	39	Esso Petroleum Co., Ltd.	—	Norton Grinding Wheel Co., Ltd.	—
Aero Research, Ltd.	—	Ether, Ltd.	—	Page Packing, Ltd.	—
Alar, Ltd.	—	Every, Hy., & Co., Ltd.	—	Paget Engineering Co. (London), Ltd.	—
Alba Chemicals Co., Ltd.	—	Eyre Smelting Co., Ltd.	—	Palmer Tyre, Ltd.	—
Albion Pulverising Co., Ltd.	—	F. & M. Supplies, Ltd.	373	Pantlin, W. & C., Ltd.	—
Allan, John, & Co. (Glenpark), Ltd.	—	Felco Hoists	—	Parish, J., & Co.	60
Alcock & Co. (Metals), Ltd.	55	Ferguson, James, & Sons, Ltd.	—	Pascal Engineering Co., Ltd.	—
Aldays & Onions, Ltd.	58	Fisher Foundries, Ltd.	—	Passe, J. F., & Co.	37
Aluminium Union, Ltd.	—	Flextol Engineering Co., Ltd.	—	Peterson Hughes Engineering Co., Ltd.	—
Anderson-Grice Co., Ltd.	51	Fordath Engineering Co., Ltd.	5	Pattern Equipment Co. (Leicester), Ltd.	—
Andrews & Platt (Engn.), Ltd.	—	Forrest, H., & Sons (Engrs. Pattern Makers), Ltd.	—	Patternmakers (Engg.) Co., Ltd.	35
Angardia, Ltd.	—	Foundry Equipment, Ltd.	10 & 17	Patterns (Derby) Ltd.	35
Armstrong Whitworth & Co. (Metal Industries), Ltd.	—	Foundry Plant & Machinery, Ltd.	—	Perry, G., & Sons, Ltd.	—
Armstrong Whitworth & Co. (Pneumatic Tools), Ltd.	—	Foundry Mechanisations (Baillot), Ltd.	43	Phillips Electrical, Ltd.	—
Asca Electric, Ltd.	—	Foundry Services, Ltd.	377	Phillips, J. W. & C. J., Ltd.	—
Aske, Wm., & Co., Ltd.	—	Fowell, Geo., & Sons, Ltd.	58	Piekforings, Ltd.	—
Atlas Diesel Co., Ltd.	—	Foxboro-Yoxall, Ltd.	—	Pieckford, Holland & Co., Ltd.	—
August's, Ltd.	28	Fullers' Earth Union, Ltd., The	375	Pneulec, Ltd.	1
Austin, E., & Sons, Ltd.	46	Gadd, Thos.	—	Portway, C., & Son, Ltd.	—
Badische Maschinenfabrik A.-G.	—	Gamma-Rays, Ltd.	—	Potlways, Ltd.	—
Bakelite, Ltd.	—	General Electric Co., Ltd.	—	Powder Metallurgy, Ltd.	—
Ballard, F. J., & Co., Ltd.	52	G.H.L. (Painters), Ltd.	—	Precision Presswork Co., Ltd.	45
Ballingier, L. J. H., Ltd.	—	General Refractories, Ltd.	20	Premo Pattern Co. (Brass & Aluminium Founders), Ltd.	50
Barnard, H. B., & Sons, Ltd.	—	Glenboig Union Fireclay Co., Ltd.	—	Price, J. T., & Co. (Brass & Aluminium Founders), Ltd.	50
Beakbane, Hy., Ltd.	—	Gilksten, J., & Son, Ltd.	37	Price, J. T., & Co., Ltd.	—
Beck, H., & Son, Ltd.	—	Green, Geo., & Co.	—	Ransomes, Sims & Jefferies, Ltd.	—
Bentley-Layfield, Ltd.	1	Grove Painting & Decorating Co., Ltd.	57	Rapid Magnetic Machines, Ltd.	—
Berk, F. W., & Co., Ltd.	—	Guest, Keen, Baldwins Iron & Steel Co., Ltd.	—	Reavell & Co., Ltd.	44
Bier, L., & Son (Iron & Steel), Ltd.	—	Gummers, Ltd.	46	R-Fractory Mouldings & Castings, Ltd.	52
Bigwood, J., & Son, Ltd.	—	G.W.B. Electric Furnaces, Ltd.	—	Richardson Engineering (B'ham), Ltd.	—
Bilston Stove & Steel Truck Co., Ltd.	57	Handling Equipment Co., Ltd.	—	Richardson, R. J., & Sons, Ltd.	—
Birlec, Ltd.	—	Harborough Construction Co., Ltd.	—	Ridsdale & Co., Ltd.	—
Blackburn & Oliver, Ltd.	—	Hargreaves Bros.	—	Riley Stoker Co., Ltd.	11
Blythe Colour Works, Ltd.	—	Hargreaves & Gott, Ltd.	36	Roper, E. A., & Co., Ltd.	—
Borax Consolidated, Ltd.	29	Harper, Wm., Son & Co. (Willenhall), Ltd.	—	Rothervale Manufacturing Co., Ltd.	—
Bradley & Foster, Ltd.	—	Harvey & Longstaffe, Ltd.	—	Round Oak Steel Works, Ltd.	42
Brearley, Ralph, Ltd.	—	Hawkins, W. T., & Co.	—	Rowland, F. E., & Co., Ltd.	—
Brightside Foundry & Engineering Co., Ltd.	9	Henderson, Chas.	—	Rule & Moffat	—
British Aero Components, Ltd.	47	Hepburn Conveyor Co., Ltd.	59	Rustless Iron Co., Ltd.	57
British Electro Metallurgical Co., Ltd.	8	Heywood, S. H., & Co., Ltd.	—	Safety Products, Ltd.	—
British Electrical Development Association	—	Hill-Jones, Thomas, Ltd.	—	Sandvik Steel Band Conveyors, Ltd.	—
British Foundry Units, Ltd.	—	Hillman, J. A., Ltd.	—	Sarginson Bros., Ltd.	—
British Industrial Plastics, Ltd.	19	Hills (West Bromwich), Ltd.	10	St. George's Engineers, Ltd.	55
British Industrial Sand, Ltd.	—	Holman Bros., Ltd.	—	Scottish Foundry Supplies Co.	35
British Industries Fair	15	Horrocks, Joseph	—	Sheffield Smelting Co., Ltd.	—
British Insulated Callenders' Cables, Ltd.	—	Ilford, Ltd.	54	Sheppard & Sons, Ltd.	—
British Iron & Steel Federation	377	Imperial Chemical Industries, Ltd.	—	Sinex Engineering Co., Ltd.	—
British Moulding Machine Co., Ltd.	1	Incandescent Heat Co., Ltd.	—	Sklenar Furnaces, Ltd.	49
British Oxygen Co., Ltd.	—	International Mechanite Metal Co., Ltd.	—	Slip Trading & Shipping Co., Ltd.	—
British Pigirons, Ltd.	—	Jackman, J. W., & Co., Ltd.	—	Slough Metals, Ltd.	—
British Resin Products, Ltd.	—	Jacks, Wm., & Co., Ltd.	31	Smedley Bros., Ltd.	—
British Roncey, Ltd.	38	Jeffrey, A., & Co., Ltd.	—	Smetton, John A., Ltd.	—
British Shotblast & Engineering Co., Ltd.	—	Keith-Blackman, Ltd.	24	Smith, Albert, & Co.	—
British Thomson-Houston Co., Ltd.	—	King Bros. (Stourbridge), Ltd.	—	Smith, John (Keighley), Ltd.	—
British Tyre & Rubber Co., Ltd.	—	King, John, & Co. (Leeds), Ltd.	54	Smith, W. H., & Sons, Ltd.	—
Bromsgrove Die & Tool Co., Ltd.	375	Kodak, Ltd.	—	Spencer & Halstead, Ltd.	—
Broom & Wade, Ltd.	—	Lafarge Aluminous Cement Co., Ltd.	—	Spermolln, Ltd.	3
Burdon Furnaces, Ltd.	—	Laidlaw, Drew & Co., Ltd.	—	Stanton Ironworks Co., Ltd., The	22
Butterworth Engineering Co., Ltd.	—	Lambeth & Co. (Liverpool), Ltd.	—	Staveley Iron & Chemical Co., Ltd.	—
Butterworth Bros.	—	Lazarus, Leopold, Ltd.	—	Steele & Cowlishaw, Ltd.	—
Catalih, Ltd.	18	Leicester, Lovell & Co., Ltd.	—	Steele & Atkinson, Ltd.	53
Central Manufacturing & Trading Co. (Dudley), Ltd.	37	Lennox Foundry Co., Ltd.	56	Steln, John G., & Co., Ltd.	—
Chalmers, E., & Co., Ltd.	—	Levy, B., & Co. (Patterns), Ltd.	36	Sterling Foundry Specialities, Ltd.	60
Chance Bros., Ltd.	—	Lord, E. S., Ltd.	—	Sternol, Ltd.	—
Chapman & Smith, Ltd.	—	Luke & Spencer, Ltd.	7	Stewart, Colln, Ltd.	45
Clayton Crane & Hoist Co., Ltd.	—	Macdonald, John, & Co. (Pneumatic Tools), Ltd.	—	Stewart and Gray, Ltd.	—
Cohen, Geo., Sons & Co., Ltd.	12	Maenab & Co., Ltd.	23	Sturtevant Engineering Co., Ltd.	—
Coleman-Wallwork Co., Ltd.	—	Madan, Chas. S., & Co., Ltd.	20	Suffolk Iron Foundry (1920), Ltd.	—
Colt Ventilation, Ltd.	40	Mansfield Standard Sand Co., Ltd.	24	Swynnerton Red Moulding Sand	—
Consolidated Pneumatic Tool Co., Ltd.	—	Marco Conveyor & Engineering Co., Ltd.	—	Tallis, E., & Sons, Ltd.	41
Constructional Engineering Co., Ltd.	—	Marsden, Hind & Son, Ltd.	35	Tangyes, Ltd.	—
Controlled Heat & Air, Ltd.	—	Mathews & Yates, Ltd.	—	Telsen, Th.	—
Cooke, Bailey, Ltd.	35	Mathison, John, Ltd.	—	Thomas, G. & R., Ltd.	—
Copper Development Association	—	Matterson, Ltd.	—	Thomson & McIntyre	—
Corn Oils, Ltd.	—	May, J. H.	—	Thlghman's Patent Sand Blast Co., Ltd.	—
Corn Products Co., Ltd.	21	Metalline Cement Co.	—	Turner Machine Tools, Ltd.	54
Council of Ironfoundry Associations	—	Metalectric Furnaces, Ltd.	—	Tyseley Metal Works, Ltd.	—
Cox, Long (Importers), Ltd.	—	Metronic Instrument Co., Ltd.	—	United States Metalle Packing Co., Ltd.	—
Crockett, & Co.	35	Midland Silicones, Ltd.	—	Universal Conveyor Co., Ltd.	—
Crooke & Co., Ltd.	—	Mining & Chemical Products, Ltd.	—	Universal Pattern Co. (London), Ltd.	36
Crofts (Engrs.), Ltd.	—	Mitchell's Emery Wheel Co., Ltd.	—	Vaughan Crane Co., Ltd.	51
Cumming, Wm., & Co., Ltd.	6	Modern Furnaces & Stoves, Ltd.	57	Vaughans (Hope Works), Ltd.	—
Cunliffe, J. C.	—	Mole, S., & Sons (Green Lane Foundry), Ltd.	—	Vauxhall Motors, Ltd.	—
Cupodel, Ltd.	50	Molineux Foundry Equipment, Ltd.	48	Vickers, John, & Sons	—
Cuxson, Gerrard & Co., Ltd.	—	Mond Nickel Co., Ltd.	—	Vokes, Ltd.	—
Dallow Lambert & Co., Ltd.	—	Monometer Manufacturing Co., Ltd.	56	Waddington, G., & Son, Ltd.	—
Davidson & Co., Ltd.	44	Monsanto Chemicals, Ltd.	—	Wadkin, Ltd.	—
D.C.M. Metals (Sales), Ltd.	44	Morgan Crucible Co., Ltd.	13	Walker, I. & I., Ltd.	60
Diamond Motors (Wolverhampton), Ltd.	4	Morris, Herbert, Ltd.	—	Ward, Thos. W., Ltd.	14
Dowson & Mason Gas Plant Co., Ltd.	—	Muir, Murray & Co., Ltd.	—	Warning Bros.	—
Dunford & Elliott, Ltd.	—	Musgrave & Co., Ltd.	—	Warner & Co., Ltd.	—
Durrans, James, & Sons, Ltd.	2	Musgrave, Elliott, Ltd.	—	Watsons (Metallurgists), Ltd.	—
Eaves & Sharples, Ltd.	35	Neville, T. C., & Sons, Ltd.	53	Webster & Co. (Sheffield), Ltd.	—
Electric Furnace Co., Ltd.	—	New Conveyor Co., Ltd.	—	Wengers, Ltd.	—



A 'GR' SAND FOR EVERY INDUSTRIAL NEED

## MOULDING SANDS

YORKSHIRE

LEVENSEAT

BRAMCOTE

HENSALL

MANSFIELD

WARSOP

YORK YELLOW

WEATHERHILL

CHELFORD

KING'S LYNN

MINIMUM

MAXIMUM

LEVENSEAT

SOMERFORD

LEIGHTON

BUZZARD

BAWTRY

SOUTHPORT

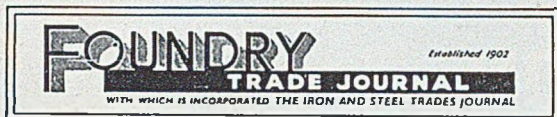
★ Technical Data of any of the above G.R. Refractory Sands sent on request.

# GENERAL REFRACTORIES LTD

GENEFAX HOUSE, SHEFFIELD, 10

Telephone: SHEFFIELD 31113





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

### INSTITUTE OF BRITISH FOUNDRYMEN

PRESIDENT: E. Longden, M.I.Mech.E. II, Welton Avenue, Didsbury Park, Manchester, 20.

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

#### BRANCHES

**Birmingham, Coventry and West Midlands:** A. R. B. Gameson, Gaia Croft, Gaia Lane, Lichfield, Staffs. **Bristol and West of England:** G. W. Brown, 51, Westbury Road, Bristol. **E. Midlands:** S. A. Horton, 163, Morley Road, Chaddesden, Derby. **Lancs.:** F. W. Nield, 114, Clarksfield Road, Oldham. **Lincs.:** Dr. E. R. Walter, The Technical College, Lincoln. **London:** W. G. Mochrie, Tyseley Metal Works, Limited, Ballfour House, Finsbury Pavement, London, E.C.2. **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 d. **Teesside:** F. Shepherd, Head, Wrightson & Co., Ltd., Teesdale Iron Works, Thornaby-on-Tees. **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, C.R. Commissioner and Harrison Street, Johannesburg.

#### SECTIONS

**Burnley:** H. J. W. Cox, "Mossbank," Whalley Road, Great Harwood, Lancs. **Cape Town:** S. Wade, P.O. Box 46, Salt River. **East Anglia:** L. W. Sanders, Lake and Elliot, Limited, Braintree, Essex. **Falkirk:** A. Bulloch, Jones & Campbell, Limited, Torwood Foundry, Larbert, Stirlingshire. **Scottish-North Eastern:** R. Leeks, Alexander Shanks & Son, Limited, Arbroath. **Slough:** P. Hoessl, Light Production Co., Ltd., Slough, Bucks. **West Wales:** C. G. Jankins, "High Winds," 26, Townhill Road, Skelky, Swansea. **Southampton:** Dr. O. P. Eimerl, F.I.M., John I. Thornycroft & Co., Ltd., Woolston, Southampton.

#### BRITISH STEEL FOUNDERS' ASSOCIATION

Chairman: T. H. Summerson, Summerson's Foundries Limited, Albert Hill Foundry, Darlington, Co. Durham. Secretary: Robert Barber, A.C.I.S., Broomgroove Lodge, 13, Broomgroove Road, Sheffield, 10. 'Phone and 'Grams: Sheffield 63046.

#### BRITISH STEEL CASTINGS RESEARCH ASSOCIATION

Chairman: F. N. Lloyd, B.A., F. H. Lloyd & Co., Ltd. Director: J. F. B. Jackson, B.Sc., A.R.I.C., F.I.M. Secretary: Robert Barber, A.C.I.S., Broomgroove Lodge, 13, Broomgroove Road, Sheffield, 10. 'Phone and 'Grams: Sheffield 63046.

#### ASSOCIATION OF BRONZE AND BRASS FOUNDERS

President: W. R. Marsland, Newman, Hender & Company, Limited, Woodchester, Glos. Secretaries: Heathcote & Coleman, 69, Harborne Road, Edgbaston, Birmingham, 15. 'Phone: EDGBaston 4141. 'Grams: "Clarify," Birmingham, 15.

#### LIGHT METAL FOUNDERS' ASSOCIATION

Chairman: A. H. Sturdee, M.B.E., Wh.Ex., M.I.Mech.E. Secretary: Eric L. Heathcote, 69, Harborne Road, Edgbaston, Birmingham, 15. 'Phone: EDGBaston 4141. 'Grams: "Clarify," Birmingham, 15.

#### FOUNDRY TRADES' EQUIPMENT AND SUPPLIES ASSOCIATION

President: Frank Webster, August's Limited, Exmoor Street, Halifax. Secretaries: Peat, Marwick, Mitchell & Company, 94/98, Petty France, London, S.W.1. 'Phone: Abbey 7515. 'Grams: "Crusades, Sowest," London.

#### INSTITUTE OF VITREOUS ENAMELLERS

President: Dr. Harold Hartley, C.B.E., D.Sc., Hon.M.I.Gas E., Radiation Limited, 7, Stratford Place, London, W.1. Chairman: S. Hallsworth, Prince Enamel and Metal Works Limited, Marsh Side, Workington, Cumberland. Secretaries: John Gardom & Company, Ripley, Derbyshire. 'Phone: Ripley 136.

#### COUNCIL OF IRONFOUNDRY ASSOCIATIONS

Chairman: N. P. Newman, Newman, Hender and Company, Limited, Woodchester, near 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, 69, Harborne Road, Edgbaston, Birmingham, 15. 'Phone: EDGBaston 4141. 'Grams: "Clarify," Birmingham, 15.

**British Ironfounders' Association and British Both 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 6052-3; 'Grams: "Brimatufa," 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 Radditor 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 1394.

**Greensand Pipe Founders' Association.**—Secretaries: McClure Nalmslth Brodie & Company, 77, St. Vincent Street, Glasgow, C.2. 'Phone: Glasgow 9476; 'Grams: "Lycidas," Glasgow.

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

#### IRONFOUNDERS' NATIONAL CONFEDERATION

Chairman: D. Graham Bisset, 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. **London, Home and Eastern Counties.**—Secretary: A. L. Nadin, Cooper Roller Bearing Co., Ltd., King's Lynn, Norfolk. 'Phone: King's Lynn 2500. **Midlands.**—Secretary: R. Forbes Baird, 117, Church Lane, Birmingham, 20. 'Phone: Northern 0037 & 0343. **North Midland.**—Secretary: Chas. J. Stone, Manlove Alliott & Co., Ltd., Bloomsgrove Works, Nottingham. 'Phone: Nottingham 73084 or 75127. **North Western.**—Secretary: H. Gott, North Foundries, Ltd., Lansdowne Road, Monton, Eccles. 'Phone: Eccles 3545. **Scottish.**—Secretary: Allan F. Ure, Allan Ure, Ltd., Keppochhill, Glasgow. 'Phone: Glasgow, Douglas 2641.

#### NATIONAL IRONFOUNDING EMPLOYERS' FEDERATION

President: T. Lee, Henry Hollindrake & Son, Limited, Princes Street, Stockport. 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 22846.

**Leeds and District Ironfounders' Association.**—Secretary: F. H. Foster, H. J. Gill & Co. (Leeds), Ltd., 194, Cardigan Road, Leeds, 6. 'Phone: 52020.

**Leicester and District Ironfounders' Employers' Association.**—Secretary: C. S. Bishop, 8, New Street, Leicester. 'Phone: Granby 511.

**Liverpool and District Ironfounders' Association.**—Secretary: J. S. Hassall, 16/18, Hackins Hey, Liverpool, 2. 'Phone: Central 0114.

**Manchester and District Ironfounders' Employers' Association.**—Secretaries: Webb, Hanson, Bullivant & Co., 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. 'Grams: "Jaelace," Birmingham.

**Monmouthshire Founders' Association.**—Secretary: I. J. Smith, Tredegar Foundry, 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: J. H. L. Beech Bournier, Bullock & Co., Federation House, Station Road, Stoke-on-Trent. 'Phone: Stoke-on-Trent 44245.

**Scottish Ironfounders' Association.**—Secretaries: Mann, Judd, Gordon & Co., 142, St. Vincent Street, Glasgow, C.1. 'Phone: Central 2857; 'Grams: "Mannca," Glasgow.

**Sheffield and District Ironfounders' Association.**—Secretary: T. Goddard, Mander, 59, Clarkhouse 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 59146; 'Grams: "Iron," Swansea.

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

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

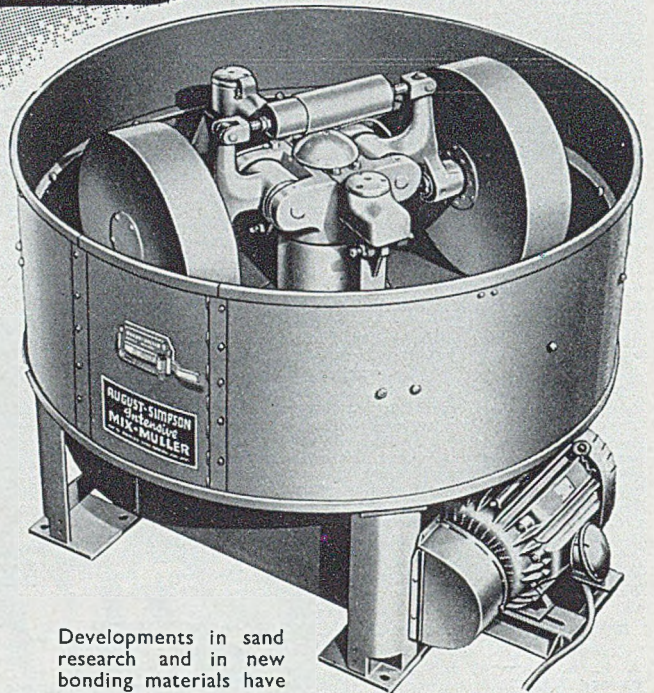
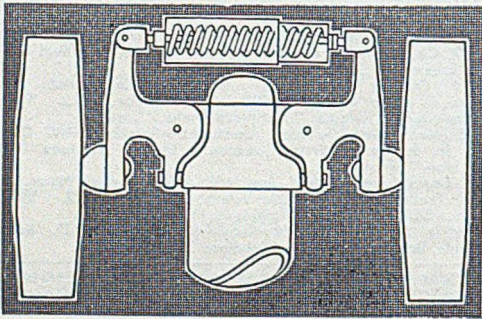
#### BRITISH CAST IRON RESEARCH ASSOCIATION

Alvechurch, Birmingham. 'Phone and 'Grams: Redditch 71  
Scottish Laboratories.—Blantyre Industrial Estate, Blantyre, Lanarkshire. 'Phone 486.

# THE NEW 2F and 3F AUGUST-SIMPSON Intensive MIX-MULLERS

## MIXING PERFECTED

- Light weight, low inertia mullers with adjustable spring pressure up to 4,000 lbs. each (in 3F) and 2,000 lbs. (in 2F).
- Large Batch capacity.
- Very large discharge door located within one wearplate quadrant . . . rapid discharge of batch.
- Muller crib has removable section through which all rotating machinery can be removed without interfering with overhead hoppers, structures, etc.
- Inside and outside plows adjustable vertically and radially by positive screw device on upper end of plow brackets . . . without entering mixer.
- Wearing edge of plows coated with special wear resistant material. Plow contour designed for maximum efficiency.
- Mullers, centre shaft, and rocker arm bearings are lubricated by centralized system accessible from outside mixer.
- Reducer mounted on mixer bedplate casting with V-belt drive motor-to-reducer and coupling reducer-to-vertical-shaft of mixer.
- V-belt drive allows flexibility in mixer speed and protection against extreme overloads and tramp iron . . . smooth, quiet operation.
- Safe, positive sand sampler.



Developments in sand research and in new bonding materials have definitely indicated a trend toward greater mulling pressures. August's have now the perfect answer to this problem in the new 2F and 3F August-Simpson Mix-Mullers, which makes possible increased muller pressures with a minimum of muller inertia. This has been accomplished by using comparatively light mullers, and employing a unique spring-loaded muller arrangement which allows complete adjustment for variable muller pressures.

## August's LIMITED

HALIFAX • ENGLAND

Tel. : Halifax 61247/8;9 Grams : August, Halifax

Sole Licensees and Manufacturers for British Empire  
(excluding Canada) of the Simpson Sand Mixer.





## PRINCIPAL CONTENTS

	PAGE		PAGE
<i>Features</i>		<i>Notes</i>	
Leader: Where the Money Goes ... ..	347	Institution of Production Engineers ... ..	348
New Catalogues ... ..	368	Production Census for 1954 ... ..	348
Publications Received ... ..	368	Nottingham's Smokeless Zone ... ..	363
House Organs ... ..	370	Industrial Injuries Regulations ... ..	368
<i>Technical</i>		German Foundrymen's Convention ... ..	370
Inter-relation of Combustion and Metallurgical		Personal ... ..	372
Reactions in the Cupola, by D. Fleming ...	349	Obituary ... ..	372
Centrifugal Casting of Rotors ... ..	358	News in Brief ... ..	374
Growth Characteristics of Ingot-mould Irons in		Raw Material Markets ... ..	378
Air and Vacuum, by J. W. Grant ... ..	359	Forthcoming Events (Advert. section) ... ..	31
Mechanization of Shell-moulding ... ..	363	<i>Statistics</i>	
Metal Melting under Vacuum ... ..	365	August Steel Output ... ..	369
B.S.C.R.A., Radiographic Exposure Calculator	370	Current Prices of Iron and Steel and Non-	
B.C.I.R.A., Method of Clamping Shell Moulds	371	ferrous Metals (Advert. section) ... ..	30

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"

## Where the Money Goes

Everybody is now familiar with those sectioned circles, or the like, which show in a manner easily understood by even the not-so-intelligent employees, how a company's income is divided. Yet, it would appear that this is by no means the ultimate lesson that can be drawn from such efforts, and Mr. Ernest Allison, F.R.ECON.S., has taken the subject much further. His findings, based on a talk given to the Works Council of F. H. Lloyd and Company, Limited, the well-known steel founders, have been reprinted and issued as a pamphlet. In it, the author has wisely made a comparison between the works' income and expenditure with that of the average employee of the firm. Cleverly, he has made fifteen divisions for both cases and thus "materials, wages and salaries" are compared to "food"; "maintenance and depreciation of buildings" to "clothes"; "transport and carriage" to "fares"; "stores withdrawal" to "household requisites"; and "general reserve" to "contingencies." Several items, such as repairs, education, income tax and insurance are (as near as can be) parallel. When it comes to "dividends," the author has equated this item with John Smith's "recreation"—a little far fetched, perhaps, but still reasonable. His table showing the amounts is garnished with particularly apt illustrations, as for instance, against "contingencies," a feeding bottle, and a first-aid box are sketched on the household budget side. Finally, he extends his argument to the repercussions of productivity on

national economy—an argument which is fundamentally sound, and yet, when expressed and illustrated so simply, is well within the comprehension of any literate person.

There is a case for further enlightenment of this kind. For instance, amongst working-class punters a 2 to 1 against "winner" is not highly regarded, yet a 25 per cent. dividend paid out by an industrial company is regarded as profiteering. One wonders if it is realized that a 2 to 1 win per day is the equivalent of some 73,000 per cent. per annum, whereas a 25 per cent. per annum dividend, if our arithmetic be correct, when expressed as odds, becomes 10,000 to 7 (tax-free, in the case of betting). Another case which is often misunderstood is that of annual income and weekly earnings. It is not uncommon to find a workman believing that a man earning £1,000 a year is a "bloated capitalist," whereas a working-class family with its members bringing in £20 a week is thought to be not too well off.

It is obvious that there is much room for intelligent instruction to be given in this field, and we regard Mr. Allison's pamphlet so highly that we suggest a copy of it should be sent to all the political parties. From the published statements of such bodies, they are all in accord with the sentiments expressed. Moreover, the Government uses a similar, simplified, presentation when issuing its annual economic survey.

## Institution of Production Engineers

### Summer School Proceedings

Speaking at the opening of the fourth annual summer school organized by the Institution of Production Engineers at Leamington, Mr. Walter Puckey, president of the Institution, said that it would be unwise for industrialists to count on getting greater freedom in the future, whatever the intentions of the present Government. He referred to the four "problem children of industry." Industry's relation with politics and industry's financial difficulties were the first two, with industry's technological tasks and its defence obligations as the third and fourth. Never, said Mr. Puckey, had industrialists taken so much interest in politics, or politicians greater interest in industry. He based his forecast of the likelihood of greater freedom on the international situation. "More competition is needed and industry must have more chances of making money and keeping it." In comparison with the depth of industry's financial difficulties, the Budget concessions were "very marginal indeed." Industry would not be able to raise its prices in the future: it would have to gain on productivity and sales and services turnover.

### Challenge from German Industry

Germany's shipbuilding industry achieved a 12-fold increase from 1951 to the first five months of 1953, and German exports, which equalled 4 per cent. of British exports in 1951, have risen this year to 50 per cent. of our own. These facts were given by Sir Patrick Hannon at the summer school. From day to day, in increasing measure, the country would be faced with two main competitors, declared Sir Patrick, the United States and Germany. The prosperity of the nation's engineering industries was becoming more and more dependent on the acquisition and maintenance of overseas markets. The engineering industries were the leading factors in paying for imports. There were increases in the export of engineering goods from 1948 to 1952, but in the first five months of the year all the main groups had weakened, and over the whole field there had been a fall of 3 per cent. from the 1952 average.

Speaking of nationalization proposals, Sir Patrick said that it was now clear that the brake was being applied to the surging demands of a certain section of organized labour to bring the intervention of the State into a wide field of national production. The Trades Union Congress had lately shown a more statesmanlike tendency in dealing with the delicate problems of national economy, he averred.

The Monthly Information Sheet of the British Standards Institution for August includes:—Revised standards, B.S. 1121:1953, Methods for the analysis of iron and steel; determination of nickel, Pt. 2 (2s.); determination of aluminium, Pt. 4 (2s. 6d.); and copper, Pt. 5 (2s.). Specification B.S. 817:1938. Cast-iron surface plates and tables for inspection and marking purposes (4s.) has been reprinted.

Disturbing Criticisms of the design and effectiveness of certain items of protective clothing were made by a medical speaker at the recent safety congress held at Birmingham under the auspices of the Birmingham and District Safety Group. These criticisms were not refuted either at or after the Conference. In particular, a doctor stated that some makes of goggles intended to protect the eyes from infra-red rays allowed 25 per cent. of these rays to pass through.

## Production Census for 1954

The scope of the census of production to be taken in 1955 in respect of the year 1954 and the information to be obtained have now been considered by the Census of Production Advisory Committee. It has been decided that all establishments within the field of production will be included in the census, which will be on similar lines to the full census for 1951.

The statutory form of return will include questions on:—(1) Working proprietors; (2) number of employees; (3) wages and salaries, etc.; (4) capital expenditure on plant, machinery, and vehicles; (5) capital expenditure on new building work; (6) materials and fuel purchased; (7) work given out; (8) stocks at the beginning and end of the year; (9) output; and (10) transport payments. In the wages and salaries section, firms will be asked to give information about employers' payments to superannuation and other pension funds, etc., as well as their contributions to all National Insurance schemes. This will help to complete the information available about labour costs. In the materials section, firms will be asked to state, as in the 1948 census, the total cost of materials and fuel purchased with details, by quantity and value, of the principal items purchased. Information will be sought about certain materials which are common to virtually all trades, e.g., replacement parts and packing materials. In the output section, firms will be asked to show the total value of sales and work done, with details of sales of each of a number of products, on the lines of the detailed form used for 1951.

In the light of the information obtained from the censuses for 1948 and 1951, some modifications of the headings in the materials and fuel section and in the output section will be made in the forms used for certain trades. No information will be required about merchant goods.

The trades covered by the census for 1954 will be manufacturing, mining, building and contracting, and public utilities. Any firm requiring further particulars about the census should address its inquiries to the Census of Production Office, Neville House, Page Street, London, S.W.1, stating the nature of the business carried on.

### Latest Foundry Statistics

According to the August *Bulletin* of the British Iron and Steel Federation, employment in iron foundries again decreased in July. The figures taken on the fourth of that month reported that 141,120 were employed (of which 132,053 were males) as against 143,362 a month earlier and 153,665 the previous year. Steel founding, too, employed fewer people. There was a total of 20,417 in July against 20,843 in June (19,561 a year ago). The average weekly output of steel for castings was down to 8,200 tons, in July as against 10,500 in June and 8,500 in July 1952.

Warning. As a result of a case where a buyer co-operating on design tried to impose a liability on the foundry for not only replacing a defective casting but reimbursing the buyer for the cost of its machining, the Council of the Association of Bronze and Brass Founders affirmed that in no circumstances should founders accept liability for the machining of castings which prove defective.

R. HYDE & SON, LIMITED, plan to extend the foundry and erect a new retaining wall in Clayton Street, Chesterfield.

# Inter-relation of Combustion and Metallurgical Reactions in the Cupola\*

By D. Fleming

*In spite of the vast amount of literature dealing with the cupola, the Author feels that a restatement of some of the fundamentals of cupola behaviour, indicating possible relationships between the combustion conditions and some of the more important metallurgical reactions, is desirable at this time in view of a trend away from the conventional cold-blast, acid-lined cupola for the quantity melting of soft grey iron. The cupola behaviour diagram of Jungbluth and Korschan is first cited as a starting point, based on experimental data. This is examined and shown to relate CO : CO<sub>2</sub> ratios to C : Fe ratio independently of blast volume (the errors of classical methods of blast-volume computation are thus exposed). The effects of C : Fe ratio, coke size, and blast temperature are considered and the mechanism of combustion indicated. The concept of a reaction temperature is introduced, together with synthetic and experimental curves; the deduced zone behaviour is compared with the results of Vogel.*

*Reactions possible in the shaft of the furnace are then considered, followed by similar considerations for the melting zone and hearth, the fundamental importance of high temperature and low iron-oxide production is pointed out, together with the importance of the control of slag/metal reactions. An ideal is suggested for soft grey iron melting and it is claimed that the necessary control can be obtained, using a combination of hot-blast, water-cooling, and continuous tapping. It is claimed that such a cupola would allow soft grey iron to be economically produced without the need for pig-iron, should supplies of ferro-alloys, and iron and/or steel scrap be available.*

The cupola has been the traditional melting unit of the iron founder practically as long as iron foundries, as such, have existed, and during this time much thought has been given to the principles underlying cupola operation, and many thousands of words have been written on the subject and many thousands more spoken in discussions between interested foundrymen the world over. In spite of this, the Author, believing that the cupola, which has undergone so many variations of a transient nature in the past, is now emerging into a period of development of greater significance than ever before, feels that a restatement of some of the fundamentals of cupola behaviour and a presentation of some of the remaining problems is justified at this time, if only to provoke a greater number of the members of the Institute of British Foundrymen into applying themselves to such development, and to recovering the lead in cupola "know-how" which has passed into the care of continental workers.

In any study of the cupola, it is first necessary to consider the laws which govern the combustion conditions occurring, as without an appreciation of these, no sound approach to metallurgical considerations can be made. Any theories developed, however, must rest on experimental data if they are to carry conviction. It is proposed first to consider the work of Jungbluth and Korschan.<sup>1</sup> These two authorities used an experimental cupola lined to a diameter of approximately 21½ in., with a stack height from tuyeres to charging point of some 12½ ft. The blowing equipment was arranged so that any air volume between 353 and 1,235 cub. ft.

per min. could be supplied under controlled conditions, and accurately measured, the danger of error through leakage being eliminated by welding of the blast main and the cupola. The charges were of pig-iron (TC 4.16, Si 2.21, and Mn 0.69 per cent.) in pieces approximately 9 by 4.7 by 4.7 in., 660 lb. being used per charge. Coke of 4 to 5 in. section and 7 to 8 in. length was used, 440 lb. being used for the bed. The coke had a fixed carbon of 88.65, sulphur 1.07, moisture 2.2, and ash, 6.39 per cent. Limestone of 98.7 per cent. CaCO<sub>3</sub> content was used to the extent of 3 per cent. of the metal charge. Iron, coke and limestone were carefully charged in layers, and, in a series of experiments each lasting for some 6 to 8 hrs., the relationship of melting rate, metal temperature, blast volume, and coke percentage, was established for coke percentages of 6, 7, 8, 9, 10, 11, 12, 13 and 14 per cent. for each of the four blast-volume rates of 15, 20, 25 and 30 cub. m. per min. (530 to 1,060 cub. ft. per min.).

American investigators<sup>2</sup> have since subjected the original graphical presentation of Jungbluth and Korschan to a progressive method of interpolation and have then checked it over a period of a year's working with a 72-in. cupola over the iron:carbon ratio variation from 6.75 to 8.5. Fig. 1 shows such an American chart for a 36-in. cupola. To use this chart for any other size of cupola of diameter, D in., the air volumes and melting rates should be multiplied by the factor  $\left(\frac{D^2}{36^2}\right)$  and the temperature, which incidentally is the "corrected" temperature, should be found from  $T_2 = (T_{\text{chart}} - 36 + D)$  deg. F. It should also be noted that, to minimize difficulties due to varying coke-ash contents, etc., iron:carbon ratios are used and not iron:coke

\* Paper presented to the Institute of British Foundrymen at their fiftieth annual meeting. The Author is metallurgist and foundry technician, Textile Machinery Makers Limited.

ratios, also the air volumes given are for air at 32 deg. F. and at a pressure of 29.92 in. of mercury. Check observations should not be made on any cupola until it has been in steady operation for an hour, so that the bed height has become steady and the actual coke ratio and the charged coke ratio identical.

This chart (Fig. 1) shows that, with a given type of coke, an increase of coke percentage at constant blast volume gives increased metal temperature and a decrease of melting rate, whereas with a constant coke percentage, an increase of blast (within the range of the chart) leads to an increase of metal temperature and an increase in melting rate, facts which, in a general way, are known to most cupola operators. The great value of the work of Jungbluth and Korschan, presented in this "Cupola Behaviour Diagram," however, is that it shows the inter-relationship of these variables in a quantitative manner and thus allows other factors, not immediately apparent, to be calculated.

Consideration of Fig. 1 shows that, with the coke type and size on which the diagram was based, at a melting speed of 10,000 lb. per hr. and an iron:carbon ratio of 9:1, the air supply will be 2,000 cub. ft. per min. of air at 32 deg. F. and 29.92 in. of mercury. Now, as the diagram is concerned with equilibrium states of melting, if the melting rate is 10,000 lb. per hr. and the iron:carbon ratio is 9:1,  $\frac{10,000}{9}$  lb. per hr. of carbon must be

consumed, i.e., 1,111.1 lb. per hr.

From the equation  $C + O_2 \rightarrow CO_2$ , however, it is known that one pound molecule of oxygen reacts with one pound molecule of carbon to produce one pound molecule of  $CO_2$ . Now one pound molecule of oxygen at S.T.P. (32 deg. F., 29.92 in. Hg), allowing for the deviation from the ideal gas law, occupies 358.6 cub. ft. and, as the deviation for air also gives a volume of 358.6, and the oxygen content of the air is 20.92 per cent., it can be said that:—

12 lb. of carbon react with  $\frac{358.6}{0.2092}$  cub. ft of air at S.T.P.; or 1 lb. of carbon burnt to  $CO_2$  requires  $\frac{358.6}{12 \times 0.2092} = 142.85$  cub. ft. of air at S.T.P.

In the example quoted, the air rate at S.T.P. = 2,000 cub. ft. per min., or 120,000 cub. ft. per hr., and the amount of carbon that this air will burn to  $CO_2 = \frac{120,000}{142.85}$  lb. = 840.04, therefore, as 1,111.1 lb. of carbon are consumed, 1,111.1 - 840.04 = 271.07 lb. must be used in the reduction

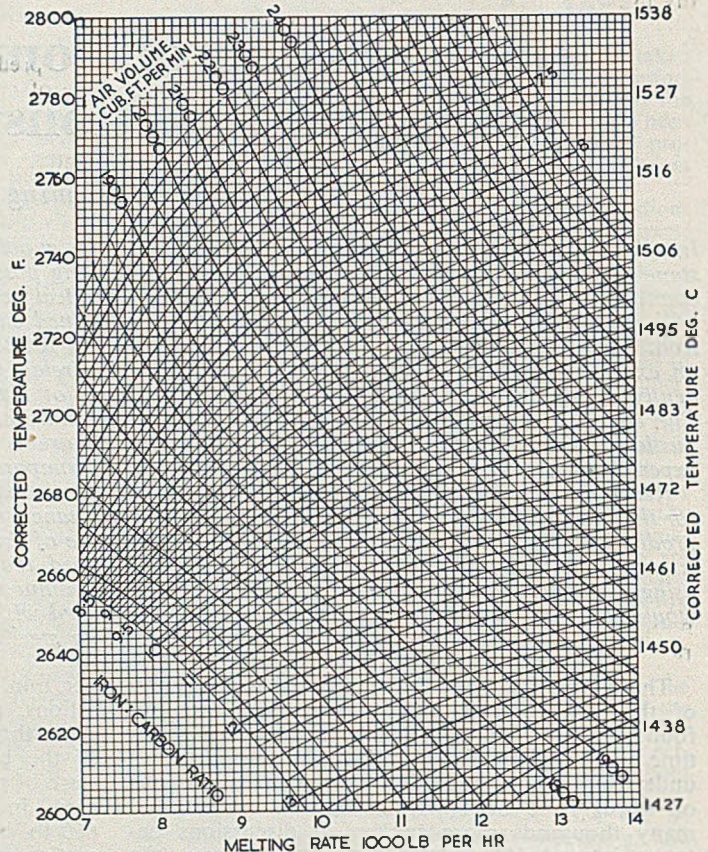


FIG. 1.—Behaviour Diagram for a 36-in. dia. Cupola, with Air at 32 deg. F. and Atmospheric Pressure at 29.92 in. Mercury. (From Jungbluth & Korschan.)

to carbon monoxide according to the equation  $CO_2 + C \rightarrow 2CO$ . The final weight of carbon burnt to  $CO_2$ , at the conclusion of all reactions, will thus be:—

$840.04 - 271.07 = 568.97$  lb. per hr.  
and the final weight of carbon burnt to CO will be:—

$$2 \times 271.07 = 542.14 \text{ lb. per hr.}$$

If one now treats CO and  $CO_2$  as if they were ideal gases\* it can be seen from the equations:—

- (i)  $C + O_2 \rightarrow CO_2$
- (ii)  $2C + O_2 \rightarrow 2CO$

that equal weights of carbon burnt to either state of oxidation give equal volumes, so that it can now be said, in the example given, that the CO: $CO_2$  ratio in the effluent gases arising from the combustion of carbon when the iron:carbon ratio is 9:1 and the melting speed is 10,000 lb. per hr. is  $\frac{542.14}{568.97} = 0.953$ . In the same manner as this example, the CO: $CO_2$  ratio can be worked out for

\* The error introduced by this assumption gives an answer about 0.6 per cent. lower than that obtained if the deviations of CO and  $CO_2$  from the ideal gas laws at S.T.P. are taken into account.



any point on the diagram of Fig. 1. This has been done for a number of points in the region lying above the iron:carbon ratio of 9:1, and the results are given in the form of a set of curves in Fig. 2.

These curves show immediately that the CO:CO<sub>2</sub> ratio resulting from carbon combustion is controlled almost exclusively by the iron:carbon ratio of the charge, *i.e.*, in practical terms by the coke ratio, and that changes in air volume have but a minor effect on the effluent gas analysis.

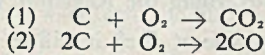
This factor incidentally shows the complete fallacy of all air calculation methods which are based on the lines of the following example:—

- (1) Melting rate ..... — S lb. per hr.
  - (2) Ratio  $\frac{\text{iron in charge}}{\text{carbon in coke}} = R$
  - (3) Carbon burnt per hr. .... =  $\frac{S}{R}$
  - (4) Cub. ft. of air per lb. of carbon for desired stage of combustion ..... = v
- ∴ Air required (V) =  $\frac{S \times v}{60R}$  cub. ft. per min.

Such methods are completely erroneous because they assume that one can simultaneously predetermine the three factors melting rate, iron:carbon ratio, and stage of combustion, in any desired relationship, and then calculate the fourth member, *i.e.*, the air volume required. In fact, as is shown by Figs. 1 and 2, the laws of cupola operation reveal that, with a given melting rate and coke ratio, there is, for a given type of coke, only one possible air volume and one possible stage of combustion.

**Applications**

Having established the general concept that, with a given constant type of fuel, and air at a standard pressure and temperature, the CO:CO<sub>2</sub> ratio at the completion of the reactions concerned with the burning of the coke carbon will be controlled by the iron carbon ratio. Let us consider, therefore, the general mechanism of combustion in the cupola: It is postulated that, of the two possible reactions



the result up to the point where free oxygen has been consumed is such that equation (1) is the only one which need be seriously entertained, as, even if at the immediate coke surface equation (2) is operative, it is instantly followed in the gas phase by the reaction  $2CO + O_2 \rightarrow 2CO_2$ . The zone of oxygen disappearance, where the overall reaction  $C + O_2 \rightarrow CO_2$  is predominant, is referred to as the oxidation zone.

Now the combustion behaviour of the carbon of the coke in a cupola is not determined by purely chemical considerations, but by a combination of chemical and physical factors, as, before any reaction can occur between the carbon and the oxygen, the two reactants must be brought into intimate contact. Further, the speed of the chemical reactions increases with temperature, becoming

extremely rapid at high temperatures, whereas at low temperatures the rates are low. Thus at low temperatures it is found that chemical reaction rates predominate, whereas at high temperatures the rate of reaction between the solid coke surface and the oxygen of the gas phase depends almost entirely on physical factors, and becomes less dependent on temperature.

The most important physical characteristic is the size of the fuel, and hence the surface area per unit volume presented to the gas phase. From this, it also follows that high-temperature reaction rates will not only increase with diminishing particle size, but will also be, in some degree, affected by the cellular structure of the fuel surface, and the degree of interference exhibited by the ash network remaining as carbon disappearance proceeds.

The rate of air admission will also affect the rates of reaction in two ways:—

- (1) The cooling effect of the air will be greater per unit volume with higher air speeds, and greater cooling in the medium-temperature zone will then slow down the chemical reaction rate.
- (2) In the upper-temperature range, where physical factors predominate, the increased speed will also result in more violent turbulence so that the apparent reduction of contact time will be counterbalanced by a more vigorous reaction, due to an increased number of actual contacts between the reacting atoms.

At the upper limit of the oxidation zone it may reasonably be expected that, with only a small amount of oxygen remaining in the gaseous phase,

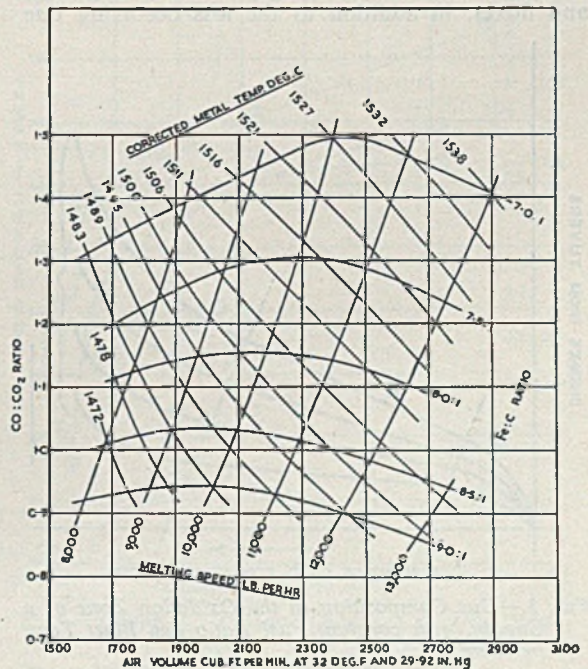


FIG. 2.—CO:CO<sub>2</sub> Ratios extended from the Values given in Fig. 1 for Iron:Carbon Ratios above 9:1 for the 36-in. dia. Cupola.

Reactions in the Cupola

the reaction  $C + O_2 \rightarrow CO_2$ , will again slow down due to the decreasing number of probable contacts between the two reactants. With the above factors in mind, a picture of the course of the reaction can be assembled, as in Fig. 3.

Turning next to the reduction zone, in which the reaction  $CO_2 + C \rightarrow 2CO$  predominates, similar considerations apply. The reaction in this zone starts at high temperature however, and initially the rate of reaction will be dependent mainly on the physical factor of the fuel size, after a short range in which the reaction coincides with the finish of the oxidation zone in areas temporarily starved of oxygen but rich in C and  $CO_2$ . The reaction  $CO_2 + C \rightarrow 2CO$  is endothermic, however, and its course is therefore accompanied by a cooling of the gas phase and the fuel surface, which proceeds until the temperatures are such that the rate of the chemical predominates over the physical factors of fuel size, but being dominated by a fresh circumstance.

To appreciate this, the heat sources at the upper part of the reduction zone must be examined. Here, the fuel is descending in the furnace at a rate controlled by the melting rate, which is in turn controlled by the iron:coke ratio and the air speed, and the descending fuel is being heated, first by the rising hot gases, and, in the reaction-zone proper, by radiation and conduction from the material in the high temperature oxidation zone also. The hot gases from the oxidation zone, however, are being rapidly cooled in the reduction zone by losing heat to the metal charge, the descending coke, and fluxes, in addition to the loss occurring due

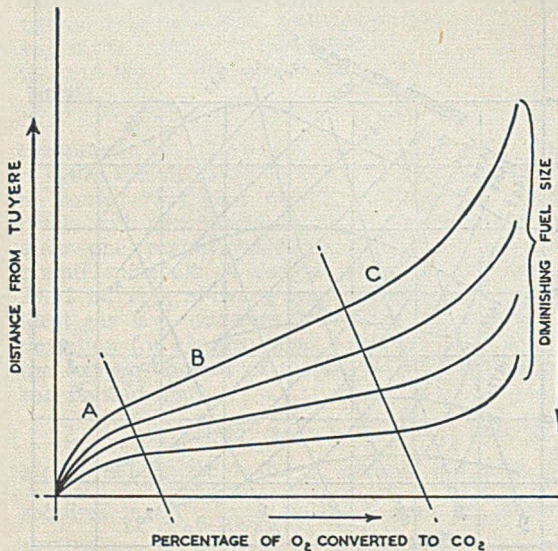


FIG. 3.—Gas Composition in the Oxidation Zone of a Cupola, with constant Fuel Ratio and Blast Temperature.

Zone (A): increasing gas temperature, chemical rate predominant, but modified by rate of air temperature gain; Zone (B): rate controlled by fuel size and turbulence, and only partly by temperature and Zone (C): conditions as in (B) but rate reduced by oxygen starvation.

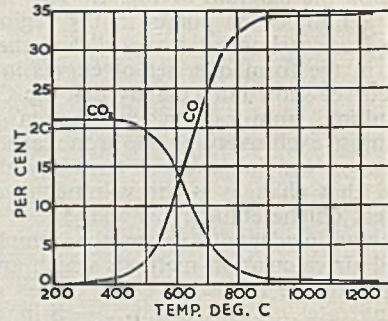


FIG. 4.—Boudouard Reaction Equilibrium Curves, i.e., the  $CO/CO_2$  Relationship produced from Air in contact with Carbon at Different Temperatures.

to the endothermic reaction  $CO_2 + C \rightarrow 2CO$ . The descending coke therefore reaches a point where its rate of temperature rise is sharply increased as it enters the reaction zone. Simultaneously, the rising gases are rapidly falling in temperature at this level, and they continue to do so until the point is reached where the temperature differential between gas and fuel surface is insufficient to ensure a rapid enough heat transfer to offset the heat loss of the endothermic reaction; at this point the endothermic reaction ceases.

The temperature at this point, known in gas-producer practice as the "reaction temperature," is most important, as the gas composition existing at the time the endothermic reaction  $CO_2 + C \rightarrow 2CO$  ceases will be virtually that of the exit gases, as no further reactions normally occur in the cupola to alter this ratio, and this gas composition will be that composition in equilibrium with the coke carbon at the reaction temperature. The relationship of CO to  $CO_2$  produced from air in contact with carbon at different temperatures is shown in the equilibrium curves for the Boudouard reaction in Fig. 4, from which it will be seen that the ratio  $CO:CO_2$  rises with temperature.

Conditions Governing the Reaction Temperature

With a given type of fuel, it will be seen that, if, at a constant fuel burning rate, the heat balance at the plane in furnace which is at the reaction temperature  $T$  is considered, the total heat-balance can be drawn up for this plane, if one makes one assumption, i.e., that the fuel, burden, and gas phase are all at temperature  $T_R$  in this plane. The heat balance is then that for the whole of the reactions occurring in the furnace reaction zones up to (in the physical sense) the temperature level  $T_R$  in the reduction zone. (See Fig. 5.)

The heat supplied to this zone then consists of:—

- (i) The total heating value of the fuel— $FH_i$
- (ii) The enthalpy of the fuel at temperature . . . . .  $T_R - FH_c$
- (iii) The enthalpy of the burden at temperature . . . . .  $T_R - F\mu H\mu$
- (iv) The enthalpy of the blast . . . . .  $MH_M$

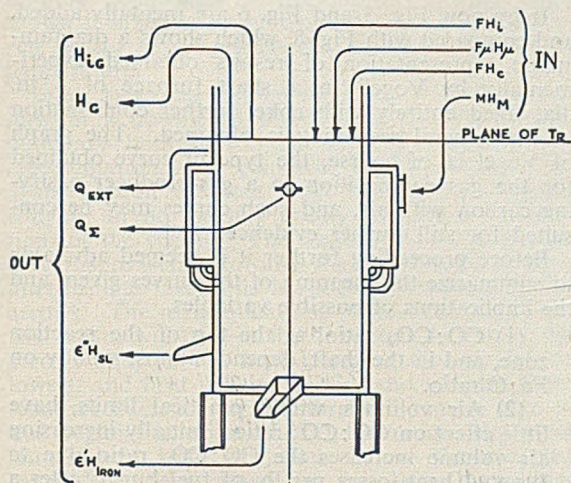


FIG. 5.—Cupola Heat Balance at Location of Reaction Temperature  $T_R$ .

The heat leaving this zone consists of:—

- (i)  $H_i, G$  .. The heating value of the product gas (composition in equilibrium at  $T_R$ ).
- (ii)  $H_G$  .. The enthalpy of the product gas at temperature  $T_R$ .
- (iii)  $F\mu Q_\Sigma$  .. The heat required for reactions (such as slag formation, metal oxidation, etc.).
- (iv)  $F\mu\epsilon'H_{iron}$  .. The heat content of the tapped iron, including heat of fusion, at its tapping temperature.
- (v)  $F\mu\epsilon''H_{sl}$  .. The heat content of the tapped slag, including heat of fusion, at its tapping temperature.
- (vi)  $Q_{EXT}$  .. The heat lost externally by radiation, conduction (and in the cooling water, if any).

Where  $F$  is the fuel quantity chosen, and  $\mu$  is the ratio of burden to fuel.\*

$\epsilon'$  is the yield of tapped iron from the burden.

$\epsilon''$  is the yield of slag from the burden.

$$\text{Thus } FH_i + FH_c + F\mu H_\mu + MH_M = H_{i,G} + H_G + F\mu(Q_\Sigma + \epsilon'H_{iron} + \epsilon''H_{sl}) + Q_{EXT}$$

therefore

$$FH_i + FH_c + F\mu[H_\mu - Q_\Sigma - \epsilon'H_{iron} - \epsilon''H_{sl}] + MH_M - Q_{EXT} = H_{i,G} + H_G$$

Now, if a given fuel ratio be chosen, the heat content of each side of this equation can be plotted against a series of different values of  $T_R$ , and the point of intersection will give the value of  $T_R$ , and, if the process be repeated for a number of fuel ratios, a graph of  $T_R$  against fuel ratio will be obtained, and hence of  $CO:CO_2$  ratio against fuel ratio.

Such a graph is shown in Fig. 6, from data calculated by Gumz<sup>3</sup>, also shown on the same graph are curves by the same authority, prepared in the

same manner, for cupolas operating with blast temperatures of 300 and 600 deg. C., and the measured data of Jungbluth and Heller<sup>4</sup>, which links up with the data of Jungbluth and Korschan referred to in Figs. 1 and 2. Data are also included, produced by Bader working with a hot-blast cupola with a blast temperature of 600 deg. C., and one point is included by the Author, from data, given by De Bock, for a hot-blast cupola operating with a carbon: iron percentage of about 18 per cent., and a blast temperature of 500 deg. C.

It is claimed that the degree of agreement of these data is sufficient to confirm the general mechanism of combustion put forward, and to verify the general factor, shown by Fig. 2, that the  $CO:CO_2$  ratios achieved in cupola practice are almost wholly controlled, with a constant type of fuel, and constant blast temperature, by the fuel ratio, and only to a minor degree by air volume, within the practical limits of cupola operation.

The Author claims, however, that precise data cannot be obtained for all cases by the heat-balance method of Gumz, albeit, an approximation will be obtained as shown by Fig. 6. The reason for this lies in the assumption, made in this calculation, that at the plane of  $T_R$ , the fuel surface temperature and the gas temperature are identical, whereas it was stated earlier that there would still be a temperature differential in favour of higher gas temperature to supply the heat for the endothermic reaction  $CO_2 + C \rightarrow 2CO$ . Further, the coke surface

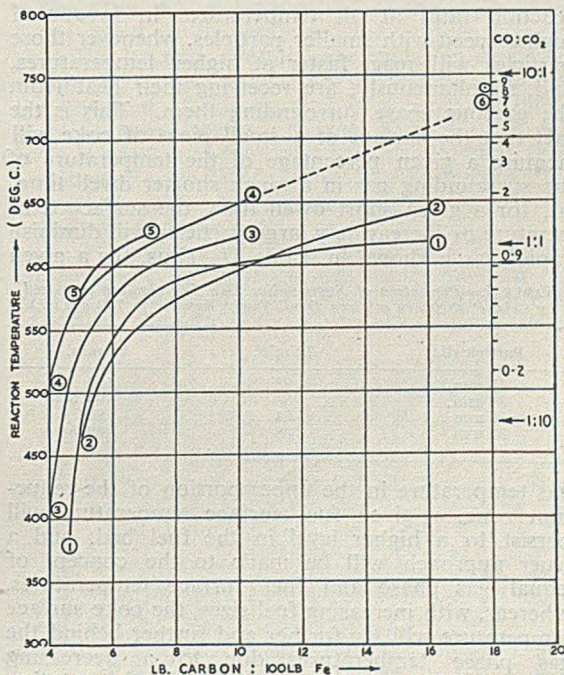


FIG. 6.—Graph of  $T_R$  (and, hence,  $CO:CO_2$  Ratio) against Fuel Ratio.

(1)—(1) Calculated cold blast (Gumz); (2)—(2) actual cold blast (Jungbluth & Heller); (3)—(3) calculated  $T_M=300$  deg. C. (Gumz); (4)—(4) calculated  $T_M=600$  deg. C. (Gumz); (5)—(5) actual  $T_M=600$  deg. C. (Bader) and (6) actual  $T_M=500$  deg. C. (De Bock).

\* Only the carbon of the fuel is considered, volatile matter being lost prior to  $T_R$  and the ash being considered part of the burden.

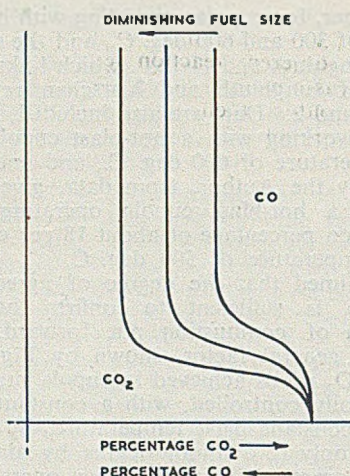


FIG. 7.—Gas Composition in Reduction Zone and Stack of a Cupola, according to Fuel Size.

temperature must be  $T_R$ , even if the whole of the heat of reaction is supplied from the gas phase which is at a temperature sufficiently higher. Now, coke has already been said to have faster reaction rates at high temperatures for pieces of small size, than for pieces of large size, in the higher temperature region—due to surface-area effects. A second factor may now be mentioned which affects reaction rates at all temperatures in favour of higher speed with smaller particles, whenever those particles will react faster at higher temperatures, and, simultaneously, are receiving their heat from the gaseous phase surrounding them. This is the fact that the surface of a small piece of coke will acquire a given percentage of the temperature of the surrounding gas in a much shorter dwell time, or, for a given short dwell time, the surface temperature of increasingly large particles will diminish rapidly as is shown in Table I. Thus, for a given

TABLE I.—Percentage of Surrounding Gas Temperature Acquired by Coke Particles in a Given Dwell Time (Range 0 to 700 deg. C.).

Particle dia.	12 min.	24 min.
15 mm.	98	100
30 mm.	88	97.5
50 mm.	64	86
70 mm.	38	69.5

gas temperature in the upper portion of the reduction zone, a given fuel surface temperature will persist to a higher level in the fuel bed, and a truer approach will be made to the concept of equal gas phase and fuel surface temperatures, whereas, with increasing fuel sizes, the coke surface temperature will lag further and further behind the gas phase temperature, due to a decreasing efficiency of heat transfer, and the effective reaction temperature will be increasingly lower. This effect is shown in diagrammatic form in the curves of Fig. 7 which deals with the reduction zone and the stack-gas composition, on the basis of the deductions made, in the same way that Fig. 3 deals with the oxidation zone.

If by now Fig. 3 and Fig. 6 are mentally added, and compared with Fig. 8, which shows a diagrammatic representation of results obtained experimentally by Vogel<sup>5</sup> in a shaft furnace of 4 in. dia. filled entirely with coke, further confirmation of the general reasoning is obtained. The graph of Vogel is, of course, the type of curve obtained for the gas composition in a gas-producer gasifying carbon with air, and such curves may be consulted for still further evidence.

Before proceeding further it is deemed advisable to summarize the meaning of the curves given, and the implications of possible variables.

(1) CO:CO<sub>2</sub> ratio, at the top of the reaction zone, and in the shaft, depends almost wholly on Fe:C ratio.

(2) Air volumes, within practical limits, have little effect on CO:CO<sub>2</sub> ratio. Initially increasing air volume increases the CO:CO<sub>2</sub> ratio due to lowered heat losses per lb. of fuel burnt; after a maximum, however, further air then lowers the CO:CO<sub>2</sub> ratio, presumably because the reduction zone is then accepting fresh carbon at a rate too high for efficient heat transfer.\*

(3) Within the limits of the curves shown, increasing air gives increasing temperature and melting speed at a given coke ratio (lower heat losses).

(4) Increasing coke ratio, at constant air volume, gives higher CO:CO<sub>2</sub> ratio, hotter metal and slower melting rate.

(5) Smaller coke gives higher CO:CO<sub>2</sub> ratio, but colder metal, and faster melting rate.

(6) Increased blast temperature, at constant coke ratio, gives higher CO:CO<sub>2</sub> ratio, hotter metal, and faster melting rate.

(7) The cupola behaves as if the combustion reactions were (i)  $C + O_2 \rightarrow CO_2$ , continuing until oxygen is virtually absent, and (ii)  $CO_2 + C \rightarrow 2CO$ . The maximum flame temperatures for zone (1) (the oxidizing zone) are therefore almost the theoretical values for CO:CO<sub>2</sub> approaching zero, say, about 2,000 deg. C. for cold blast, or some 2,400 deg. C. for a blast temperature of 600 deg. C.

(8) Reduced fuel size, or hot blast, shorten the zones, and thus decrease the area in which free oxygen exists, though the first method reduces efficiency much more than the latter, and is less effective. (Incidentally, increased oxygen content in the blast would also have a similar effect.)

(9) At a temperature of 1,100 deg. C., in the absence of fresh supplies of oxygen or carbon dioxide, the CO:CO<sub>2</sub> ratio of a gas derived from air and carbon is over 10<sup>3</sup>:1, and rises rapidly with increasing temperature. (Fig. 4.)

With this information in mind, Fig. 9(a) is presented merely as a diagrammatic aid to further consideration of the internal conditions obtaining in a cupola. Areas (1) and (2) indicate, respectively, the zones cooled by the incoming blast, and the

\* The Author believes that if air volume were increased sufficiently, the oxidation zone would also be overloaded by cold air and metal, and metal temperatures would also decline, i.e., the temperature curves of Fig. 1 represent one side only of a parabolic curve.

limiting boundaries of free oxygen; it has been shown that the point of disappearance of free oxygen is also approximately the point of peak flame temperature.

In an operating cupola, however, there is no gas flow in a downward direction so that whilst the boundary lines shown are believed to be a fair representation, the combustion occurring in the lower portion of these areas will be that due to eddying air not passing deeply into the lower portions of the cupola. The main flow of gas will be upwards, resistance towards the centre being at some intermediate level, this is roughly indicated by the arrows. The main quantities of heat carried by the gas stream will flow in the directions shown by the arrows and, as the heat losses at the centre are lowest, and heat is being carried and radiated there from all sides, the temperature will remain high in this region, in spite of CO formation, the peak temperature zone will thus follow the accepted saucer-like shape shown by the upper boundaries of the areas (2), and the heavy broken line.

In an upward direction from this boundary, heat will be used to melt and heat the metal and to melt and heat slag components and the fuel, in a stream of gas of fairly uniform flow, with CO<sub>2</sub> diminishing and CO rising, until the end of the reduction zone when the gas temperature will be at least T<sub>R</sub>, and the fuel temperature will be T<sub>R</sub>, and the gas composition that shown by the previous figures.

Heat will be carried downwards, however, by radiation and by conduction, the temperature being maintained at a high level by the molten iron and slag constantly washing downwards, and thus the higher the temperature generated in the upper zone the higher will be the "well" temperature. The gas composition in this area will thus consist almost entirely of CO, and the conversion of CO<sub>2</sub> to CO will use but little heat as gas flow does not occur to any significant degree. It can, in fact, be expected that the CO:CO<sub>2</sub> ratio in this area will closely approach the equilibrium value for the temperature reached. The centre zone between the free-oxygen lobes will also tend to high CO values, but as a constant flow of CO<sub>2</sub> will enter the zone, the CO:CO<sub>2</sub> ratio will be at an intermediate value. Figs. 9(b), 9(c) and 9(d) have been prepared to show these effects, and refer respectively to conditions in the planes A-B-C, E-F-G, and E-H, in Fig. 9 (a).

### Cupola Sectional Reactions

Consideration can now be given to the reactions possible in the main sections of the cupola.

I *The shaft* (i.e., the cupola from charging door down to the level of T<sub>R</sub>, in which the temperature of the charge is raised from normal to a level of about T<sub>R</sub>, and the CO:CO<sub>2</sub> ratio of the gases is constant at a figure dependent on T<sub>R</sub>), is first considered. In the upper region, water will be evaporated and other matter volatilized at low temperature will be removed. To determine whether the tendency will then be towards reduction of oxides or a creation of further oxides, the position with respect to iron and its oxides is first examined. Fig. 10 shows the Boudouard-reaction curve ( $\text{CO}_2 + \text{C} \rightleftharpoons 2\text{CO}$

plotted against reaction temperature) and, superimposed on it, the equilibrium curves for the reactions between the iron oxides and CO/CO<sub>2</sub> mixtures at different reaction temperatures.

Let two cases now be taken:—

(a) A cold-blast cupola is run with an iron:carbon ratio of 12.5:1 (12:1, coke:iron with 4 per cent. ash coke), i.e., 8 lb. coke carbon per 100 lb. iron, then the reaction temperature, using curve 2, Fig. 6, will be approximately 575 deg. C. Thus, for all temperatures below 575 deg. C. in the shaft, the CO per cent. will be of the order of 8.2 per cent., and it can be seen from Fig. 10 that, at all temperatures below 575 deg. C. (in fact at all temperatures below about 840 deg. C.) this gas is oxidizing and would tend towards the production of Fe<sub>3</sub>O<sub>4</sub>.

(b) Let a cold-blast cupola be run with a 15½ lb. coke carbon per 100 lb. iron ratio, then, from curve (2), Fig. 6, the reaction temperature will be 640 deg. C., and it will be seen from Fig. 10 that, at all temperatures below this, the tendency would be to reduce all oxides of iron to the metal.

It is also clear that the higher the reaction temperature is raised by percentage fuel increases, hot blast, or both, the greater is the movement towards reducing conditions with respect to iron oxides in the shaft. Fig. 11 shows the position with respect to manganese, and it will be seen from this that, in this case, even if very high reaction temperatures are achieved, any reduction beyond the oxide MnO achieved in the cooler portions of the stack would be reversed as the reaction temperature was approached, so that, overall, only oxidation can occur in the shaft with respect to manganese, although the potential of the reaction is reduced by higher reaction temperatures. Silicon, likewise, can only suffer oxidation in the stack with any possible reaction temperature T<sub>R</sub>, as, similarly, the highest CO:CO<sub>2</sub> ratio achievable will be too low to effect a reduction of SiO<sub>2</sub> to Si.

II. *The zone* between the plane of the reaction temperature, T<sub>R</sub> (end of the shaft) and the top of the "well" is a much more complicated zone, as different conditions occur at the outer portions

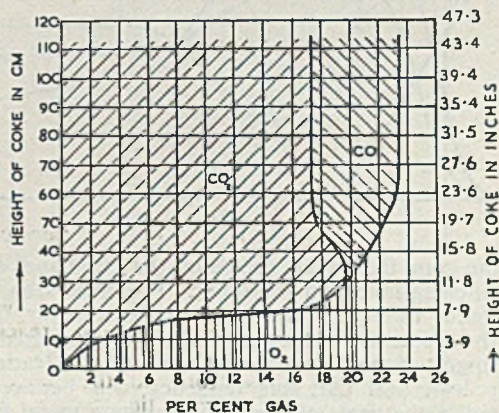


FIG. 8.—Combustion Conditions in an Experimental Cupola 4 in. dia. (after R. Vogel).

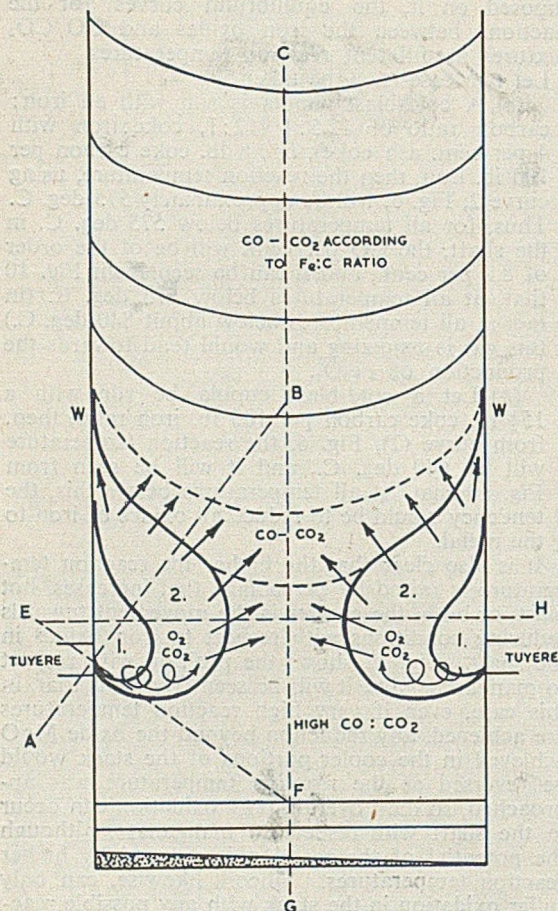


FIG. 9 (a).—Diagrammatic Representation of Conditions obtaining in a Cupola Cross Section.

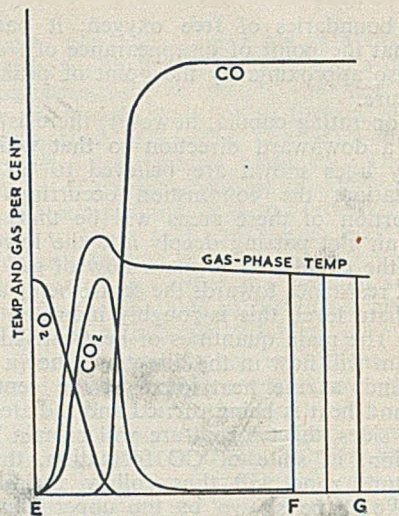


FIG. 9 (c).—Gas Composition denoted by the Plane E-F-G in Fig. 9 (a).

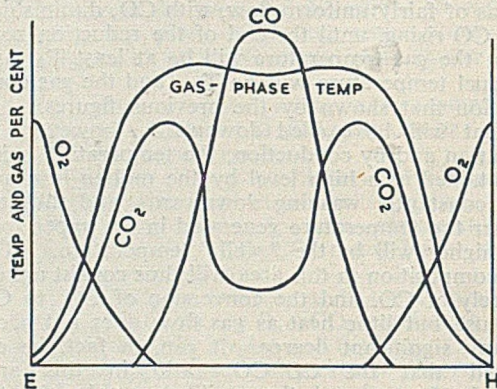


FIG. 9 (d) (above).—Gas Composition denoted by the Plane E-H in Fig. 9 (a).

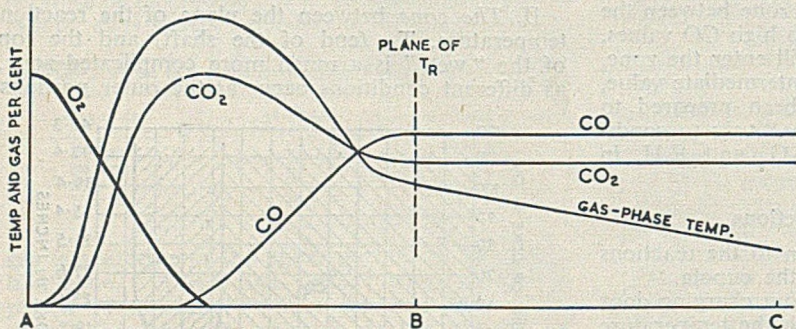


FIG. 9 (b) (left).—Gas Composition in the Cupola Area denoted by the Plane A-B-C in Fig. 9 (a).

of the zone than at its centre on the one hand, and at differing levels on the other. It can be seen, by reference to Figs. 9 (a), (b), and (d), however, that all the elements, including iron, will be oxidized in the high-temperature zone, as the CO:CO<sub>2</sub> ratio is very low, and that this tendency will be accentuated in the parts of the furnace where metal falls through the tuyere zones 2, 2, encountering free oxygen, but, after first continuing in the centre of

the furnace, it may reverse if the CO:CO<sub>2</sub> ratio rises sufficiently.

This zone will, therefore, always produce oxidation, but the degree of oxidation will be reduced by all the factors which restrict the sphere of influence of oxygen in the tuyere zones 2, 2, and which reduce the sphere of influence of CO<sub>2</sub> (i) in the high-temperature zone above the tuyere zones (Fig. 9 (b)), and (ii) especially in the high-tempera-

ture zone between the tuyere zones (Fig. 9 (d)). These factors are those which lead to short reaction distances, *i.e.*, fuel size, blast temperature, and high fuel ratios (the cooling effect of higher rates of iron flow for a given rate of heat production giving lower temperatures and slower reaction speeds). It will be noted that these factors are also those which lead to high reaction temperatures and high CO:CO<sub>2</sub> ratios in the stack. Small fuel size, however, increases the melting rate and lowers the metal temperature and temperatures at the cupola centre, so that it is the least desirable of these approaches.

III. *The zone* below the tuyeres where free oxygen no longer exists, and a high temperature is coupled with very high CO:CO<sub>2</sub> ratios, is perhaps the most important in the cupola, as, here, reducing conditions again obtain, and the oxidation which has occurred is reversed in some measure; the degree of this reversal, coupled with the final metal/slag reactions, will decide the final overall melting loss of the cupola. Fortunately, perhaps, the primary factors which control the efficiency of this zone as a reducing zone are obvious, and consist of high temperature coupled with high CO:CO<sub>2</sub> ratio, and as has already been shown from the form of the Boudouard curve, CO:CO<sub>2</sub> ratio rises with temperature when a system is in equilibrium, so that, in the absence of gas flow, one might say that the major efficiency of this zone depends on one factor, *i.e.*, high temperature.

Now, whilst the absence of gas flow cannot be assumed, in cupolas of very low "well" depth, in the "well" space above the slag level, the very presence of a slag serves to guarantee the absence of gas movement in the normal sense below the slag level. Yet, in and below the slag, the reactions that occur at the slag/coke interface, and the metal/coke interface, will proceed in the one direction or the other in a manner corresponding to that for a given CO:CO<sub>2</sub> ratio and temperature, as any reduction of an oxide by carbon implies the production of CO or CO<sub>2</sub>. Furthermore, at any given temperature, there is, on the one hand, a balance between the C, CO, CO<sub>2</sub> and the metal oxide or metal, which, unless the whole system is

in equilibrium, tends to alter the relationship between the C, CO, and CO<sub>2</sub>, as either reduction of oxidation proceeds, and on the other hand there is a balance between the CO, CO<sub>2</sub> and carbon, which attempts to come to rest in accordance with the Boudouard reaction and thus to restore the CO:CO<sub>2</sub> ratio in accordance with the equilibrium for this reaction. Thus, even if the element concerned be not reduced, when the drops of oxide-coated metal, or oxide-bearing slag (tumbling over the incandescent coke), fall through the high-temperature high-CO:CO<sub>2</sub> portion of a deep-enough "well," but, instead, arrives in the slag and metal phases in the "well" (where reaction then proceeds between metal and coke, and slag and coke), the ultimate result will be similar, given adequate reaction time.

Secondary factors affecting this zone can now be realized, for instance, it is obviously desirable that the cupola-well portion should neither be so shallow above the slag surface that free oxygen or a high-CO<sub>2</sub> gas phase is re-oxidizing slag components at this interface, nor that the well depth should be so extreme that high heat losses unduly lower the slag and metal temperatures. The provision of adequate slag depth is also advantageous to allow sufficient reaction time between the slag and the falling drops of metal, which present much better interface conditions, due to the high ratio of surface area to weight, than does the normal slag/metal interface. It is also obvious that fluid slags are to be preferred to viscous slags; that, where possible, slags forming complex and stable compounds with the oxides to be reduced should be avoided and slags containing materials catalytic to desired reactions should be sought. Again, slags which readily remove the ash network remaining as the carbon of the coke is consumed, will improve the effectiveness of the carbon, and hence of the reduction processes. The question arises as to what reductions can take place in this zone of the cupola, either by direct oxidation of CO→CO<sub>2</sub>, or indirectly as oxide/slag/coke reactions.

(To be continued, see References page 358 at foot of col. 2)

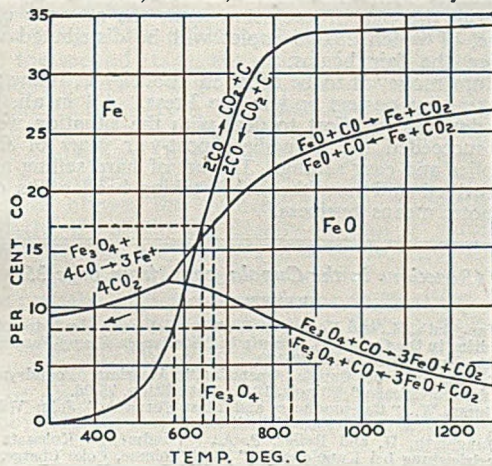


FIG. 10.—Iron Reduction by Carbon Monoxide, superimposed upon the Boudouard-reaction Curve.

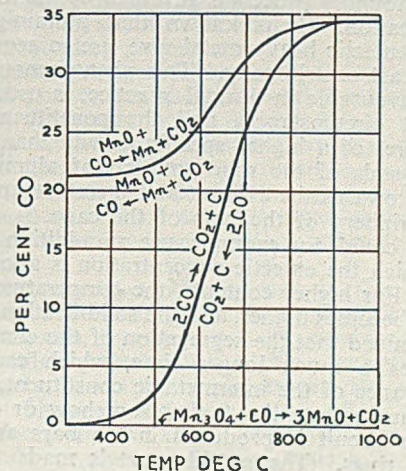


FIG. 11.—Equilibrium Curves for Manganese Oxides reduction by Carbon Monoxide.

## Centrifugal Casting of Rotors\*

Squirrel-cage motors are used in many branches of industry, and efforts have been made to reduce the intensity of the starting current. As the search increases to establish a direct connection for these motors, it is necessary to reduce, as far as possible, the intensity of the starting current. It is possible to obtain the result with a ring motor by introducing a variable resistance in the rotor circuit, the increase of resistance decreasing the intensity of the current.

The squirrel-cage motor, by the careful consideration of the form of the grooves, (which are deep and narrow), can be given a feeble starting current intensity because the upper part of the bars alone is charged with an induced current, which increases the resistance. This effect can be heightened by using rotors with special grooves in which the conducting material located in the periphery presents a higher resistance than the material situated in the interior. The external part of the bars should therefore present a higher resistivity—which leads to the idea of a rotor carrying a double system of bars in the same grooves.

### Assembly for Casting

Centrifugal casting permits of the conception of a rotor so composed, when using a machine with a vertical axis. The magnetic part of the rotor is made up as usual by an assembly of sheets carrying at their surface a series of passages into which the conductor metal is cast—this is usually pure aluminium. During casting, the central part of the machine rotates at high speed, carrying the mould and the rotor. The liquid metal is impelled to the periphery in such a way that it fills perfectly the peripheral passages. The short circuit rings are obtained at the same time and serve to feed the bars. To obtain a difference of resistivity between the exterior and interior of the bars, one can substitute for pure aluminium an alloy containing one or several heavier metals and of lower conductivity than the pure metal.

The foundry process is governed by the following specification. It is known that aluminium and a non-eutectic heavy metal give rise to segregation when cast centrifugally. This phenomenon, which is unfavourable in normal practice, is used in the present circumstances and the constituent of the structure, of a higher specific gravity than that of the crystals of the solid solution of aluminium is found towards the exterior and therefore appears at the periphery of the bars of the cage.

One could, for example, use an addition of iron, for which the eutectic concentration is about 2 per cent. For higher contents, the temperature of the liquid becomes higher, and the solidification interval so extended that the segregation of the constituents requires a much longer time, which causes the appearance of the intermetallic constituent, Al<sub>3</sub>Fe.

It thus comes about, that somehow or other, a double circuit is produced in the bars and short circuit rings. The outside part is made up of a

metal of high specific gravity and also relatively high resistivity, whereas the inner portion benefits from the good conductivity and the light weight of the pure aluminium. The peripheral parts of the rotor will thus serve the starting current and the internal portions the working current.

During the casting, it is wise to provide a slight superheat to the aluminium in order that it has the chance to decant and separate itself into constituents of different resistivities. To aid these process advantages it is equally necessary to ensure an appropriate section for the peripheral bars to help the segregation of the constituents. This process does not appear to be completely solved, for it remains necessary to elucidate the effect of numerous variables. It would seem that in particular the separation of the different constituents requires that the speed of rotation of the spinning plant should be relatively high, involving the need for a soundly constructed and robust machine. Many practical tests may still be necessary to establish the best composition of the alloys and the know-how of the process. Nevertheless, the use of the centrifugal process for this purpose is novel and well worth investigation.

## New B.I.F. Policy

In an effort to attract more exhibitors, a vigorous campaign has been launched to tell manufacturers how they can benefit from the London sections of the British Industries Fair, which will be held from May 3-14 next year. Instead of the rather formal invitations of previous years to some 9,000 firms, for the most part past exhibitors, letters will be sent to 30,000 manufacturers. There will be much more information than before and the letters will be reinforced with the aid of the staffs of the regional offices of the Board of Trade (which is responsible for the London sections), who will for the first time add their resources and local knowledge, especially to any firm wishing to know more about the B.I.F.

A further radical change is in the reserving of space, since manufacturers will be able to choose specific sites from plans now being prepared, instead of having to bid for a certain amount of space only. The first applicants will therefore have the best sites and will not run the risk of exclusion from the advance catalogue, of which 25,000 copies will be distributed well before the fair begins.

More money is to be spent in publicity at home and overseas by posters and in the Press. All in all, this is a determined effort to deal with the situation which has succeeded the immediate post-war years of short supplies and easy selling. The art of hard selling must be revived and now the B.I.F. taking heed of its own keynote, means business.

### (Reactions in the Cupola, cont. from page 357)

#### REFERENCES

- <sup>1</sup> Jungbluth, H., and Korschach, H., "Das Schmelzen im Kupolofen" ("Melting in the Cupola"), *Technische Mitteilungen Krupp-Forschungsberichte*, June, 1938, No. 5, 79-100.
- <sup>2</sup> "Handbook of Cupola Operation," American Foundryman's Association, Chicago 6, Illinois, 1946. 1st edition, 75-96.
- <sup>3</sup> Gumz, W., "Gas-producers and Blast Furnaces," John Wiley & Sons, Inc., New York, 1950. 1st edition.
- <sup>4</sup> Jungbluth, H. and Heller, P. A., "Windmenge, Kokssatz und Schmelzleistung bei Kupolofen" ("Blast Volume, Coke Charge, and Melting Rate in the Cupola"), *Technische Mitteilungen Krupp*, December, 1933, No. 4, 99-105.
- <sup>5</sup> Vogel, R., Thesis at Aachen, 1926.

\* Extracted from an article by Hovst-Günter Halt in *Die Technik*.



# Growth Characteristics of Ingot-mould Irons in Air and Vacuum\*

By J. W. Grant, A.M.I.Mech.E.

(Continued from page 331)

## GROWTH THEORIES IN THE LIGHT OF PRESENT OBSERVATIONS

The tests reported in this Paper have established that appreciable growth can take place in cast iron even in the absence of oxidizing influences and gases. The results, in fact, lend support to Benedicks' and Löfquist's theory that when cast iron is repeatedly heated and cooled, growth is principally due to cracking caused by differential expansions and contractions occurring during the  $\alpha \rightleftharpoons \gamma$  change and the consequent solution and precipitation of the graphite.

Perhaps the most interesting observation emerging from this investigation relates to the influence of a surrounding oxidizing atmosphere. The penetration of oxygen appears to set up two opposing mechanisms affecting the course of growth, the extents of the mechanisms being dependent on the composition and structure of the metal, the size of the specimen, the rate of heating and cooling, the temperature range and the oxidizing power of the surrounding medium. In the first case, growth is caused by the oxidation of the metallic constituents of the matrix: silicon, iron and manganese. Since these products of oxidation are bulkier than the metal, an expansion takes place, the extent of which depends on the nature and quantity of the oxides and silicates formed. This type of growth is increased by stressing or repeated heating, since such treatments open up inlets for the further penetration of gases into the body of the specimen. At a later stage of oxidation, the graphite also oxidizes to a gas and diffuses out of the specimen, probably without any change in volume. Indeed, there might even be a contraction resulting from this loss of graphite which would, however, probably be masked by the progressive oxidation of the metallic matrix.

In the second stage, the oxides form a protective envelope around the graphite, thereby isolating the graphite flakes from the metallic matrix. This restricts or—in severe cases of oxidation where there is no contact at all between the graphite and the matrix—prevents the solution of graphite in the austenite above the transformation temperature. Similarly, if carbon be already present in solution in the austenite and the graphite be isolated, there is no surface on which the carbon will deposit and, therefore, the austenite transforms to pearlite; the magnitude of the volume changes is thereby reduced and little growth occurs. During the  $\alpha \rightleftharpoons \gamma$  changes, the behaviour of the matrix will resemble that of carbon steel; it is known that when a steel is subjected to repeated heating in an oxidizing

atmosphere, scaling takes place but no appreciable growth occurs.

Growth occurring in an oxidizing atmosphere will, therefore, depend upon a combination of the growth-promoting effect on the one hand, *i.e.*, the formation of bulky oxides, and the growth-inhibiting effect on the other, *i.e.*, the isolation effect of the graphite. It is thus conceivable that under mildly-oxidizing conditions the rate of growth would be increased either as the surrounding atmosphere approaches a vacuum, or as it becomes more oxidizing. Optimum conditions for minimum growth are therefore probably reached when the iron is partially oxidized. This may have an important bearing on the growth observed in nominally non-oxidizing and inert gases unless extreme care is taken to eliminate moisture and other oxidizing impurities. Tests have shown that growth can occur to an appreciable extent in dry, pure argon (comparable with that observed in vacuum), but that as soon as some oxidation has taken place the subsequent rate of growth is considerably reduced.

## Summary and Conclusions

In the first part of this Paper, the factors affecting growth and the theories of the mechanism of growth have been considered. It is well established that growth is due to decomposition of pearlite with the resulting precipitation of graphite, and also to oxidation of the metallic constituents of cast iron. The oxidizing gases pass along the cavities between the graphite flakes and the metallic matrix and oxidize the metallic matrix in the immediate vicinity of the graphite flakes. The degree of oxidation and amount of growth occurring depends upon the composition, structure, heating cycle and nature of the surrounding atmosphere.

These causes of growth, however, do not explain all growth phenomena and the theory has been suggested by Benedicks and Löfquist that a greater part of growth during repeated heating is due to cracks or fissures formed by irreversible reactions as the iron is heated and cooled through the  $\alpha \rightleftharpoons \gamma$  transformations. There are other theories that dissolved and absorbed gases play an important part in growth.

The experimental work reported in this Paper was carried out mainly on ingot-mould irons in air and vacuum, the vacuum being produced by a mercury diffusion pump backed by a rotary pump in which the pressure did not exceed  $10^{-3}$  mm. of mercury. The work included a study of the oxidation products formed at sub-critical temperatures, growth due to repeated heating tests in air and vacuum and the effects of oxidation on the forma-

\* Paper presented to the fiftieth annual meeting of the Institute of British Foundrymen.

### Growth Characteristics of Ingot Moulds

tion and transformation of austenite. The following are the main observations and conclusions:—

(1) By annealing in air at 500 deg. C. for 30 and 60 days, some spheroidization and decomposition of the pearlite occurred. The graphite flakes near the edge of the specimen were surrounded by a dark layer of compact oxides and an outer envelope which was probably due to the oxidation of the silicon in the ferrite to silica or silicates in a very fine form (Figs. 7 and 8). Similar structures were obtained by annealing for shorter periods at 700 deg. C.

(2) Volume growths of 21 to 39 per cent. occurred in specimens of as-cast and vacuum-annealed ingot-mould iron that were repeatedly heated 100 times over the temperature range 650—900—650 deg. C. in vacuum, Table II. In another test, a growth of 80 per cent. was obtained after 300 cycles. When using a specimen of an iron/carbon ingot made from pure iron and electrode graphite, melted and solidified in vacuum, and subsequently repeatedly heated in vacuum, a growth of 44 per cent. was obtained after 300 heatings. In a similar test, the iron/carbon ingot absorbed aluminium from the alumina crucible during melting, owing to the extremely high temperature reached, and it then grew 153 per cent. by the same treatment with a reduction in specific density from 6.8 to 2.7 (Fig. 17). An austenitic iron grew only 1.6 per cent. after 100 heatings in vacuum.

These results prove beyond reasonable doubt that growth can occur from causes other than graphitization and oxidation, and that the presence of gases in any form is not essential. This lends strong support to the theory that growth can be caused by local differential expansions and contractions during the  $\alpha \rightleftharpoons \gamma$  changes.

(3) By previously annealing in air, and permitting oxide to form in the iron, major growth was inhibited, but not indefinitely, upon repeated heating in vacuum. Specimens machined from blocks that had been previously annealed in air at 700 deg. C. grew from 3.4 to 5.6 per cent. after 100 cycles, 650—900—650 deg. C. in vacuum (Table II), whereas those tested as-cast or after annealing in vacuum grew from 21 to 39 per cent. by the same cyclic heat-treatment. In another test, the rate of growth of an air-annealed sample increased appreciably between the 244th and 300th cycle (Fig. 17). The growth of this sample and others that were still growing steadily after 300 heatings was stopped, however, after annealing in air for 20 hrs. at 700 deg. C. (Table V).

(4) Though a different iron was used for tests in argon, the growth of the as-cast material was greater in argon than in vacuum, and yet the growth of the air-annealed material was less in argon than in vacuum (Table II). This suggests that argon, though inert, may in some way affect growth.

(5) The microstructures of the as-cast and vacuum-annealed samples showed an unidentified "fluffy" constituent growing from the sides and

ends of the graphite flakes, and there were areas within the matrix where a new constituent or cracks had appeared (Figs. 10 and 11). In specimens that had been previously annealed in air, the structure did not differ appreciably from the original annealed structure. A small amount of pearlite that had formed was mainly associated with the graphite flakes (Fig. 12). In the iron/aluminium/carbon specimen, which had grown 153 per cent., there were large, black areas around the graphite flakes (Fig. 13).

(6) The fact that so little growth was obtained in vacuum with oxidized metal suggested that oxide penetration may substantially prevent the expansions and contractions from taking place at the critical temperatures. It was verified that when an oxidized ferritic ingot-mould iron sample was held in the austenitizing temperature, the graphite did not enter into solution as readily as in a sample that had been made ferritic in non-oxidizing conditions (Table VI and Figs. 22 to 23). The pearlite formed during subsequent cooling of the oxidized sample was associated mainly with the graphite flakes (Fig. 24). In one case where a sample had been oxidized by annealing for 1,000 hrs. at 700 deg. C., an austenitizing treatment at 900 deg. C. for 16 hrs. followed by furnace-cooling produced only traces of pearlite. It appears that the annealing treatment in air provides an envelope of oxide around the graphite flakes, thereby isolating them and preventing the solution of graphite in the austenite. The volume changes will therefore be correspondingly restricted.

(7) Under repeated heating in air, 650—900—650 deg. C., scaling was severe, but the volume growth was of the same order as in vacuum. The change in microstructure was entirely different. Oxidation was severe, penetrating into the centre of the 2 by 2 in. block. Nearer the edge, the oxides had formed a continuous boundary enclosing some of the matrix and the graphite flakes. At the extreme edge, the oxide boundary had contracted further around the areas originally occupied by the now-oxidized graphite flakes, producing the appearance of "white or ferrite flakes" (Figs. 25 to 29). White flakes have also been seen in used ingot moulds and in irons heat-treated at temperatures of 700 deg. C. (Fig. 9).

(8) A repeated-heating test on a material previously tested by Rocquet and Olette" over the same temperature range gave a greater growth in the B.C.I.R.A. vacuum apparatus than was obtained by these workers. The fact that the qualities of the vacuum in each apparatus were nominally the same indicates the difficulties in comparing results of tests made under testing conditions only slightly differing.

The chief interest of the present work lies first in the strong support it gives to the theory put forward by Kikuta, and by Benedicks and Löfquist, to explain the mechanism of growth. Secondly, it shows that whilst oxidizing atmospheres primarily cause growth, a pre-anneal in air can also inhibit growth in vacuum. It is possible that,

during heat-treatment in air, both these effects could operate at the same time.

#### Acknowledgments

While this work did not form part of the formal programme of the Ingot Moulds Sub-Committee of the British Iron and Steel Research Association, of which the Author is a member, some of the material employed had been specially cast by several leading ingot-mould makers in connection with that programme, and the Author wishes to acknowledge his thanks to the Sub-committee and to B.I.S.R.A.

The Author is indebted to the director and Council of the British Cast Iron Research Association for permission to publish this Paper, and particularly to the staffs of the Association's vacuum-fusion and metallographic laboratories.

#### DISCUSSION

MR. COLIN GRESTY said growth of ingot moulds was a subject in which he had been interested for very many years, and he had noticed that Mr. Grant drew attention to earlier work and the very important effect of silicon, *i.e.*, the lower the silicon the lower the growth (excepting the very-high-silicon irons). This had made him wonder why, for very heavy castings like ingot moulds and iron of considerably lower silicon content was not used. In Table I, the silicon contents ranged from 1.32 to 1.85 per cent., but there was no doubt that ingot moulds could be cast with very much lower silicon—probably less than 1 per cent.—and still be grey.

Had the Author any views on actual carbon content in relation to growth? The second sentence of the Paper stated that growth occurred in all grey irons, but he wondered whether that was strictly correct. Was there no such thing as a non-growing iron which was still a grey iron? He had in mind sub-critical temperatures at which Thompson had found permanent contraction in one iron and no growth at all.

MR. J. W. GRANT, in reply, said that ingot moulds were made with silicon contents varying from 1 per cent. to over 20 per cent. but all were substantially pearlitic. There was sometimes a tendency for free carbide to form and even large ingot moulds with up to 20 in. wall thickness were almost entirely pearlitic. With some moulds an increase in life had been obtained as the silicon content increased from 1.5 to 2.2 per cent.

As regards the carbon content, the quantity and size of the graphite particles had an important influence on growth. In general, the growth increased with size and quantity of the graphite particles. Carpenter's work had shown that in flake-graphite irons growth increased with silicon content up to 5.0 or 6.0 per cent., whereas in contrast to this, Morgan and Norbury had obtained the lowest growth with 5 per cent. silicon, when only a small amount of graphite was present and all was in the undercooled form.

With regard to non-growing grey cast iron, he (Mr. Grant) did not think there was such a material, although some irons were more stable than others.

It was true that a contraction could be registered, due perhaps to a relaxation of internal stresses, but this would be a linear contraction and there would be a corresponding linear expansion in another direction. He doubted if there would be an overall reduction in volume.

MR. GRESTY said it still did not follow that the normal ingot mould composition was the ideal.

#### Thermal Shocks

THE CHAIRMAN, Dr. A. B. Everest, suggested that a factor to be considered was thermal shock. Ingot moulds were subject to very severe conditions in service and it had proved difficult to determine the precise properties required.

MR. R. LEE (Brightside Foundry) said that, as the representative of an ingot-mould maker, he could possibly speak as one who had to deal with the casting of the largest ingot moulds made in this country. His firm felt that a ferritic structure was desirable for large ingot moulds in order to resist thermal shock, but experience had proved such a structure was almost impossible to produce from hematite irons. With silicon contents below about 1.85 per cent. there was a tendency for free carbides to be present, in a wholly pearlitic matrix. The same iron cast into small moulds always showed appreciable amounts of free ferrite.

Various methods to produce wholly-ferritic structures had been examined and the only consistent method appeared to be by inoculation with sand as the metal passed from the cupola to the ladle. This obviously was not a practicable proposition. If anyone present could say how one could produce a completely ferritic structure in large ingot moulds, he was more than ready to listen. So far as small moulds were concerned, good results had been obtained with 1.0 per cent. silicon irons, but it depended on several factors. Thus this composition might be satisfactory where machine stripping was practised but would be unsatisfactory where hand stripping was adopted.

It seemed to him that the Paper was really meant more for the research worker than the person engaged in ingot-mould manufacture, but there was one point he could not understand. The Author seemed to stress the fact that growth was due to cracks or fissures formed by the transformations, but he did not see how that tied up with annealing in air inhibiting growth due to repeated heating in vacuum. Whatever the medium during heating—air or vacuum—the volume changes must take place.

Lastly, in 1951, Mr. Grant in a Paper published in the *Journal* of the Iron and Steel Institute, had disagreed with the suggestion of intercrystalline cracking, and he wondered whether such a phenomenon had been masked.

MR. GRANT, in reply, said that sand additions at the cupola spout even then resulted in only a partially-ferritic mould casting. He would not like people to gain the impression that the mould became entirely ferritic.

On the question of the bursting or cracking theory, he agreed that this was not wholly

### *Growth Characteristics of Ingot moulds—Discussion*

acceptable. The important fact to explain was that such astonishing growth could occur in vacuum where no oxidation was possible, and the possibility of the formation of cracks due to local expansions and contractions could not be ruled out. To explain the fact that growth during repeated heating in vacuum was inhibited by pre-annealing in air, it was suggested that oxide layers formed around the graphite flakes and isolated them from the matrix. The graphite then did not enter into solution with the austenite upon heating through the  $\alpha$  to  $\gamma$  change and there was a smaller contraction and hence less localized stress than in an iron that had not been oxidized. Conversely, on cooling, the graphite was not readily deposited during the  $\gamma$  to  $\alpha$  change and hence the localized expansion would be restricted. Since both on heating and cooling the local volume changed and resulting stresses had been reduced by isolation of the flakes, the likelihood of forming or extending cracks was likewise reduced and the overall volume growth would be small.

As regards inter-graphitic cracks, he had seen many examples of what were claimed to be cracks in the matrix of microspecimens taken from as-cast ingot moulds. These had always turned out to be thin lines in the polished microspecimens where the graphite flakes had been badly burnished due to faulty polishing. He had never seen inter-graphitic cracks in as-cast ingot moulds and had no reason to believe that they existed.

#### **Dictates of Experience**

MR. J. BLAKISTON, referring to the standard type of ingot mould, said the decision to more or less standardize the silicon content had been dictated by practical experience as regards resistance to thermal shock and also mechanical shock. In the average steel plant, a mould was subject to a considerable amount of misuse. Some time ago, he had found when manufacturing ingot moulds on a large scale that the amount of superheat put into the metal prior to casting had a marked influence on the life of the mould, reflecting in some cases on the amount of growth. The metal was superheated in a cupola and then allowed to cool in the ladle to a normal casting temperature. Another fact which had occurred to him was that cast iron was sometimes used as a carburizing medium for the case-hardening of precision steel parts, using hematite borings. In an ingot mould there was transferred from the mould to the steel every time a teem took place—had that been taken into consideration?

MR. GRANT, in reply, said that a report of the Ingot Moulds Sub-committee to the British Iron and Steel Research Association was due to be submitted to the Iron and Steel Institute shortly, and this dealt with many of the factors affecting the life of ingot moulds. One of the sections dealt with melting procedure and the manufacture of the moulds, and although pouring temperature had been considered, as far as he knew, no information was available on the effect of superheating.

He thought that there might be a danger of adversely affecting the graphite structure, but it was a fact that could certainly be looked into and he would bear it in mind.

He had been unable to follow the point about carbon loss, but perhaps the speaker would elaborate this point.

MR. BLAKISTON explained that he had not meant that the loss would be from the whole mould but from the surface of the mould in constant contact with the molten steel, and over the life of the mould the amount of carbon loss from the surface would be considerable. He was wondering whether that would accelerate the failure.

Replying, MR. GRANT said that when it came to the life of the ingot mould many changes such as oxidation and localised cracking took place on the surface adjacent to the steel ingot and the loss of carbon was another such factor, but as far as he could see this could not be avoided. It was undoubtedly a factor that caused the surface ultimately to break up. A material that would offer better resistance to growth by oxidation and to decarburization would probably not withstand the severe thermal shock.

#### **Relation to Actual Service Results**

MR. BLAKISTON remarked that one did not get these conditions in laboratory tests and MR. GRANT, continuing, repeated a remark which he had made during the presentation of his Paper, that in his opinion there was no close tie-up between most of the experimental work in that report and the behaviour of the ingot mould in service.

DR. RILEY (Staveley), congratulating Mr. Grant on his Paper, said it was excellent to have such a reasoned statement on a problem with which the industry had been faced for many years. He had been rather surprised to see the extent to which the cast iron had grown when heated in a vacuum, and presumably if the cast iron specimen had grown to that extent it would lead to the formation of cavities inside the iron, but on glancing through the photo-micrographs he had been unable to see any holes in the specimen. Was that a fact or were holes present in the photomicrographs?

MR. GRANT replied that he wished he could answer that question to Dr. Riley's and his own satisfaction. In Fig. 11 there were shown some markings on the side of the graphite flakes and on the extreme left there were a lot of inter-granular markings as well. Also, in Fig. 13, the photomicrograph of the Fe/Al/C alloy which had grown 55.8 per cent.—there were large black areas but in no case had he been able to identify that black constituent. It was not graphite and not simply holes.

THE CHAIRMAN, concluding the discussion, proposed a vote of thanks to the Author which was carried with acclamation.

LAST THURSDAY, delegates to the Royal Aeronautical Society's Anglo-American conference visited the Rolls-Royce aero-engine works at Derby, and made a tour of the works.

# Mechanization of Shell Moulding

By "Dornal"

Interest amongst foundrymen everywhere in shell moulding has grown rapidly since the first F.I.A.T. report was read by an observant few in 1947. The encouragement given by the resin manufacturers who wisely recognized the possibilities of a new outlet for their products has given this new technique a great impetus and, particularly in the U.S.A., the process is now everyday practice in a number of foundries.

Shell moulding necessarily applies to the production of quantities of similar castings and this in turn involves some mechanical means of manufacture. Quite a number of designs of shell-moulding machines have emerged, but it seems to the writer they all suffer from certain disadvantages.

Included in these disadvantages there are:—Undue intricacy, unnecessary motions, long time cycles, the difficulty of obtaining even sand-dumping, complication in the withdrawal of the shell from the pattern and its subsequent handling to convey it away to the assembly and pouring area.

## Desirable Characteristics

From these thoughts on the subject has arisen a clear conception of the sort of machine which would seem to meet all the criticisms which can so easily be raised against those now available. There is little doubt that this is the ultimate form into which shell-moulding machines will evolve, but it would perhaps speed the process if the various desirable features were to be enumerated:—

(1) To combine a rapid output of finished shells, irrespective of the time taken by the baking period, (which may be more with some moulds than others) the machine should be of the rotary-table, indexing pattern. This will involve a plurality of pattern stations, but the patterns can all be different, with advantage.

(2) With present designs, much waste of time and motion occurs whilst the pattern is being inverted for attachment to the dump box, turned back to allow the sand to fall on it, inverted again to allow the surplus

sand to fall away and finally turned back again preparatory to baking. To save all this, the patterns should be permanently mounted face downwards.

(3) The dump box could then be mounted so that it merely rises upward to make contact with the downward-facing pattern, so eliminating a roll-over motion.

(4) The sand in the dump box could be pushed upward into contact with the inverted pattern by a pneumatic or hydraulic ram, by applying air to a rubber diaphragm such as is employed in the Taccone moulding machine or the inflation of a rubber bag such as employed in a bag press. In this way, the sand is distributed evenly at uniform pressure over the whole face of the pattern. Variation in sand density due to variations in the distance the sand has to fall on to the pattern are thus avoided; so are such complications as "venetian-blind" shutters in the dump box.

(5) After application, the pattern and its cake of sand may be indexed to the baking oven. Here, with the pattern and sand facing downwards, heat which naturally rises upwards is more readily applied to complete the baking process.

(6) When the mould is properly baked, ejection becomes a simple process. It is no longer necessary to arrange complicated forks to pick up the mould when it has been lifted by the ejector pins. Arrangements could be such that the shell drops a very short distance directly on to a rubber cross-belt which can be employed to take it quickly to the clamping and pouring area, without any handling complications.

(7) One final provision is thought necessary; the sand box must be fitted with a dust-tight lid only to be removed when sand is to be spread over the pattern face. The sand box in turn should have an enclosed feed from a sand-storage hopper. To the writer's mind, the principal objection to shell moulding is that it introduces to the foundry industry an entirely new dust-producing process unless this problem is properly tackled at the outset.

## Nottingham's Smokeless Zone

Tenants of houses at Clifton, Nottingham, are an integral part of an experiment that may be followed in other parts of the country. Nottingham Corporation insists that a tenant uses "coke anthracite, or one of the manufactured solid fuels, unless he can show that smokeless fuels are not reasonably obtainable." It all started in April, 1951, when the corporation began building at Clifton, which lies to the south-west of the city, what will be virtually a new town of between 5,000 and 6,000 dwellings, together with shops and other amenities to make it self-contained. So far, rather more than 1,600 houses are inhabited, and it may be 1958 before the new town is complete.

A visitor to Clifton to-day can easily assess the progress of the experiment; no matter how many fires are burning, there is an almost complete absence of smoke. The experiment has been facilitated by the co-operation of local officials of the Ministry of Fuel and Power, who have authorized the necessary permits for supplies of smokeless fuels, and by the goodwill of the tenants themselves, many of whom, in the early stages, found difficulty in obtaining the best results from their new heating equipment. Demonstrations of the appliances and the advice of a housing inspector have, however, done much to enable tenants to play their part.

Work on the Volta River aluminium scheme in the Gold Coast Colony cannot begin before 1955, as the project must first be proved absolutely sound technically, according to the scheme's special commissioner Commander Robert Jackson. The Gold Coast Government is to appoint a national committee for the project. Dr. Arthur Morgan, first chairman of the Tennessee Valley Authority, and Prof. Arthur Lewis, of Manchester University, have agreed to act as advisers.

**Machinery.** A return to pre-war conditions is evidenced by the publication of a machinery catalogue by George Cohen, Sons and Company, Limited, Broadway Chambers, Hammersmith, London, W.6. Further editions will be produced three or four times a year. It is a ponderous tome running to over 200 pages, which can well be understood as there are no fewer than 25 items listed under "woodworking machinery (used)." The locality where each item is lying is announced and, for the more important items, the machine is illustrated. An essential in a catalogue of this type and size is good indexing and this has been meticulously carried out. It is reasonably certain, though not expressly stated, that this catalogue is available to readers on application to the Publicity Department, Cunard Works, Chase Road, London, N.W.10.

## Portable Electric Mould-drying Stoves

At the moment, much attention is being devoted to the problem of portable drying stoves. Up to now, large moulds set in foundry floors have been dried in place by means of coke fires, while the majority of boxed moulds have, as a general rule, been heated in special drying ovens. If the consumption figures for fuel and power used in drying are compared and the tariff per unit of electricity is calculated on the basis of fuel costs, the resulting equivalent energy price works out here, as in some other cases, to a value at which electricity companies are not prepared to sell their energy. Nevertheless, if the other factors which also influence the total operating costs are taken into consideration, it becomes evident that electric drying is economical even in countries where electricity is produced exclusively from heat energy. Brown Boveri, who operate in this country through British Brown & Boveri, Limited, 75, Victoria Street, London, S.W.1, have given special attention to the drying of floor moulds and have developed an apparatus which has revolutionized drying methods in this field. The plant is illustrated in Fig. 1. With fuel-fired equipment, the hot gases are led into the "green" mould and made to pass over its inner surfaces, heat being transferred into the depths of the mould exclusively by conduction. In the new process, however, air is heated electrically in the drying unit and is then forced at considerable pressure from the inside of the mould through the sand to escape finally at the outer mould surfaces. In this way, the drying process makes full use of the hot air and consequently raises the degree to which the available heat energy is utilized from about 20 to 100 per cent., a fact which alone makes electric drying an interesting proposition. On the technical side, the ability to hold all parts of the mould at the same pressure ensures uniform drying of even the most restricted mould sections. One particular new feature of the process is that simple cores can be dried in place in the moulds. These advantages explain why

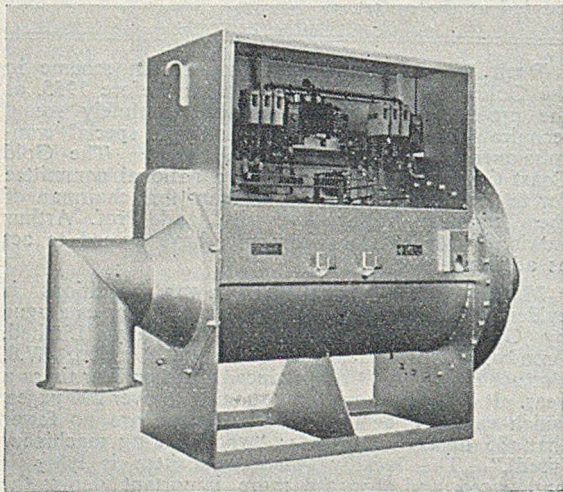


FIG. 1.—Brown-Boveri Portable Plant for Drying Moulds by Electricity, showing the Control Equipment uncovered.

(Continued at the foot of Col. 2)

## Tata's Impressive Results

Despite a further substantial increase in costs, the Tata Iron & Steel Company, Limited, Jamshedpur (India), have announced impressive results for the year ended March 31, 1953. The gross profit has risen by nearly Rs. 15 lakhs to Rs. 25 crores\* as a result of an increase in the gross revenue from Rs. 35 crores to Rs. 37.74 crores. Expenses have, however, continued to rise, the figure being Rs. 29.48 crores, against Rs. 26.96 crores in the preceding year.

The provision for depreciation (including Rs. 25 lakhs on collieries) has been stepped up from Rs. 2.15 crores to Rs. 2.35 crores and that for plant rehabilitation reserve from Rs. 75 lakhs to Rs. 1 crore. The tax bill is higher at Rs. 2.8 crores, against Rs. 2.67 crores. On balance, the net profit is lower at Rs. 2.1 crores, compared with Rs. 2.53 crores in the previous year.

### Directors' Explanation

The directors attribute the decline in the net profit mainly to lower production and despatches of pig-iron and steel, and to the curtailment of operations at the Agrico plant owing to lack of orders. Furthermore, the previous year's profits included a non-recurring item representing retrospective increase in retention prices in respect of previous years which was only partly made up in the present year by the accretion of the post-war refund of excess profits tax and by a profit on the sale of scrap, leaving a difference of about Rs. 20 lakhs between the two years.

The negotiations with the Government for a Rs. 10 crore loan have been virtually completed, and it is expected that the company will be in a position to commence drawing on the loan shortly.

Substantial progress has been made with the modernization and replacement of plant. Work on the construction of the new Simon-Carves battery is well up to schedule, the lighting up of half the battery having taken place on July 27. The lighting of the remaining half is expected to take place towards the end of this month. Pig-iron production rose by 2.13 per cent. to 1,153,000 tons and ingot output by 0.37 per cent. to 1,061,000 tons.

Blast furnaces "A," "B," "C," and "E" were in operation throughout the year and gave a slightly higher production. "D" furnace was blown out in December, 1952, for complete rebuilding. A slackening of demand for merchant-mill materials and the rolling of a larger quantity of light sections resulted in lower production during the year in this section. The production by the sleeper plant was higher.

Iron-ore despatches rose from 1,930,000 tons to 2,030,000 tons, manganese ore from 48,000 tons to 63,000 tons, and dolomite from 22,000 tons to 26,000 tons.

The directors state that, although steel supplies available in the country are much below the real needs, lack of purchasing power and the tightness of the money market have resulted in reduced sales and accumulation of stocks.

\* 1 lakh=Rs. 100,000; 1 crore=100 lakhs; Rs. 1 crore = £750,000 approx.

box moulds as well as floor moulds can be dried on site by such units. Moreover, the great reduction in transport costs and the extra space made available in the drying ovens for smaller moulding boxes and cores, react favourably upon the economy of electric drying.

## Metal Melting under Vacuum

*Founders of the future may need to envisage melting and casting their metal in vacuum and in this article are recorded mechanical problems associated with the process and means at present available for their solution.*

The melting of metals under high vacuum is a process of comparatively-recent development, but during and since the last world war it has progressed from the initial stages of laboratory experiments with small and makeshift equipment, until at the present time a standardized range of sizes is available having crucible capacities from 20 to 240 lb., with accompanying high-vacuum pumping equipment suitable for vacua in the order of  $10^{-5}$  mm Hg., and there is today a plant installed in a Swiss works with a crucible capacity of 450 lb. steel.

### Container

It will be appreciated that the design and construction of the outer vacuum vessel or container which surrounds the furnace proper presents a number of problems, especially in view of the fact that in a well-designed plant the melting should be carried out as far as possible under the same conditions as any other installation working at atmospheric pressure. In the case of the plant illustrated in Figs. 1, 2 and 6, which is a 60-lb. standard installation, made by the Swiss firm G.A.B., of Balzers, Liechtenstein, the container is made of stainless steel, double-cased, with a large, hinged cover, both body and cover being intensively water-cooled. In general, the time required for the production of a vacuum in such a vessel depends not only upon the internal capacity of the container, but also upon the dimensions, composition, and quality of the internal surfaces, which should have smooth and flowing lines and be capable of being cleaned readily. Some of the problems which have to be solved in the design of such a container are:—(1) The provision of means of charging the various constituents of an alloy in the proper order

and at the appropriate stages in the process; (2) observation and measurement of the temperature of the melt, and (3) means for pouring the charge.

### Swiss Furnace

In the design of the Swiss furnace illustrated, the problem of obtaining access to the crucible for the addition of various constituents during the progress of the melt is overcome by the provision of a supplementary 6-chamber rotating hopper, in the main cover of the container, as shown by Fig. 3. This hopper is situated directly above the crucible, and can be turned by means of an external handle so that each of the compartments can be brought successively over a charging hole, through which the contents of the compartment are dropped on to a hinged chute immediately beneath, while the actuation of another external lever allows the chute to be tipped and to slide the charge into the crucible.

### Temperature Measurement

Observation of the progress of a melt is a difficult matter in a vacuum plant, because, owing to the heavy vaporisation of the charge, a normal inspection window would be quickly obscured by a metallic deposit. In the plant described, there is an inspection window of quartz glass in the hinged cover, which is reinforced internally by a second window of Pyrex. The latter is protected to a considerable extent against the deposit of metallic vapour when not in use by a movable guard, while it can be cleaned of any such deposit by a wire wiping brush operated by an external lever.

However advantageous visual observation may be the method is naturally no substitute for accurate pyrometric temperature measurement, and although

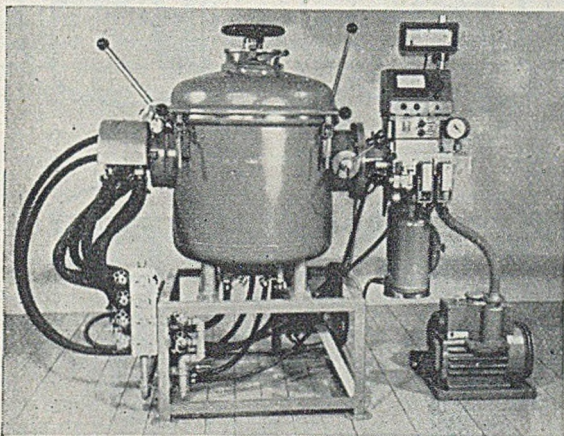


FIG. 1.—General View of the G.A.B. Vacuum-melting Plant.

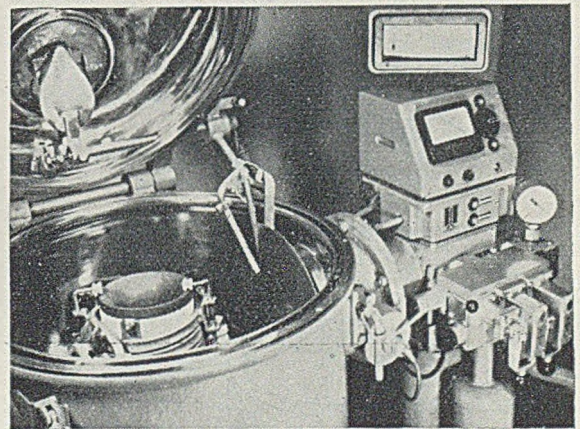


FIG. 2.—Close-up of the Vacuum-melting Plant, with the Lid Raised and Pyrometer withdrawn.

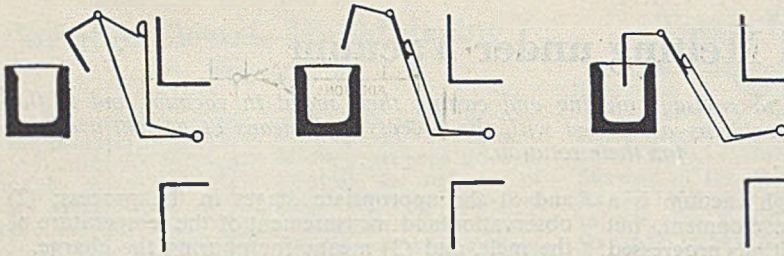


FIG. 4.—Diagram showing the Method of Inserting the Pyrometer Tube into the Melt.

the use of an optical pyrometer is not possible, an ingenious method has been devised for readings to be taken by a thermocouple, as shown by Fig. 2. By means of a spring-mounting arrangement, this couple (in a quartz protecting tube) is normally maintained alongside the crucible where it is not liable to either mechanical or thermal damage, and in this position does not interfere either with charging or tilting of the crucible. It is inserted into the crucible by the simple movement of an external hand-lever in the manner shown diagrammatically in Fig. 4.

### Pouring

Various possibilities have been tried for pouring a molten charge of metal inside a vacuum container, some of which are illustrated by Fig. 5. In methods (a) and (b), tilting of the entire container is necessary, which involves the movement of considerable masses. In the case of (c) the metal is run off through the bottom of the crucible by the withdrawal of a taper plug, but this system can only be adopted in cases where it is possible to use a graphite crucible. Example (d) shows a German solution of this particular problem. At the bottom of the crucible is a plug of the same metal as that which is being melted, this plug being in its turn melted by an auxiliary heating coil. The method

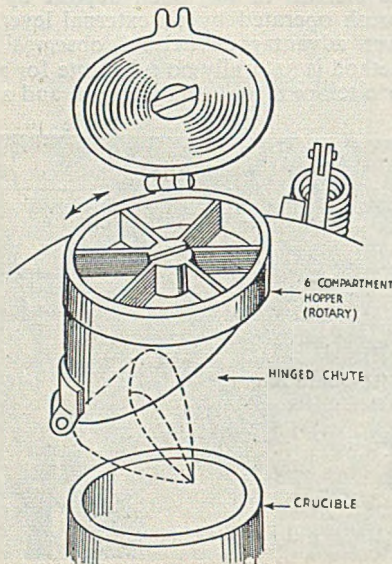


FIG. 3.—Sketch showing the Method of Making Successive Additions to the Charge Crucible.

adopted in the plant shown by Fig. 1 can be seen from the sectional view Fig. 6, in which it will be noticed that it is only the crucible which tilts.

Induction heating is employed, the method permitting of the crucible being moulded and fired *in situ*. The latter is of the lip-tilting type, so that the molten charge is poured directly into the mould located immediately beneath the lip, without any necessity for movement or adjustment of the mould during the progress of pouring.

The mould material also presents certain problems in vacuum melting. In this process, it is naturally not feasible to employ sand moulds, unless it is possible for these first to be heated under vacuum and completely de-gassed, otherwise the gases disengaged in contact with the metal would be liable to result in a porous casting. In the plant illustrated, the moulds usually employed are of cast-iron or steel having perfectly smooth surfaces and pre-heated to some 300 deg. The ingot mould is attached to a vertical stand having adjustable arms, so that the stand will serve for a variety of moulds of different sizes. Provision is made for these to be water-cooled if necessary.

### Melting Process

Fig. 7 enables the progress of a typical melt to be followed, this particular instance being the melting of 11 lb. of tool steel (0.45 per cent. C, 1.2 per

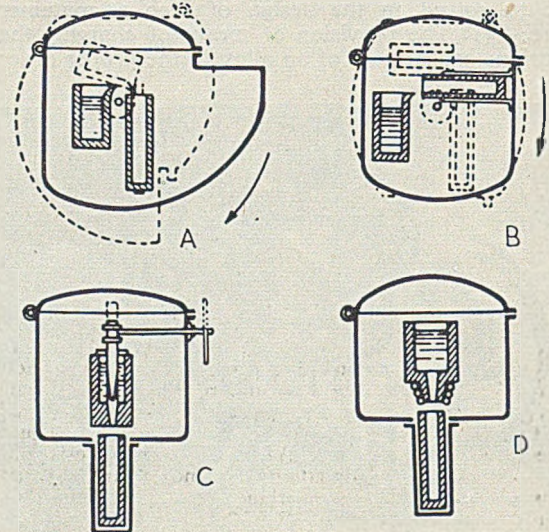


FIG. 5.—Various Methods of Pouring which can be arranged for the Vacuum-melting Apparatus.



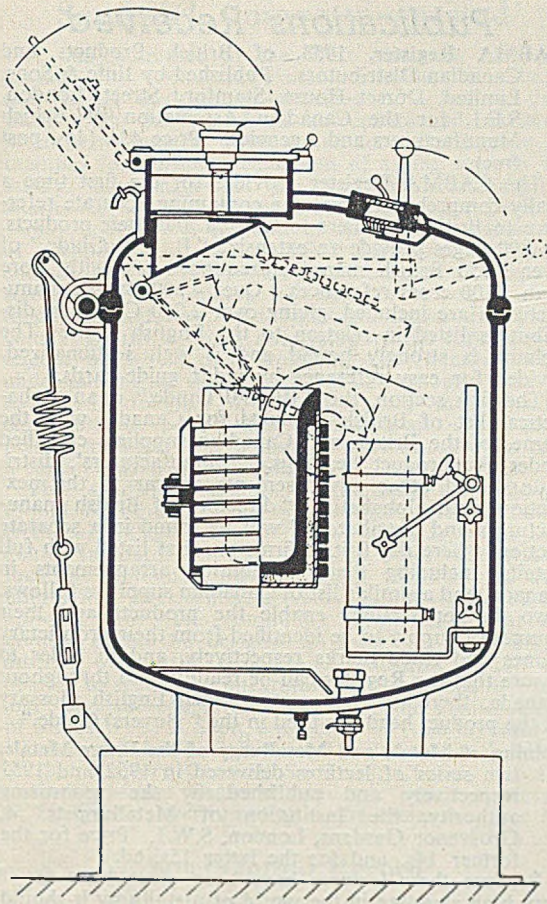


FIG. 6.—Sectional View of the Vacuum-melting Plant.

cent. Cr, and 0.15 per cent. V) previously melted under atmospheric pressure. The crucible employed was of magnesium oxide. Four minutes after closing the container, a pressure of  $8 \times 10^{-4}$  mm Hg. was reached and heating of the charge commenced. Pressure rose sharply from this point, partly due to gases given off by the crucible and partly from the charge, the pump being switched

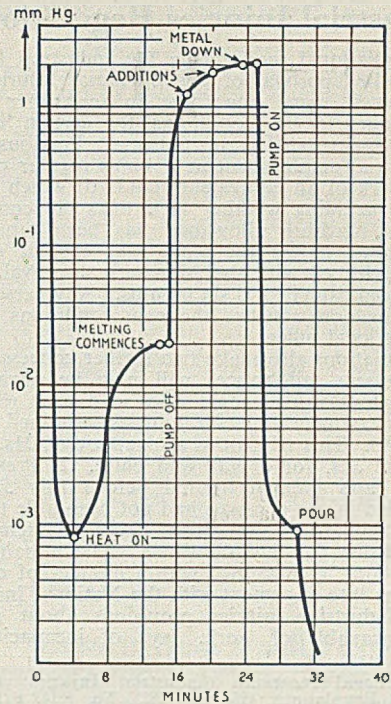


FIG. 7.—Time/Pressure Record for a Typical Melt carried out in Vacuum.

off immediately after the commencement of the melt as the reaction between the oxygen and carbon in the melt was so strong that metal was thrown out of the crucible. Additions to the charge were made at the points indicated, and when all the material was brought down and the melt quiet, pumping was resumed. Energy consumption for melting under a high vacuum is for all practical purposes the same as for an equivalent charge melted in the same type of furnace under atmospheric pressure, and it will be seen from the diagram that the production of the preliminary vacuum has very little effect upon the time factor, the main difference in the time taken being dependent upon the extent to which it is desired to accomplish the de-gassing of the charge.

**New Industrial Democracy.** Mr. Harold Watkinson, Parliamentary Secretary to the Ministry of Labour advocated the creation of a new industrial democracy between the two extremes of materialistic individualism and an equally materialistic communism, when he spoke at the opening of a summer school for young business executives at Oxford recently. He quoted an example of the kind of competition our motor-car industry was meeting with in Switzerland. In terms of English currency a French Renault cost £435; an Italian Fiat £448; a German Volkswagon £466; a British Austin Seven £546 and a British Morris Minor £539. Those figures indicated the handicap we had to overcome.

A meeting convened by local members of the Institute of British Foundrymen, is being held in the George Hotel, Luton, this evening to discuss a proposal to form a section of the London branch of the Institute, to cater specially for residents in the Luton/Bedford/Leighton-Buzzard/Dunstable area. The programme of the proceedings includes a film show by Mr. Frank Hudson, addresses by Mr. V. C. Faulkner and Mr. E. Daybell (chairman of the local committee), followed by general discussion of the project. All foundrymen in the area who are interested should write to Mr. W. Twaddle, acting secretary, 108, Great Northern Road, Dunstable, Bedfordshire.

## Industrial Injuries Regulations

New regulations\* made under the Industrial Injuries Act, with the approval of the Industrial Injuries Advisory Council, came into force on September 2 and made changes in the conditions for certain benefits under the Industrial Injuries Scheme. Previously, the period of trial employment in a man's regular occupation (or work of an equivalent standard) which can be ignored in deciding whether he satisfies the conditions for special hardship allowance has been limited to three months, unless the work was carried out on medical advice or with the Minister's approval. This has now been extended to six months. Any person who considers he now satisfies the new conditions should consult his local office.

The regulations also make two further concessions:— (1) Dependents' allowances will now be payable to certain unemployable people who have been receiving workmen's compensation for injuries sustained before July 5, 1948. This will mean an increase of 21s. 6d. for a wife, and 32s. for a wife and child. (2) Previously, policemen and firemen injured before July 5, 1948, and awarded injury pensions had not been able to draw constant-attendance allowance; from September 2 the will qualify for this allowance. The remainder of the regulations is concerned with a number of changes which bring into alignment with the National Insurance Act the Industrial Injuries provisions about persons deemed incapable of work, days of incapacity and night-workers.

\* The National Insurance (Industrial Injuries) (Benefit) Amendment Regulations, 1953, S.I. 1953, No. 1314, Price 4d.

## New Catalogues

**Flame-proof Motors**—Newman Industries Limited of Yate, Bristol, have just issued a 32-page well-illustrated catalogue covering a wide range of flame-proof motors. It contains a number of tables giving useful data and characteristics of the various types and sizes. Usually this type of plant is found in mines, chemical works, and other places where there is a risk of explosions.

**Cable Fastenings.** By assembling segments between the strands before inserting the wire into a sleeve—a patented system—an attachment has been developed for making self-locking fastenings on steel cable and is described and illustrated in an eight-page pamphlet issued by E. H. Bentall and Company Limited, from their cable-fastenings department, 59, Broad Street, Worcester. The message of this booklet is reinforced by the inclusion of a reprint of a paper by Mr. T. E. Dimberley to the Institution of Mechanical Engineers (Midlands branch) and by a test report undertaken by the Industrial Research Laboratories Birmingham. Excellent findings have been described. These documents are available to readers on writing to the Worcester address.

**Shot-blast Equipment.**—When folders are used for publicity purposes, they should be kept as simple as possible, otherwise pages appear upside down and even may be missed. One from Guyson Industrial Equipment Limited, North Avenue, Otley, near Leeds, has rightly avoided complications by using a plain six-page folder covering shot-blast cabinets, an air compressor and a dust extractor. Two models are illustrated, the larger one having a 32 in. by 22 in. by 29 in. chamber and the smaller 20 in. by 20 in. by 28 in. They are equipped with a motorized dust extractor and work at 50 to 150 lb. per sq. in. The chamber illumination is by 100-watt lamp. The folder is available to readers on application to Otley.

## Publications Received

**CABMA Register, 1953**, of British Products and Canadian Distributors. Published by Iliffe & Sons, Limited, Dorset House, Stamford Street, London, S.E.1, for the Canadian Association of British Manufacturers and Agencies. Price 42s. (44s. post free).

The CABMA Register provides for the first time a really comprehensive volume containing accurate reference to British suppliers to Canada and their products. Its 800 pages provide an extensive "Buyers' Guide" of over 3,750 British manufactured products, with more than 1,300 cross references. Over 4,500 British manufacturers are included, giving over 2,750 Canadian distributors listed in relation to the English firms. The volume is strongly bound and is well sectionalized, divided for easy reference by index guide cards.

The first section, the "Buyers' Guide," is an alphabetical list of British products for Canada, with the names of the British and Canadian suppliers classified under the product headings. Manufacturers', distributors' and other advertisements appear in the next section. An alphabetical "directory of British manufacturers and distributors" will be found in a separate section, where the British firms are first listed with full details, including their distribution arrangements in Canada, and a similar list of Canadian suppliers follows. Two further sections enable the products and their sources of supply to be identified from their proprietary names and trade marks respectively, and in order to ensure that the Register can be readily used throughout Canada, there is a complete French/English glossary of the product headings used in the "Buyers' Guide."

**Joining of Metals and Metallurgy of the Rarer Metals**, two series of lectures delivered in 1952 and 1953 respectively and published by the sponsoring authority, the Institution of Metallurgists, 4, Grosvenor Gardens, London, S.W.1. Price for the former 14s. and for the latter 15s. 6d.

Because these lectures have been given by men of very high standing in the world of metallurgy it should not be thought that they are high-brow. On the contrary, they are not only easily understood by the average of those in the profession but they are, in many cases extraordinarily interesting. By the time a technical man has been practising in one field for a number of years, knowledge of those far remote becomes hazy, if indeed it was ever acquired. The opening lecture of the "Joining of Metals" series, by Professor O'Neill, produces the first list the reviewer has ever seen of all the methods and processes that have been or are used for joining metals. When thinking about "burning-on" one would indeed be unlikely to associate the making of Sheffield plate as entering into the same category. The rest of the lectures deal with various phases of welding, soldering and brazing and the determination of weldability.

The second series of lectures deals with the very subjects on which but few are really knowledgeable, and in most cases reliance has been made in the past on text-books written by people only well versed in a fraction of the fields covered in their bulky tomes. In the series under review, however, detailed consideration has been given to the metallurgy of uranium; beryllium; molybdenum; tungsten; titanium; zirconium; tantalum; niobium; chromium; manganese and the platinum group. Dr. Chaston, when dealing with tantalum and niobium has recalled the discovery of these elements and shows how the designation "columbium" for "niobium" is historically correct. This is the type of book which will be treasured by all metallurgists who take a broad interest in their profession.

## Sandwich Courses Suggested

A sub-committee of the West Midlands Advisory Council for Technical, Commercial and Art Education which has been considering how best to implement the findings of the universities and industrial productivity reports which called for an expansion of facilities for full-time education of young men in industry, has suggested that "sandwich" courses—alternating college attendance and industrial experience—may provide the solution of the country's shortage of technologists. They define the object of such courses as "the provision of technologists of adequate standard whose training has been developed in close touch with industry" and "adequate standard" in this context means a broad knowledge of the fundamental science on which their technology is founded, some understanding of the historical and economic basis of society in relation to industry, and the personal characteristics, powers and expression and social competence necessary for a man to play an effective part in an industrial organization.

The "sandwich" courses, the committee recommends, should be developed by one or more selected major technical colleges, chosen on the grounds of an adequate standard of staffing, and other educational facilities combined with sufficient facilities for corporate life. Residential accommodation should be the ultimate aim. The committee recommends that the courses should be designed to meet the needs of industries within the region and industries should cooperate to secure the integration of the periods of training. The sub-committee was under the chairmanship of Major W. F. F. Scott, a director of Tube Investments Limited and Accles & Pollock Limited. The chairman of the Advisory Council, Sir Hugh Chance, and the chairman of the Regional Academic Board, Professor F. H. Garner, were among its members.

## Steel Output Record

Steel production in August, which was again affected by holidays, averaged 291,400 tons a week and reached an annual rate of 15,155,000 tons. This was the highest August figure ever recorded and it compared with a weekly average of 279,500 tons in August, 1952, when the annual rate was 14,535,000 tons, which was itself a new record for the month. The effect of holidays last month was less pronounced than in the corresponding month a year ago.

The output of pig-iron last month also constituted a record for August; it averaged 204,400 tons a week, against 201,900 tons a week in August of last year.

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

	Pig-iron.		Steel ingots and castings.	
	Weekly average.	Annual rate.	Weekly average.	Annual rate.
1953—July ..	202,400	10,524,000	276,600	14,383,000
August ..	204,400	10,620,000	291,400	15,155,000
1st half year	213,500	11,102,000	347,600	18,074,000
1952—July ..	201,600	10,482,000	273,800	14,236,000
August ..	201,900	10,498,000	279,500	14,535,000
1st half year	199,900	10,397,000	308,600	16,046,000

ROOD END FOUNDRY COMPANY, LIMITED, has had plans approved to carry out extensions to the foundry in Tat Bank Road, Rowley Regis.

## Rehabilitating Disabled Workers

There are at present 14 industrial rehabilitation units in operation in this country. A new type of unit which is to be opened by the Ministry of Labour at Waddon (Surrey) in December will differ from the existing centres in that it will undertake special research into the rehabilitation of disabled workers as well as the provision of training and exercises. The research will be directed by the suggestion of the Industrial Rehabilitation Development Committee that success in placing people in employment after a course at a rehabilitation unit should not be the sole measure of the value of the unit's methods. The committee recommended that a way should be found of rating scientifically in physical and psychological terms the "employability" of a worker when he comes to the unit. It could then be ascertained if he was likely to profit by the course or, if it had been taken, how much good it had done.

The units cater mainly for industrial workers who come to them when they leave hospital, but they also take a few disabled and crippled people who have never worked before. Many of these are trained so that they can live in a normal community and support themselves from their own earnings. Of those who complete a course, more than two-thirds find jobs or begin training as skilled workers within three months of leaving the unit.

## Exports from Small Firms

Encouragement to small firms to enter overseas markets is advocated by the Select Committee on Estimates, which has just issued its thirteenth report. British export trade, it is emphasized, would rest on a much broader foundation if many more small firms could be induced to take active interest in overseas markets; in addition, the volume of the trade would be increased. The committee suggests that the Board of Trade's services to the smaller manufacturers should be improved, and it gives two suggestions as to how this might be achieved.

The first is that the Board of Trade should concentrate on familiarizing small firms with the particulars of the services it provides for exporters, and the second is that it should publicize more effectively its practice of obtaining samples of the products with which British products would have to compete.

## Index to Volume 94

The index to the JOURNAL, volume 94, covering the period January 1 to June 25, 1953, has now been printed and is available to readers free of charge. Applications for copies should be addressed to the publishing office, FOUNDRY TRADE JOURNAL, 49, Wellington Street, London, W.C.2. Subscribers who wish to receive copies of indices automatically as they are printed may apply for inclusion on a permanent mailing list.

TWO 64-IN. ELECTRIC LIFTING MAGNETS were ordered by a Canadian firm from the Witton-Kramer Electric Tool and Hoist Works of the General Electric Company, Limited, for loading scrap iron into ships at Montreal Pier. Only fourteen days after the order had been received in England the magnets were in service in Canada, and within less than three weeks of the date of despatch from Birmingham, they had handled 2,500 tons of scrap iron for shipment to this country. Since that time, four further magnets, one 64-in., two 36-in. and one 26-in. dia., have been delivered at Montreal with equal promptitude.

## B.S.C.R.A. Radiographic Exposure Calculator

The British Steel Castings Research Association has recently developed a radiographic exposure calculator for use with the isotopes cobalt<sup>60</sup> and iridium<sup>192</sup>, materials which are now commonly employed for industrial radiographic purposes in steel foundries and elsewhere. The calculator can also be used in conjunction with radium or radon, and scales are included which permit allowances to be made for the relatively rapid decay of radon and iridium sources. The calculator will fill a long-felt want for a rapid and reliable means of ascertaining radiographic exposure times, when using the artificially prepared radiographic sources in particular.

The calculator, the prototype of which is illustrated in Fig. 1, is in the form of a plastic, pocket-size slide rule and consists essentially of two fixed scales and two sliding scales, the bottom one of which is locked in a position determined by the type of film in use and the film density required. This position is determined by setting the appropriate density index mark on the bottom fixed scale against a "film factor" on the bottom mov-

able scale. In routine work, this setting will not normally be disturbed, unless for any reason the type of film in use is changed, so that the majority of exposure calculations will be carried out by appropriate setting of the upper movable scale only. This scale is reversible, the side employed being determined by the isotope in use. Its setting correlates the four variables, source strength, source to film distance, steel thickness and exposure time. The setting of the rule may be adjusted to the film density requirement of the user, and includes scales for calculation of radon and iridium decay as well as one which gives the thickness of steel which, for the purpose of setting the rule, may be employed when examining materials other than steel.

The exposure calculator is clearly of interest in industries other than steel founding, and it is now in course of manufacture in sufficient quantity to render it available outside the membership of the Association. Enquiries should be addressed to the Association at Broomgrove Lodge, Broomgrove Road, Sheffield, 10.

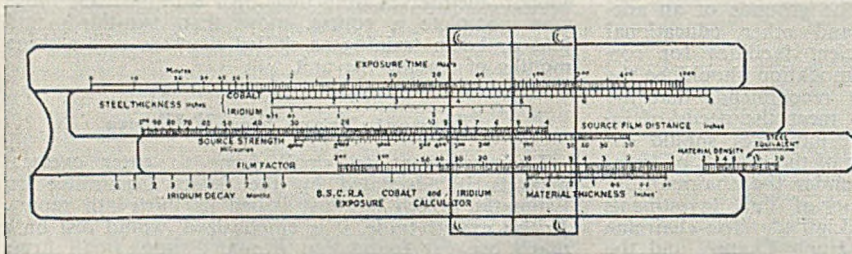


FIG. 1.—Prototype of the B.S.C.R.A. Radiographic Exposure Calculator (Copyright).

### German Foundrymen's Convention

The German Foundry Technical Association (Verein Deutsche Giesserfachleute) is holding a convention in the Robert Schumann Hall, Düsseldorf, on Friday and Saturday, October 9 and 10. The first session, starting at 9.30 a.m., with Dr. F. Grosser in the Chair, opens with a paper on the "Influence of Work Study on Production in Foundry Practice" by Mr. M. Forster. He is to be followed by Professor Piwowarsky on "Influence of Magnesium on Low-carbon Steel Castings." The third lecture is by Dr. Schwietzke on "Gas Porosity in Non-ferrous Castings—Gassing and Degassing of Melts." This session concludes with a colour film dealing with "Feedex" to be presented by Dr. Lanzendörfer.

The afternoon session, starting at 2.30, is to be presided over by Dr. H. Timmerbeil. The opening lecture is by Dr. P. Schneider, who will present two American films on "Running and Riserling." Next, there is a paper by Dr. K. Sauerwein on the "Use of Radioactive Isotopes and their Application to Foundry Problems" (with demonstration). The final lecture is by Professor K. Roesch, who will present a "Critical Study of Non-destructive Testing." In the evening there is to be a supper-dance at the Rhein Hall (formerly the Plantetarium).

Mr. R. J. H. Küster presides at the Saturday morning session, which is to start of 9.45 a.m. First, there will be the annual general meeting, and following this, Professor E. Gutenberg is to lecture on "Some New Phases of Industrial Costing." The final lecture is by Professor Chr. Gerthsen on "Some Applications of Cosmic Rays." A suitable programme has been arranged for the entertainment of lady guests.

### House Organs

**Perkins News.** Summer 1953. Issued by F. Perkins Limited, Peterborough.

This issue is primarily devoted to illustrated stories all connected with the 21st birthday celebrations of the company. The graphs of progress incorporated are very impressive, for from very small beginnings, a turnover approaching £12,000,000 was achieved by 1952.

**Mettle.** Summer, 1953. Published by the Marshall Organisation, Stafford House, Norfolk Street, London, W.C.2.

There are two articles of importance in this issue. The first deals with the growth of combine harvesters in this country, and shows how it has increased. From fewer than 2,000 in 1943 the total reached over 19,000 in 1952 and now home manufacturers have captured the bulk of the market. The second article is a necessary consequence, and that is the subject of stock holding for distribution of spare parts.

**Ruston Overseas News.** Vol 2, No. 14, August. Published by Ruston and Hornsby Limited, Lincoln.

As this very well produced magazine is for the enlightenment of overseas agents and customers, it was only to be expected that the Coronation should figure prominently and a feature article on this has been excellently carried out. There is a long, well-illustrated article on foundrywork by Mr. R. C. Shepherd, who includes some data on shell moulding. The reviewer learnt with interest that an iron filigree fruit dish illustrated was of German origin, but the sample which he possesses was made in Essex! The balance of the contents has been well chosen to serve the policy of the publishers.

## B.C.I.R.A. Method of Clamping Shell Moulds

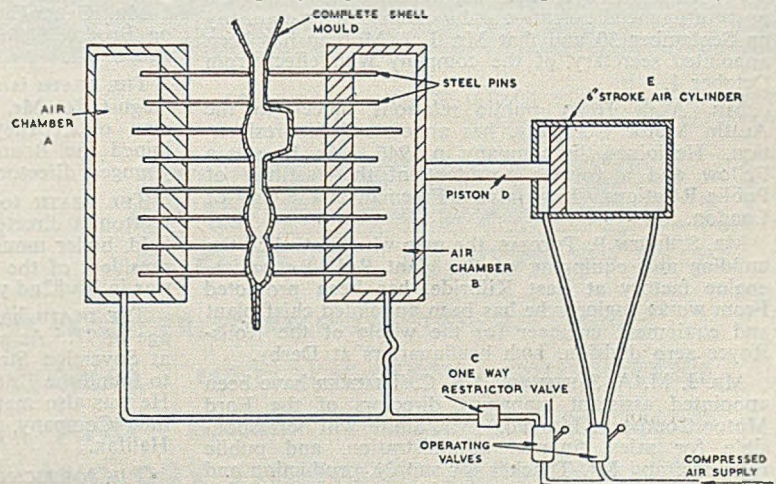
Since the introduction of shell moulding, the joining of the half-shells to form the complete mould has presented difficulties. In joining shell moulds cast horizontally the clipping of the halves together and weighting them if necessary is effective, but vertically-cast moulds need a more rigid form of clamping. Various methods of joining shells cast in a vertical position are used. They include clipping the edges together with wire clips or wedge clamps; gluing the shells with quick-setting resin; bolting them together and mechanical clamping with a vice. Each of these methods has its disadvantages, and whichever is used it is possible for the operations necessary to take longer than the actual production of the shells.

To overcome the shortcomings of previous methods, a new method of joining the halves of shell moulds for vertical pouring has been developed by the British Cast Iron Research Association and is being demonstrated at the current Engineering and Marine Exhibition. It consists of a mechanical clamp comprising two sets of freely-sliding pins, as shown diagrammatically in Fig. 1.\* The complete shell mould is placed between the sets of pins and they are then forced forward by compressed air so that they adjust themselves to the contours of the shells. In this way, the entire mould area is supported uniformly and rigidly during pouring, distortion is minimized and there is less flash on the casting.

### Construction and Operation

The clamp is constructed in the form of two rectangular hollow chambers which face each other. In the facing surfaces, a regular pattern of holes is drilled, each hole being fitted with a

FIG. 1.—Diagrammatic Section through the Pneumatic Clamping Arrangement for Shell Moulds developed by the British Cast Iron Research Association.



\* Abstracted from the B.C.I.R.A. *Journal of Research and Development*.

**A 35-h.p. Two-stroke Engine** made in 1913 by Levis, Limited, Stechford, for an ultra-light aeroplane has been removed from the works stores at the request of the Science Museum, South Kensington, and will shortly be displayed there in the aeronautics section. The plane—a monoplane with triangulated wings—was assembled at the Levis works and made its only flight at Castle Bromwich playing fields, which later became the aerodrome. Recently the Levis company (who now make air compressors), built from old parts, for the Science Museum, a 1915 Levis motor-cycle, the belt-driven 211 c.c. model. The plane engine has its original Bosch box magneto and has been mounted on a tubular steel stand.

sliding steel pin. Compressed air can be supplied to each chamber and when the air is admitted the pins are forced forward, each pin giving the same thrust, proportional to the cross-sectional area of the pin and the air pressure used. One of the chambers is fixed but the other is movable, being connected to the piston of an air cylinder of 6-in. stroke.

In operation, the movable chamber is brought to its forward position, nearest the opposing chamber, and the pins of both chambers are retracted. The complete shell mould is placed between the two sets of pins and compressed air is admitted into both chambers. The pins move forward and adjust themselves to the contour of the shell, locking the halves together ready for casting. When the casting has solidified, the air pressure is released in both chambers and the movable chamber is retracted so that casting and mould drop away and can be removed.

The advantages claimed for the new method are that all preliminary work normally involved in securing the half-shells together is avoided, distortion and flash are reduced because the shell mould is held uniformly over its whole area, and only sand and castings have to be separated after casting is completed. An additional advantage of the method is that slightly-warped shells can be properly registered and clamped satisfactorily.

**Nickel/Molybdenum Alloys.**—Adding molybdenum to nickel or to nickel containing small percentages of iron, produces alloys which are strongly resistant to corrosion by hydrochloric and phosphoric acids, and to a lesser extent by sulphuric acid. The initial work on these alloys was done in the United States and Germany, and in the form of castings the alloys have been produced in this country for some years. Wrought forms are required, however, often for use in conjunction with castings, and for those interested Henry Wiggin & Company Limited, Birmingham, have begun the manufacture of material of this type under the name of "Corronel B".

## Personal

MR. ARTHUR D. BAILEY has been appointed manager of the Newcastle-upon-Tyne branch of Brook Motors, Limited, Huddersfield.

MR. W. G. PAVITT has resigned from his position as a director of Brown Bros., Limited, hydraulic and general engineers, etc., of Edinburgh, after 56 years' service with the firm.

MR. JAMES STEEL, joint managing director of Steel & Company, Limited, engineers, etc., of Sunderland, leaves Britain on September 26 for a 10-week tour of the U.S.A. and Canada.

MR. A. R. NEELANDS, chairman of the Cementation Company, Limited, group, is now visiting Canada to inspect operations and to consult with the managing directors of the Canadian subsidiary companies.

MR. M. K. ARNOTT has relinquished the secretaryship of the British Oxygen Company, Limited, on his appointment to a higher position within the organization. MR. H. COBURN has been appointed secretary of the company.

MR. J. D. DOBSON, who has for several years been connected with the Iron and Steel Division, Ministry of Supply, is now with the new Iron and Steel Board, temporary address, 21 to 24, Grosvenor Place, London, S.W.1 (telephone, SLOane 9686).

MR. R. A. RIDDLES is retiring on September 30 from his position on the Railway Executive, where he has been responsible for the mechanical and electrical engineering activities. He was formerly a vice-president of the London Midland and Scottish Railway.

BRIGGS MOTOR BODIES, LIMITED, announces that MR. S. W. KALLEND is relinquishing his directorship and his posts of financial executive and secretary of the company on September 30 and that Mr. J. I. Morgan has been appointed secretary of the company with effect from October 1.

MR. ALAN HESS, public relations officer to the Austin Motor Company, has announced his resignation. He joined the company in 1946. Mr. Hess is a Fellow and a former president of the Institute of Public Relations. He is also a Freeman of the City of London.

MR. STEPHEN P. THOMAS, the man who controlled the building and equipping of the giant Rolls-Royce jet-engine factory at East Kilbride, has been promoted. From works engineer he has been appointed chief plant and equipment engineer for the whole of the Rolls-Royce aero division, with headquarters at Derby.

MR. J. M. A. SMITH and MR. C. THACKER have been appointed assistant managing directors of the Ford Motor Company, Limited. Mr. Smith will be responsible for sales, finance, administration, and public relations; and Mr. Thacker for supply, production and construction engineering, manufacture, manufacturing services, and industrial relations.

MR. E. CARNEGIE and MR. J. SMITH have resigned from the board of Sentinel (Shrewsbury), Limited, manufacturers of Diesel engines, locomotives, etc., which is a subsidiary of Metal Industries, Limited. Both Mr. Carnegie, who was chairman of the company, and Mr. Smith have reached the statutory age of retirement from the board. Mr. Smith has been in the company's service for 50 years.

MR. A. G. B. OWEN was again elected president at the annual conference in Sheffield of the National Trade Technical Society. He is a prominent member of the South Staffordshire section of the Society. MR. W. H. DAVIES, also of the South Staffordshire section, was

elected treasurer. The Derby section won the cup given by the president at the sports which took place during the afternoon of the conference.

The retiring steel plant manager of the Cargo Fleet Iron Company, Limited, Middlesbrough, MR. ROBERT BURNETT, has been presented with a gold watch by Mr. E. Marriott, chairman of the Cargo Fleet No. 1 branch of the British Iron, Steel and Kindred Trades Association. Mr. Burnett has been with the company 42 years, for 31 of which he was steel plant manager. He is taking on a less arduous task in the laboratory.

THIS YEAR, Mr. Kenneth Bridges, managing director of F. W. Bridges & Sons, Limited, celebrates his fortieth anniversary as an organizer of trade exhibitions, which annually attract thousands of visitors to Olympia, Earls Court and other big exhibition venues. A score of his friends who have long been associated with him in the business of organizing more and bigger exhibitions than anyone else in the world, entertained him to luncheon just before the opening of the 19th Engineering Exhibition at Olympia. This exhibition which closes to-day, is the twenty-first that Mr. Bridges has organized since the end of the war. Mr. Bridges revealed at the luncheon that the first exhibition he personally supervised was in the pottery town of Stoke-on-Trent, in 1913. He was seventeen at the time. Mr. Kenneth's father started the family business in 1896, when he staged several exhibitions at the Royal Agricultural Hall, Islington.

## Obituary

THE DEATH is announced of Mr. Norbert Coolens, of Les Fonderies Coolens, Mont St. Amand, Belgium.

MR. CARL CHRISTENSEN, of A/S Carl Christensen og Brodre, Oslo, Norway, died on August 25 at the age of 72.

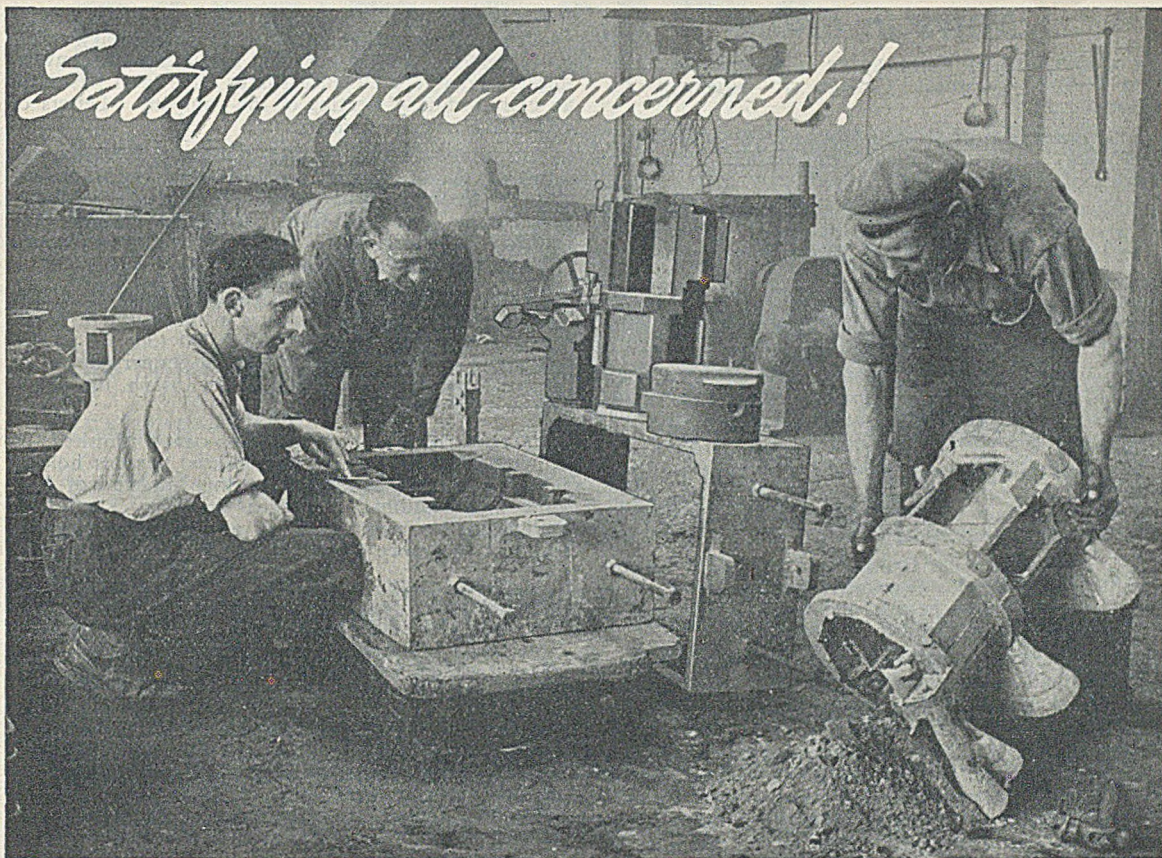
THE DEATH is announced of Mr. F. P. I. Crossley on August 26. Mr. F. Crossley, the grandson of the chairman of Crossley Brothers, Sir Kenneth I. Crossley, joined the Board in September, 1950, and was the youngest director.

THE DEATH took place last Thursday of Mr. C. J. Hofton, a director of Hopkinson, Limited, of Huddersfield, boiler mountings manufacturers. He was a past-president of the Nottingham Society of Engineers and was in his 82nd year.

THE DEATH has occurred of Mr. Frank Ford, at the age of 77. As a manufacturer of restaurant equipment at Sovereign Street Works, Halifax, Mr. Ford helped to found the British Range Makers' Federation in 1933. He was also managing director of Halifax Metal Spinning Company, Limited, metal platers, of Boothtown, Halifax.

THE AMERICAN TECHNICAL PRESS reports the death of MR. JOHN HOWE HALL, aged 72 years, the well-known steel metallurgist and author of "The Steel Foundry." He was an honorary member of the American Foundrymen's Society and the first recipient of the J. H. Whitney Gold Medal. A graduate of Harvard, he spent his whole working life in the steel foundry industry, either in the works or as a consultant.

MR. EDWARD PACEY, general secretary since 1923 of the National Union of Operative, Heating, Domestic and Ventilating Engineers and General Metal Workers, died in Birmingham last week. He was 66. Mr. Pacey was also a member of the executive council of the Confederation of Engineering and Shipbuilding Unions and was recently elected vice-president of the National Joint Industrial Council for his industry.



*Satisfying all concerned!*

SUPINEX "R" IN USE—

Illustration of Binnacle casting in DTD 165 alloy by courtesy of Gascoignes Non-Ferrous Foundries Ltd., Slough.

# **SUPINEX "R"**

## **C O R E B I N D E R**

AN ENTIRELY NEW TYPE OF BINDER, STARTLING IN ITS PERFORMANCE . . .

- ★ EXCEPTIONAL "KNOCK-OUT" PROPERTIES
- ★ FUMES AND GASES GREATLY REDUCED
- ★ GREEN AND DRY STRENGTH PROVIDED FOR
- ★ LOW PRICE REDUCING YOUR COST PER TON OF CORE SAND

Developed and manufactured by :

# **F. & M. SUPPLIES LTD.**

4, BROAD STREET PLACE, LONDON, E.C.2 Telephone: LONDON Wall 7222

Free working samples gladly supplied on request.



## News in Brief

THE DUCHESS OF GLOUCESTER is to open the new Denbighshire Technical College at Wrexham on November 11.

THE DIRECTORS of Henry Hope & Sons, Limited, Smethwick, have appointed Mr. Patrick Beesley a director of the company.

TYNEMOUTH CORPORATION has completed protracted negotiations for the purchase of the nearby Cullercoats Harbour from the Duke of Northumberland.

BEESTON (NOTTS) COLLEGE OF FURTHER EDUCATION, which is to open shortly, is to have courses specially designed to meet the needs of the light engineering and building industries in the area.

THE ADDRESS of the Newcastle-upon-Tyne area sales office of the Northern Aluminium Company, Limited, is now Groat House, Collingwood Street, Newcastle, 1 (telephone: Newcastle 20878/9).

THE LAST of seven shipments of heavy scrap raised at Scapa Flow, totalling 1,450 tons, left Orkney at the week-end. Salvage work will be resumed next year as soon as weather conditions permit.

A "WARMER HOMES EXHIBITION," organized by the Farnham Joint Service Committee of the Coal Utilisation Council, will be held at the Central Hall, South Street, Farnham, on October 1, 2, and 3.

THE JAPANESE MINISTRY OF TRANSPORT has announced that Japan will build 300,000 tons of shipping for domestic owners next year—five times the tonnage built for domestic use two years ago.

NOTTINGHAM AND DISTRICT TECHNICAL COLLEGE has widened the scope of the management section of its Department of Commerce. New courses are to be held to train men for executive positions in industry.

THE BRITISH WELDING RESEARCH ASSOCIATION announces that the fourth Annual School will be held at Ashorne Hill, near Leamington Spa, Warwickshire, from Monday, June 14, to Saturday, June 19, 1954.

AS FROM SEPTEMBER 19, the London address of Clarke, Chapman & Company, Limited, manufacturing marine and electrical engineers, etc., will be Dunster House, Mark Lane, E.C.3 (telephone: MINcing Lane 8345).

THE SCOTTISH BOARD FOR INDUSTRY is to convene a meeting at Grangemouth this month with a view to setting up a productivity committee for the Grangemouth and Falkirk area. Industrialists in the area are to be invited to attend.

PLANS HAVE BEEN APPROVED for proposed factory alterations at Hartlepool (Co. Durham) trading estate for John B. Pillin, Limited, makers of lubricating equipment and air compressors. The scheme will link three existing factories into one.

MR. B. L. PERKINS, B.SC.(ENG.), A.M.I.E.E., general sales manager, Foster Transformers, Limited, left this country on September 10 to make an extensive business tour of East and South Africa on behalf of the company and others in the Lancashire Dynamo Group.

THE DIRECTORS of Thomas Tilling, Limited, announce that a controlling interest has been purchased in Bagshaws & Company, Limited, of Dunstable, manufacturers of malleable iron chains and castings and of conveyor and elevator equipment, established in 1892.

THE EDUCATION COMMITTEE of the Incorporated Plant Engineers announces that for the coming winter session it has arranged a comprehensive refresher course, comprising 20 weekly lectures, to be held at Leeds University on Thursday evenings, commencing on October 15.

RESOLUTIONS to enable the Brush Electrical Engineering Company, Limited, to offer its ordinary stockholders 940,000 new 6 per cent. £1 cumulative convertible redeemable preference shares have been passed at an extra-ordinary meeting of the company. Letters of offer have been posted.

THE DIRECTORS of W. H. Dorman & Company, Limited, manufacturing engineers and ironfounders, etc., of Stafford, propose to distribute to ordinary shareholders one new fully paid 2s. share for each ordinary 2s. share held. Ordinary capital at present in issue totals £29,600.

ISRAEL hopes to be exporting copper from the legendary King Solomon's mines in the southern desert within two years. There are 100,000 tons of proved reserves in the area with an average copper content of 1.4 to 1.5 per cent., according to Dr. Joseph, the Israeli Minister for Development.

YELLOW NATIONAL INSURANCE CARDS finished on September 6. Employers and insured persons holding yellow cards are reminded by the Ministry of Pensions and National Insurance that they should be exchanged for new cards at a local Pensions and National Insurance Office this week.

A VIRGIN DEPOSIT of lead ore discovered below Riber Hillside, Matlock, is claimed to be the most important find of the century in the Derbyshire lead-mining field. Tunnelling operations by Matlock Lead Mines, Limited, have led to the striking of ore in a bed of limestone 450 ft. below the surface.

AT A MEETING of the Tees-side advisory committee of the Northern Regional Board for Industry it was reported that during May, June, and July factory extensions covering 151,336 sq. ft. were sanctioned on Tees-side. These are expected to result in employment for another 52 men and 215 women.

A FURTHER REDUCTION in the number of unemployed in the Greater Birmingham area was reported to the Employment Committee at its quarterly meeting on September 10. The number registered on August 10 was 3,455 men and 1,736 women, a reduction of just under 200 compared with the returns on July 13.

AN ALUMINIUM BRIDGE being built for Aberdeen Harbour Commissioners by Head, Wrightson & Company, Thornaby-on-Tees, is to be officially opened by the Queen Mother on September 30. The bridge, which was built in sections on the Tees and shipped to Aberdeen for erection, is the first of its kind in Scotland.

ECONOMY is one of the reasons given for the slowing-down of the rate of stockpiling of strategic materials for arms production in the United States. Stockpiling of high priority items such as alloy metals will be completed by June, 1954, if possible, but for other items the completion date will be postponed to June, 1955, or beyond.

A NEW THREE-STOREY BUILDING has recently been completed at the works of Edgar Allen & Company, Limited, steelmakers, of Sheffield. The building houses mainly the equipment and personnel for chemical investigation, and includes an experimental machine shop or toolroom and sections for physical metallurgy and other research work.

*(Continued on page 376)*

WE REGRET that in an announcement of R. J. Richardson & Sons, Limited, in our issue of September 3, the address of Garringtons, Limited (Bromsgrove, Worcestershire) was incorrectly quoted.



# 'FULBOND'

TRADE MARK

For sand texture and  
good skin

'FULBOND' gives

the sand smooth  
texture—the  
castings good finish



For service and information write to:—  
**THE FULLERS' EARTH UNION LTD.**

Patteson Court, Redhill, Surrey. Tel: Redhill 3521. C.H.F. 12

# DIES

**Gravity and Pressure**

**PROMPT DELIVERY**

*Manufactured by*

**BROMSGROVE DIE & TOOL  
COMPANY LIMITED**

**STOKE PRIOR, BROMSGROVE**

Telephone : 2794

A WHOLE-DAY SYMPOSIUM on cathodic protection will be held at the Institution of Electrical Engineers, London, W.C.2, on Friday, November 13, beginning at 9.45 a.m. Seven papers will be presented embodying experience gained in various parts of the world with the protection of ships, underground pipes, storage tanks and other structures used in contact with water or soil.

A CONTROLLING INTEREST has been purchased by Hills (West Bromwich), Limited, manufacturers and engineers to the building trades, in Bryan's Adamanta, Limited, Birmingham. This firm has acquired additional premises, and installed plant for the rapid production of precast plaster units, partitions, fireproof ceilings, etc., and its new managing director will be Mr. E. D. Hinchliffe, managing director of the parent company.

AS PREVIOUSLY ANNOUNCED the Bureau International de la Récupération (B.I.R.) is holding its next conference in London on September 24 and 25. The meetings are to be held at the Piccadilly Hotel, London, W.1, and there is to be a dinner-dance at the Dorchester Hotel, Park Lane, London, W.1. Meetings dealing with iron and steel scrap and non-ferrous scrap are to start at 9 a.m. on September 24. It is presumed the meetings are private.

BRITISH FIRMS are to have an opportunity of competing for the contract for the erection of a bridge across the River Ganges 50 miles east of Patna, India. The new project, which altogether will cost about £12,000,000, will open up the coal and iron resources of northern Bihar and will link two of India's important railway systems. The undertaking will include the construction of guide and protection works, a new transshipment yard, and ancillary works.

AS A RESULT of seeing an industrial film made at the works of F. H. Lloyd & Company, Limited, Wednesbury, and shown at a recent Düsseldorf exhibition, Mrs. Lissy Russ, owner of the Russ-Electroofen plant at Cologne has come to England to see the Lloyd works personally. Accompanied by her chief engineer, she visited the Wednesbury factory of September 8 and before her return to Germany is to see work done at the Burton-on-Trent and Derby premises of subsidiary companies.

Craven Bros. (Manchester), Limited, is just completing the largest machine tool ever built in Great Britain. This vertical boring and turning mill, which is now undergoing its final test, weighs 650 tons, and has a work turning table 41 ft. in dia., which will rotate at a maximum peripheral speed of 450 ft. per min. The machine is for export to Canada, where it will be used in the manufacture of the largest hydro-electric installation components, water-turbine parts, steam-turbine casings, etc.

TO RECAPTURE Scottish trade which has gone South, Switchgear & Equipment, Limited, Blantyre Industrial Estate, are negotiating an extension to their factory sufficient to double their present floor space and to treble production. At an exhibition of their products, Mr. D. D. W. Hope, a director of the firm, whose head office is in Banbury, explained that he was confident that more Scottish trade could be obtained if delivery dates were reduced. The new extension would necessitate doubling the number of employees.

W. & A. E. BREARLEY (MACHINERY) LIMITED, Station Works, Ecclesfield, Sheffield, have absorbed Aldam (Misterton) Limited, iron and non-ferrous founders, of Misterton, near Doncaster, and, except for certain repair and maintenance, the complete organisation will be transferred to Misterton. An associated company, W. Brearley & Company, Limited, wire manufacturers,

will remain at Ecclesfield and correspondence should, from September 15, be addressed in the case of the parent company to Misterton and for the subsidiary concern to Ecclesfield.

BRITISH FIRMS received orders for oil equipment and materials valued at £38,000,000 during the first half of this year, according to figures issued by the Council of British Manufacturers of Petroleum Equipment. Orders received during the second quarter of 1953 were valued at £16,466,100. The most important items in this total were bulk chemicals which amounted to £2,757,700, tubulars, pipefittings and valves (£1,972,200), drilling and production equipment (£1,714,800), and refinery equipment (£1,711,200). Other leading groups were machine and hand tools, etc., and electrical equipment, each of which received orders valued at over £1,000,000.

AT THE ENGINEERING AND MARINE EXHIBITION at Olympia, which closes to-day, for the first time in this country and possibly for the first time in any country, Shell-Mex and B.P. Limited publicly demonstrated the use of radio-active isotopes for the investigation of engine wear. The unit used for the demonstration was a single-cylinder compression-ignition engine fitted with a piston-ring irradiated in the atomic pile at Harwell. With such equipment, extremely-accurate wear measurement is possible and one-millionth of an ounce of metal can be detected. Actual engine wear is electronically calculated and the result is transmitted to a continuous recording graph while the engine is running.

ADDRESSING a convention of the Institution of Production Engineers at Birmingham University on September 5, Sir Cecil Weir, the industrialist and former chairman of the Dollar Exports Board, now head of the United Kingdom delegation to the High Authority of the European Coal and Steel Community, said that human relations were the most important factor in industry, and the key to successful production. He suggested that human relations were very much the concern of the production engineer, whose job it was to introduce new ideas and new methods, some of which would rouse antagonism in operators, to whom all new projects should be explained. The conference was also addressed by Mr. Ian Morrow, deputy managing director of the Brush group of companies.

AN ADVANCED DIPLOMA COURSE in industrial engineering is to be organized during the coming session at Wolverhampton and Staffordshire Technical College. Designed for students chosen as potential future executives, it is planned to meet the need in industry for highly-qualified production engineers. Mr. C. L. Old, principal of the college, believes that such a course is unique in the Midlands. During the three years of the course, students will each year spend six months in full-time study at college and six months gaining works experience. The students will cover the complete requirements of the associate membership examinations of the Institution of Mechanical Engineers and the Institution of Production Engineers, as well as the City and Guilds full technological certificate in machine-shop engineering and mechanical-engineering inspection.

**Interesting Exhibits.**—In the paragraph on page 312 of last week's issue dealing with tests on spheroidal graphite cast iron at the Engineering and Marine Exhibition, it was stated that the S-g. iron ring opened under test to a greater degree than the ordinary iron. Actually, the reverse was the case—the S-g. iron revealing the greater modulus of elasticity. Apologies are tendered to all readers who may have been confused.

*“... the moulder’s  
magazine that  
the foundry  
manager reads”*

That aptly describes “FOUNDRY PRACTICE”—a magazine written in simple, non-technical language, on subjects of everyday importance to casters, moulders, core makers, pattern makers—and foundry managers.

*The following are a few titles of articles which have recently appeared.*

- Gravity Diecastings .. .. No. 84/99
- Fastening Cores by Nailing .. .. No. 84/100
- The Treatment of “Y” Alloy .. .. No. 84/100
- Nodular Cast Iron .. .. No. 84/102
- Blow Holes in Gunmetal .. .. No. 84/102
- Brass Gravity Diecastings .. .. No. 84/86

“Foundry Practice” is published alternate months and is available free and post free to everyone interested in foundry work.

*If you would like to receive copies regularly—and all available back numbers—just fill in this Coupon.*

Please send “FOUNDRY PRACTICE” regularly and free of charge to:

NAME .....

ADDRESS .....

.....

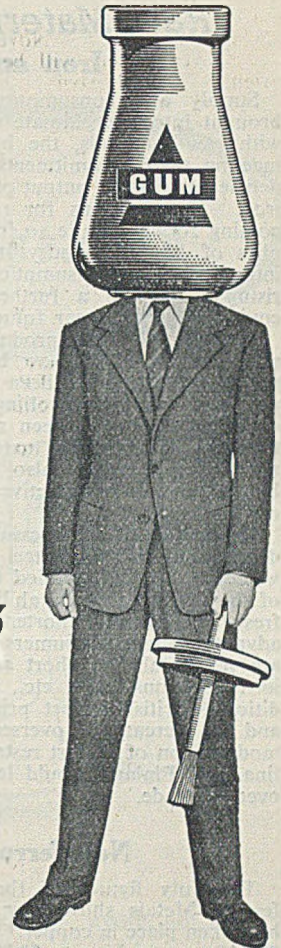
.....

(Please write in BLOCK CAPITALS)

AND POST TO:

**FOUNDRY SERVICES LTD.**  
LONG ACRE · NECHELLS · BIRMINGHAM · 7  
Telephone: EAST 1911 (10 Lines) Telegrams: KUPRIT BIRMINGHAM 7

L.G.B.



# Who is gumming up the works?

*Could it be you?* Are you sticking to scrap that should be on its way to the steelworks?

Don't assume that because steel is not one of your raw materials you have no scrap in your factory. Old machinery is scrap. Whatever you make you must have scrap — scrap iron and steel.

Search your works. Turn out your scrap. Every ton you find will make a ton of new steel.

What is scrap?  
*All iron and steel that has outlived its effective purpose.*

Where should it go?  
*To your local scrap merchant. He will be glad to help with the dismantling and removal of obsolete plant and machinery.*

Issued for the STEEL SCRAP DRIVE  
by the British Iron and Steel Federation and the National Federation of Scrap Iron, Steel and Metal Merchants.

## Raw Material Markets

### Iron and Steel

Supply and consumption of pig-iron have been brought into approximate equilibrium. Well supplied with raw materials, the blast furnaces are regularly meeting their commitments and there are no serious deficiencies in the output of the various grades of pig-iron. Specifications for refined iron have not been coming forward quite so freely of late and small supplies of No. 3 foundry iron are occasionally taken into stock, but consumption of other grades is on a rising scale and a further expansion of output is envisaged in the near future.

Supplies of home-produced billets, blooms, slabs, and sheet bars are now being distributed in greater abundance than has been the case for several years past and, as the re-rolling mills are running below capacity, there has been a sharp contraction in the tonnages of imported material. The greater abundance of primes has also had the effect of limiting buyers' interest in defectives, crops, and certain classes of re-rolling scrap.

Relaxation of the pressure for deliveries of various descriptions of rolled steel products is not wholly unwelcome. It has enabled the mills to overtake some of the arrears and the ability of the makers to accept fresh business with shorter delivery dates should prove advantageous to consumers and producers alike. Plates are perpetually in short supply and order-books for joists, sections, rails, etc., are still in a healthy condition. British export prices are keenly competitive and an increase of overseas inquiries suggests that a modification of import restrictions in Australia, Argentina, and Finland would lead to an expansion of the overseas trade.

### Non-ferrous Metals

The July figures of the British Bureau of Non-ferrous Metals show *inter alia* that no improvement has taken place in copper. Consumption dropped from 32,366 tons in June to 30,873 tons in July, and of this less than 15,000 tons comprised virgin copper. Stocks at just under 200,000 tons were up by about 14,000 tons, the Government's holding being 187,500 tons, while it had also afloat and abroad about 46,000 tons. Compared with the first seven months of 1952, when the usage of copper was about 216,000 tons, the corresponding figure this year is 128,000 tons, a very poor showing which the remainder of the year is hardly likely to put right. Our usage of zinc in July, virgin, remelted, and scrap amounted to 19,226 tons, compared with 21,141 tons in June. Stocks of virgin zinc at July 31 were 34,609 tons, against 31,661 tons at June 30. Lead stocks stood at 25,820 tons, which showed a drop of about 1,000 tons on June 30, while consumption of virgin, remelted, and scrap in July was 23,455 tons, compared with 23,612 tons in June. Tin consumption was 1,328 tons, a drop of nearly 200 tons on the June figure of 1,519 tons, while stocks increased by 238 tons to 3,749 tons.

Last week was not a good one for bulls of the non-ferrous metals, although copper must be excepted from this statement. Influenced perhaps to some extent by the disastrous declines in share values on Wall Street, the trend of prices was mostly downwards, zinc showing itself to be particularly vulnerable to adverse influences. Two reductions in the price of this metal were seen in America, each of  $\frac{1}{2}$  cent, which brought the current level there down to 10 cents, equal to about £80. In London the break in values was severe, and

the quotation touched the lowest seen for three months or more. The turnover was probably rather above average. Whether lead influenced zinc or the other way round it is hard to say, but the former, although closing virtually without change compared with a week earlier, was, nevertheless, below the best. Tin, too, lost ground. Copper, on the other hand, put up a good show.

Official metal prices were as follow:—

**COPPER, Standard—Cash:** September 10, £230 to £232 10s.; September 11, £227 10s. to £232 10s.; September 14, £229 to £230; September 15, £227 10s. to £232 10s.; September 16, £230 to £235.

**Three Months:** September 10, £213 10s. to £214 10s.; September 11, £214 to £215; September 14, £213 10s. to £214; September 15, £213 to £213 10s.; September 16, £215 10s. to £216.

**TIN, Standard—Cash:** September 10, £610 to £612 10s.; September 11, £607 10s. to £608; September 14, £607 10s. to £608; September 15, £597 10s. to £600; September 16, £597 10s. to £600.

**Three Months:** September 10, £605 to £607 10s.; September 11, £601 to £602; September 14, £600 to £602; September 15, £595 to £597 10s.; September 16, £589 to £590.

**ZINC—September:** September 10, £70 2s. 6d. to £70 7s. 6d.; September 11, £69 to £69 10s.; September 14, £67 12s. to £67 15s.; September 15, £67 5s. to £67 7s. 6d.; September 16, £67 10s. to £67 12s. 6d.

**December:** September 10, £70 to £70 2s. 6d.; September 11, £69 to £69 10s.; September 14, £67 10s. to £67 15s.; September 15, £67 2s. 6d. to £67 7s. 6d.; September 16, £67 2s. 6d. to £67 5s.

**LEAD—September:** September 10, £95 15s. to £96; September 11, £94 10s. to £94 15s.; September 14, £92 15s. to £93; September 15, £91 to £91 10s.; September 16, £90 10s. to £91.

**December:** September 10, £91 10s. to £91 15s.; September 11, £90 to £90 5s.; September 14, £89 to £89 10s.; September 15, £87 5s. to £87 15s.; September 16, £87 5s. to £87 10s.

### Swedish Iron and Steel

The Swedish Government started pig-iron production at the Norrbottens Järnverk, Lulea (just south of the Arctic Circle), in 1943 and has since developed the works into an integrated plant, although it is still not completed. Reports indicate that the plant is running into financial difficulties.

Heavy losses are expected this year, according to statements by the board. The company has a relatively small capital and has had to resort to large credits from the State and the banks. A reduction of pig-iron output appears to be inevitable.

Erection of the works was criticized by the privately owned iron and steel industry of Central Sweden and also was attacked by political parties. The management maintains that the technical and economic bases of the plant are sound and that it will eventually pay its way.

### Sweden/U.S.S.R. Trade Agreement

Under a trade agreement signed between Sweden and Russia, Sweden will export 600 metric tons of unalloyed steel, 100 tons of high-speed steel, 100 tons of stainless steel, 1,000 tons of drill steel, 300 tons of cold-rolled hoop, 500 tons of cold-drawn steel wire, 800 tons of ball-bearing tube, and about £1,000,000 worth of drilling machinery and parts. Russia will export 60,000 metric tons of chrome ore, 15,000 tons of manganese ore, and 300 tons of manganese.



3.B. O'Three

It is the considerable proportion of 20 Mule Team Borax (or, in the case of some acid-resisting enamels, Boric Acid) which makes vitreous enamelling possible without causing warping of the metal base.

In addition, Borax is used for neutralizing the ware after pickling; it prevents rusting and helps the ground coat to adhere. 20 Mule Team Borax plays an important part, too, in imparting a bright, glistening finish which is easy to clean and maintain.

20 Mule Team Borax is available in ordinary decahydrate form, or as Neobor (pentahydrate) or as Dehybor (anhydrous). Our Technical Department will be glad to advise you on the best use of 20 Mule Team products. *A 64-page handbook 'Vitreous Enamels,' containing a wealth of valuable technical information, is yours for the asking.*

**20 MULE TEAM** **BORAX**

**BORAX CONSOLIDATED, LIMITED** • REGIS HOUSE • KING WILLIAM STREET • LONDON • EC4

Telephone : MINcing Lane 7333



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

(Delivered unless otherwise stated)

September 16, 1953

## FIG-IRON

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

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

Scotch Iron.—No. 3 foundry, £16 11s., d/d Grange-mouth.

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

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

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

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

## FERRO-ALLOYS

(Per ton unless otherwise stated, delivered).

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

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

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

Ferro-titanium.—20/25 per cent., carbon-free, £165 to £181 per ton; 38/40 per cent., £229 to £235 per ton.

Ferro-tungsten.—80/85 per cent., 21s. 4d. to 22s. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 24s. 3d. to 26s. 6d. per lb. of W.

Ferro-chrome (6-ton lots).—4/6 per cent. C, £85 4s., basis 60 per cent. Cr, scale 28s. 3d. per unit; 6/8 per cent. C, £80 17s., basis 60 per cent. Cr, scale 26s. 9d. per unit; max. 2 per cent. C, 2s. 2d. per lb. Cr; max. 1 per cent. C, 2s. 2½d. per lb. Cr; max. 0.15 per cent. C, 2s. 3¼d. per lb. Cr; max. 0.10 per cent. C, 2s. 3¼d. per lb. Cr; max. 0.06 per cent. C, 2s. 4d. per lb. Cr.

Cobalt.—98/99 per cent., 20s. per lb.

Metallic Chromium.—98/99 per cent., 6s. 3d. to 6s. 9d. per lb.

Metallic Manganese.—93/95 per cent., carbon-free, £225 to £232 per ton; 96/98 per cent., £255 to £262 per ton.

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

## SEMI-FINISHED STEEL

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

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

over 0.41 up to 0.60 per cent. C, £30 16s.; acid, up to 0.25 per cent. C, £33.

Sheet and Tinplate Bars.—£25 11s. 6d.

## FINISHED STEEL

Heavy Plates and Sections.—Ship plates (N.-E. Coast), £30 6s. 6d.; boiler plates (N.-E. Coast), £31 14s.; floor plates (N.-E. Coast), £31 16s. 6d.; heavy joists, sections, and bars (angle basis), N.-E. Coast, £28 9s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., untested, £32 4s. 6d.; flats, 5 in. wide and under, £32 4s. 6d.; hoop and strip, £32 10s. 6d.; black sheets, 17/20 g., £41 6s.; galvanized corrugated sheets, 24 g., £49 19s. 6d.

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

Tinplates.—57s. 9d. per basis box.

## NON-FERROUS METALS

Copper.—Cash, £230 to £235; three months, £215 10s. to £216; settlement, £235.

Tin.—Cash, £597 10s. to £600; three months, £589 to £590; settlement, £597 10s.

Zinc.—September, £67 10s. to £67 12s. 6d.; December, £67 2s. 6d. to £67 5s.

Refined Pig-lead.—September, £90 10s. to £91; December, £87 5s. to £87 10s.

Zinc Sheets etc.—Sheets, 15 g. and thicker, all English destinations, £95 17s. 6d.; rolled zinc (boiler plates), all English destinations, £93 12s. 6d.; zinc oxide (Red Seal), d/d buyers premises, 87.

Other Metals.—Aluminium, ingots, £150; magnesium, ingots, 2s. 10½d. per lb.; antimony, English, 99 per cent., £225; quicksilver, ex warehouse, £64 15s.; nickel, £483.

Brass.—Solid-drawn tubes, 22d. per lb.; rods, drawn, 31½d.; sheets to 10 w.g., 246s. 3d. per owt.; wire, 29½d.; rolled metal, 233s. per owt.

Copper Tubes, etc.—Solid-drawn tubes, 27½d. per lb.; wire, 261s. 6d. per cwt. basis; 20 s.w.g., 290s. 6d. per owt.

Gunmetal.—Ingots to BS. 1400—LG2—1 (85/5/5/5), £160 to £170; BS. 1400—LG3—1 (86/7/5/2), £170 to £180; BS. 1400—G1—1 (88/10/2), £252 to £285; Admiralty GM (88/10/2), virgin quality, £252 to £300 per ton, delivered.

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

Phosphor Bronze.—Strip, 347s. per owt.; sheets to 10 w.g., 368s. 9d. per cwt.; wire, 43½d. per lb.; rods, 38½d.; tubes, 36½d.; chill cast bars: solids 38d., cored 39d. (C. CLIFFORD & SON, LIMITED.)

Nickel Silver, etc.—Rolled metal, 3in. to 9in. wide × .056, 3s. 0½d. per lb.; round wire, 10g., in coils (10 per cent.), 3s. 5½d.; special quality turning rod, 10 per cent., ½in. dia., in straight lengths, 3s. 4½d. All prices are net.

## Forthcoming Events

SEPTEMBER 18

**Institute of British Foundrymen**

*East Midlands branch (Northampton and district):*—"Foundry Sand Control," by A. Tipper, M.Sc., 7.30 p.m., at Northampton. Details from the branch secretary.

SEPTEMBER 19

*West Riding of Yorkshire branch:*—Presidential address by C. S. Johnson, 6.30 p.m., at the Technical College, Bradford, preceded by tea, at 1. Mannville Terrace (opposite the Technical College), at 4.45 p.m.

SEPTEMBER 21

**Incorporated Plant Engineers**

*Merseyside and North Wales branch:*—"Paint in Industry," by P. I. Gay, B.Sc., 7.15 p.m., at Radiant House, Bold Street, Liverpool.

**Institution of Production Engineers**

*Derby section:*—Presidential address by W. C. Puckey, M.I.Prod.E., F.I.I.A., 7 p.m., at the Midland Hotel, Midland Road.

SEPTEMBER 22

*Manchester graduate section:*—"Die-casting," by T. Bradshaw, 7.15 p.m., Room C3, Reynolds Hall, College of Technology.

**Institution of Works Managers**

*Merseyside branch:*—Annual General Meeting, Reece's Restaurant, Liverpool.  
*Wolverhampton branch:*—"Is there too much talk about Management?" by D. G. Petrie, 7 p.m., at the Star and Garter Royal Hotel.

SEPTEMBER 23

*Paisley group:*—Informal Discussion, 7.30 p.m., in the canteen of Eadie Brothers & Company, Limited.

SEPTEMBER 24

**Incorporated Plant Engineers**

*Sheffield and District branch:*—"Electrical Factory Regulations," 7.30 p.m., at the Grand Hotel.

**Institute of British Foundrymen**

*Southampton section:*—"Casting Defects," by J. L. Francis, 7 p.m., in the Southampton Technical College, St. Mary Street.

SEPTEMBER 26-27

8th Annual Golf Meeting at Woodhall Spa.

SEPTEMBER 26

*East Midlands branch:*—Presidential Address by H. Pinchin, and two films, "Mechanization of Moulding" and "Modern Malleable," 6 p.m., at the College of Arts, Derby.

## Lower Western German Steel Tariffs

From September 1, Western Germany has reduced tariffs against the imports of iron and steel products from non-member countries of the European Coal and Steel Community. The new tariff of 6 per cent. to 8 per cent. instead of the former 14 per cent. to 18 per cent. is in force for one year. It is emphasized in Bonn that this lower tariff is only applicable to a monthly import quota of 120,000 metric tons, of which 50,000 tons will be plate and strip, and that this quota has been fixed to allay French fears that Germany will re-export this steel to other pool countries.

French fears have not, however, been allayed. The French point out that last year Germany imported a total of 836,000 metric tons, of which 792,000 tons came from pool countries, the annual amount imported from non-pool countries being 44,000 metric tons. As the new quotas would allow an import of 1,440,000 metric tons a year from non-pool countries, or 30 times the amount actually imported from these sources, it is not surprising that the French are apprehensive.

PIG

Low Phosphorus  
Refined & Cylinder  
Hematite  
Malleable  
Derbyshire  
Northamptonshire  
Swedish Charcoal

Ferro Silicon (12-14%)  
Alloys & Briquettes  
N.F. Metals & Alloys  
Limestone  
Ganister  
Moulding Sand  
Refractories

IRON

# WILLIAM JACKS & CO., LTD.

Winchester House, Old Broad Street  
London, E.C.2.

TELEPHONE: LONDON WALL 4774 (8 Lines)

<p><b>Birmingham, 2.</b> 39, Corporation Street. <small>MIDLAND 3375/6.</small></p>	<p><b>Liverpool, 2.</b> 13, Rumford Street. <small>CENTRAL: 1558</small></p>	<p><b>Glasgow, C.2.</b> 93, Hope Street. <small>CENTRAL: 9969.</small></p>
---------------------------------------------------------------------------------------------	--------------------------------------------------------------------------------------	------------------------------------------------------------------------------------

## NOTICE

Replies to Box Numbers to be addressed to "Foundry Trade Journal," 49, Wellington Street, London, W.C.2.

## SITUATIONS WANTED

**FOUNDRY FOREMAN** (age 49) requires position with small Ferrous and Non-ferrous Foundry. Accustomed to full control. Available at once. A.M.I.B.F.—Box 3729, FOUNDRY TRADE JOURNAL.

**PLANT ENGINEER**, fully experienced in all aspects of design, development and maintenance, seeks executive post requiring hard work and initiative.—Box 3759, FOUNDRY TRADE JOURNAL.

**YOUNG MAN** with 7 years' experience in metallurgical analysis and 3½ years' responsible experience of cupola melting practice, desires minor position in which some time for classes is available. London area.—Box 3758, FOUNDRY TRADE JOURNAL.

**COMPANY SECRETARY / ACCOUNTANT**, 46, wide experience Iron and Non-Ferrous Foundries, Final Accounts, Taxation, Costing, Budgetary Control. Sound knowledge foundry practice.—Box 3755, FOUNDRY TRADE JOURNAL.

**STEEL FOUNDRY WORKS MAINTENANCE ENGINEER**, (age 33), requires new position home or abroad. Well versed i/c Heavy Plant Maintenance, Machine and Workshops Supervision, Development, installation, etc. Available at short notice.—Box 3752, FOUNDRY TRADE JOURNAL.

**FOUNDRY TECHNOLOGIST**, (Indian), (28), highest education foundry science, management; sound practical experience—premier Indian, English foundries, iron, non-ferrous; wide range of castings—jobbing, mechanised production. Desires position home, overseas establishment British Firm; would consider technical/sales representation abroad. Available for interview.—Box 3753, FOUNDRY TRADE JOURNAL.

## SITUATIONS VACANT

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

**THE ADVERTISER** under Box 3693, dated 13/8/53, wishes to thank the numerous applicants for the post of Foundry Manager, and to inform them that the vacancy has now been filled.

**OLD ESTABLISHED** Midlands Ferrous Jobbing Foundry requires Representative on Commission basis for London and South Areas.—Box 3724, FOUNDRY TRADE JOURNAL.

**OPPORTUNITY** for Young Chemist with experience of enamelling techniques and foundry practice to join staff of leading company. Right man may later be offered executive appointment with South African branch. Write in confidence giving full details of training and experience to Box 3761, FOUNDRY TRADE JOURNAL.

## SITUATIONS VACANT—contd.

**DIE CASTINGS**: Manager required for Aluminium Gravity Die Casting Foundry near Manchester. Must be capable of full control. Salary according to qualifications. Full particulars to Box 3751, FOUNDRY TRADE JOURNAL.

**WRIGHT & PLATT, LIMITED**, the World's Largest Engineer-Master Patternmakers, with own ferrous and non-ferrous foundry, with unlimited capacity, desire to appoint experienced representatives in some of the larger towns and districts on a part salary and commission basis. Write fully giving age, experience, connections, etc., to Irving Street, Birmingham.

**FOREMAN** required for Aluminium Alloy Gravity Die Foundry. Experienced first class man with initiative and capable of assuming responsibility for production and control of labour. Write giving details of previous experience and positions held, together with salary desired to: Personnel Manager, WILLIAM MILLS, LIMITED, Friar Park Foundry, Wednesbury.

**FOREMAN MOULDER** required for small partly mechanised Foundry, also plate and loose patterns, for firm engaged on Ranges, Grates and Engineering Castings, "Baxi" Patent Fires and Products. House will be found if required. Apply in writing, stating full particulars age, wage required and experience.—RD BAKENDALE & SONS, LTD., Ironfounders, Albert Street, Chorley, Lancs.

**TECHNICAL REPRESENTATIVE** required by Vitreous Enamel and Ceramic Colouring Oxide Manufacturers. Knowledge of Enamelling Trade essential. Position Superannuated. Applicants should state in confidence: age, their complete experience and salary required to Messrs. MAIN ENAMEL MANUFACTURING CO., LTD., Gothic Works, Angel Road, Edmonton, London, N.18.

**ELKINGTON & CO., LTD.**, Goscote Works, Walsall, require **SHIFT SUPERVISORS** for employment in their Refining Department and in their Blast Furnace or Cupola. Applicants should be fully experienced in the production of fire-refined copper and to mechanised plant. They should be able to maintain discipline and take full control if required.—Applications in writing, stating age and experience, to PERSONNEL MANAGER.

**IRON FOUNDRY** in the West Riding of Yorkshire requires 2 Technical Assistants to train for posts of responsibility on the foundry floor. Applicants should be under 30 years of age, and should have had practical foundry experience in addition to a General Scientific Education. Both posts offer excellent prospects of advancement and salaries will be paid in accordance with age and ability. Reply giving details of age, experience, education and present salary to—Box 3746, FOUNDRY TRADE JOURNAL.

**APPLICATIONS** are invited for the post of a Foundry Manager for a heavy steel Foundry that is being installed in India. Applicants must have first class technical qualifications together with a knowledge of steel foundry management, layout and design and detailed knowledge of all branches of steel casting production. Initially the work will be concerned with planning and construction and the recruitment of the necessary staff. The work calls for drive and initiative. A good salary with excellent prospects for an experienced man. Reply giving full details of experience, age, positions held with amount of emoluments received.—Write Box 7017, c/o CHARLES BARKER & SONS, LTD., 31, Budge Row, London, E.C.4.

## SITUATIONS VACANT—contd.

**DRAUGHTSMAN/ENGINEER**. Opening offered by Ventilating Engineers to experienced young foundry maintenance Draughtsman. Some dust control experience desirable.—AIR CONTROL INSTALLATIONS, LTD., 19, Temple Street, Birmingham, 2.

**FOREMAN** required for Birmingham Foundry, experienced in pressure die castings, knowledge of brass an advantage. State experience and wages required.—Box 3762, FOUNDRY TRADE JOURNAL.

**SALES AGENTS/REPRESENTATIVES** required by F. & M. Supplies, Ltd., 4, Broad Street Place, London, E.C.2, manufacturers of Supinex "R" Core Binder, Ferro-alloy Briquettes, etc., in the following counties: Leicester, Derby, Notts., Staffs. (part of).

**N.W. LONDON FOUNDRY** producing non-ferrous sand castings require outside Representative or Agent preferably with Home Counties connections and car. Remunerative commission offered. Retired executive considered, whole or part time. Confidential.—Box 3754, FOUNDRY TRADE JOURNAL.

**FOUNDRY METALLURGIST** required to control Laboratory of high-class Grey Ironfoundry in Birmingham. This vacancy offers a first-class opportunity to a man of 25/35 years of age, fully experienced in the chemical analysis of iron and steel, and in furnace and sand control. Applicants are invited to write giving full particulars of experience and salary required.—Box 3749, FOUNDRY TRADE JOURNAL.

**A COMPANY** located near Niagara Falls requires a **GRAVITY DIE DESIGNER** for Non-ferrous Castings, with a minimum of five years' experience of actual design work in this field. A practical shop or toolroom background is essential with foundry experience desirable. Successful candidates will be interviewed in London during August or September. Reply, stating experience, age, and availability.—Box 3725, FOUNDRY TRADE JOURNAL.

## PROPERTY

*By Order of the Mortgagees,*  
**WHITEWALL IRONWORKS,**  
**COMPTON, BERKS.**

**HENRY BUTCHER & CO.** are instructed to offer for SALE BY AUCTION, at the Works, on **WEDNESDAY, 14th OCTOBER, 1953,** at 11 a.m., as follows:

*Lot 1.*  
**THE FREEHOLD MODERN FOUNDRY AND FACTORY PREMISES,**

comprising  
A compact unit of Mainly Single-Storey Buildings, having an approx. **FLOOR SPACE OF 50,000 SQUARE FEET,** together with  
Land for extension of about 5.7 Acres.

*Also the*  
**DIRECTOR'S RESIDENCE AND 8 COTTAGES**  
(Vacant Possession with the exception of the Cottages).

*Lot 2.*  
**THE FREEHOLD SITE**  
Facing the Main Works, with an area of about 2½ Acres.

*Lot 3.*  
**THE FREEHOLD DETACHED RESIDENCE,**  
known as  
"PLEASANT VIEW," ILSLEY ROAD, COMPTON,  
comprising  
**6 ROOMS, KITCHEN, BATHROOM, W.C., GARAGE, GARDEN.**

(continued in next column)



**PROPERTY—contd.**

**Lot 4.**  
**THE FREEHOLD AGRICULTURAL LAND.**  
 With a frontage of about 500 ft., to the **COMPTON-ILSLEY ROAD**, and containing an area of approx. 4 Acres.  
 Note.—**THE MODERN FOUNDRY PLANT, MACHINE TOOLS AND EQUIPMENT** will be offered for Sale by Auction, in Lots, immediately following the offering of the Properties, but the Auctioneers are prepared to entertain offers for the **WORKS AS EQUIPPED**, any time up to within 7 days of the advertised date of the Auction.  
 Particulars and Conditions of Sale of the Properties (price 6d. each) may be obtained of: Messrs. **SIMMONS & SIMMONS**, 1. Threadneedle Street, London, E.C.2, and of Messrs. **HENRY BUTCHER & CO.**, Auctioneers, Valuers & Surveyors of Factories, Plant and Equipment, 73, Chancery Lane, London, W.C.2.  
 Telephone: HOLBORN 8411 (8 lines).

By order of the Receiver.  
 R.C. T. Baker & Son (Foundry and Engineers), Ltd.

**WHITEWALL IRONWORKS, COMPTON, BERKS.**

**HENRY BUTCHER & CO.** are instructed to offer for **SALE BY AUCTION**, at the Works on **WEDNESDAY, 14th OCTOBER, 1953**, at 11 a.m., as a first Lot, the **GOODWILL OF THE BUSINESS OF MESSRS. T. BAKER & SON (FOUNDRY & ENGINEERS), LTD.**, including any data, patterns or drawings for the manufacture of Baker Loaders, Water and Tumbler Cars, Road Sweepers, Municipal Vehicles.  
 To be followed by the **SALE** in Lots, in Detail, of the **MODERN FOUNDRY PLANT, MACHINE TOOLS AND EQUIPMENT.**

including  
 "Foundry Equipment Co." Sand Handling Plant; "Jackman" Sand Shaker; "Linslade" Automatic Sand Rammer; "Green" 1½- and 4-cwt. Cupolas; "Foundry Equipment" Jolt Moulding Machine; Overhead Electric Cranes and Hoists; Sand Mills; Steel Hoppers; Disintegrators; Magnets; Belt and Bucket Elevators; Iron and Steel Moulding Boxes; Ladles; Foundry Weights; Graphite Pots; Trolleys and Trucks; S.S. and S.C. Capstan and Turret Lathes; "Lapointe" Broaching Machine; Horizontal Boring; Radial and Pillar Drilling Machines; Slotting and Grinding Machines; Vertical and Horizontal Milling Machines; Sheet Metal and Woodworking Plant; Arc Welding Sets; Air Compressors, Profile Cutters, Cold Saws; Consumable Stores and Stock of Steel; Motor Vehicles; Engineers' Small Tools; Office Furniture and Equipment.  
 Note.—**THE FREEHOLD FACTORY, FOUNDRY AND HOUSES** will be offered for Sale in Lots immediately prior to the **PLANT AND EQUIPMENT**, and the Auctioneers are prepared to entertain offers for the **FREEHOLD WORKS** as equipped any time up to within 7 days of the advertised date of the Auction.  
 Catalogue of the Plant and Machinery (price 6d. each) may be obtained of:  
 Messrs. **JOSOLYNE, MILES & CO.**, Chartered Accountants, 28, King Street, Cheapside, London, E.C.2; of  
 Messrs. **WILD, COLLINS & CROSSE**, Solicitors, 87, Duke Street, Grosvenor Square, London, W.1; and of  
 Messrs. **HENRY BUTCHER & CO.**, Auctioneers, Valuers and Surveyors of Factories, Plant and Equipment, 73, Chancery Lane, London, W.C.2.  
 Telephone: HOLBORN 8411 (8 lines).

**PROPERTY—contd.**

**FOR SALE**, as a Going-Concern, Non-ferrous Repetition and Jobbing Foundry with Machine-shop and Pattern-shop, situated in Scottish east coast town. The buildings and plant are modern. Floor area approximately 9,500 sq. ft. with ground available for extension. Further particulars to genuine enquirers apply Box 437, ROBERTSON & SCOTT, 42, Charlotte Square, Edinburgh, 2.

**TENDER**

**QUOTATIONS** required for C.I. Castings (Boiler Doors). Those interested in Tendering, write Box 3763, FOUNDRY TRADE JOURNAL.

**WANTED**

**ONE** Copy of "Melting Iron in the Cupola" by J. E. Hurst. Please write Box 3756, FOUNDRY TRADE JOURNAL.

**WANTED**.—2 tons, or thereabouts, Electric Arc Steel Melting Furnace. Age not important. Hand-operated electrodes accepted.—Box 3733, FOUNDRY TRADE JOURNAL.

**MACHINERY FOR SALE**

**FOR THE DISPOSAL AND PURCHASE OF ALL TYPES OF FOUNDRY PLANT AND MACHINERY.**

**S. C. BILSBY, A.M.I.C.E., A.M.I.E.E.,**  
 Hainge Road, Tivdale, Tipton, Staffs.  
**TIPTON 2448.**

Pallett Conveyor, plates about 3 ft. by 2 ft.  
 Pneumatic Plain Jolter, table 21 in. by 17 in.  
 Rotary Blower, 1,400 c.f.m. to 7 lbs. per sq. in. pressure.  
 Air Compressor, 2,000 c.f.m. to 30 lbs. per sq. in.  
 Sand Mills, up to 6 ft. dia. pan.  
 Exhaust Fans, all sizes.  
 Box 3748, FOUNDRY TRADE JOURNAL.

- 2 pairs of Pagets Boxes. 16 in. by 14 in. by 4 in. by 4 in.
- 2 pairs of Pagets Boxes. 16 in. by 14 in. by 4½ in. by 4 in.
- 2 pairs of Pagets Boxes. 16 in. by 14 in. by 5 in. by 4 in.
- 3 pairs of Pagets Boxes. 9 in. by 7 in. by 3 in. by 4 in.
- 1 pair of Pagets Boxes. 12 in. by 12 in. by 4 in. by 4 in.
- ½ box of Pagets Boxes. 12 in. by 12 in. by 5 in. by 4 in.
- 1 pair of Pagets Boxes. 12 in. by 12 in. by 4 in. by 4 in.
- 1 pair of Pagets Boxes. 24 in. by 14 in. by 8 in. by 4 in.
- ½ box for above. 24 in. by 14 in. by 8 in. by 4 in.
- 1 pair of Pagets Boxes. 28 in. by 18 in. by 3½ in. by 4 in.
- 2 pairs of Pagets Boxes. 28 in. by 18 in. by 4 in. by 4 in.
- 4½ pairs Stirling Boxes. 20 in. by 15 in. by 4 in. by 4 in.
- 7½ pairs Stirling Boxes. 15 in. by 13 in. by 4 in. by 4 in.
- 4 pairs Wooden Boxes. 24 in. by 18 in. by 6 in. by 4 in.
- 6 pairs Wooden Boxes. 12 in. by 12 in. by 4 in. by 4 in.

**W. J. HOOKER, LTD.,**  
 4, Midland Crescent, Finchley Road,  
 London, N.W.3.

**MACHINERY FOR SALE—contd.**

**FOR SALE: HUNDTWEBER CENTRIFUGAL CASTING MACHINE** suitable for casting Bronze Bushing, Cylinder Liners, Piston Rings, etc. Condition as new.—Box 3750, FOUNDRY TRADE JOURNAL.

**SECONDHAND Ajax Plain Jolter**, No. 16 size, 5 ft. 5 in. sq. table. 180 jolts per minute at 80 lbs. per sq. in. Air Pressure. Good condition, new machine in November, 1947. Costing £658; price required £50, f.o.r. Sunderland.—R. W. COLLIN, LTD., Pallion Foundry, Sunderland. Telephone: Sunderland 4987.

**HERMAN JARR ROLL OVER MACHINE** with clamps, size 25 in. by 36 in., 750 lbs. capacity. Ten years old, but not used in high production unit. £335.—RICHARDS, Phoenix Works, Leicester.

**FOR SALE: 7 ft. 6 in. Edge Runner Grinding Mill** by Smedley Brothers, Belper. Serial No. 8145. Over-gear Drive. G.E.C. Starter and 25 h.p. Motor. For further information contact Works Engineering Dept., K. & L. STEELFOUNDERS & ENGINEERS LTD., Letchworth, Hertfordshire.

**ALBION**  **WORKS**

**FOUNDRY PLANT & MACHINERY. AIR COMPRESSORS.**

**BMM. RD.5. JOLT SQUEEZE** TURNOVER, cap. 1,300 lb., pattn. draw 12 in.; table 48 in. by 30 in.  
**BMM. HPL.2. JOLT SQUEEZE** STRAIGHT DRAW, cap. 400 lb., pattn. draw 9 in.; table 30 in. by 21 in.  
**C/WALLWORK ON JOLT SQUEEZE** PATTERN DRAW, cap. 600 lb., pattn. draw 10 in.; max. size boxes 20 in. sq. or 25 in. by 12 in.  
**C/WALLWORK WT562C JOLT SQUEEZE** TURNOVER, cap. 800 lb., pattn. draw 10½ in.; table 35 in. by 24 in.  
**C/WALLWORK R.2 CORE BLOWER.**  
**POLFORD MOULD DRYER, Coke Fired.**  
**FORWARD FOUNDRY SAND RIDDLE,** tripod type.  
**150/200 lb. ALUMINIUM BALE OUT FURNACE**  
**HALF TON CENTRAL AXIS TILTING FURNACE.**  
**BELT AND MOTOR DRIVEN RUMBLING ROTORS.**  
**GEARED FOUNDRY LADLES**, up to 4 tons cap.  
**AIR COMPRESSORS OF ALL TYPES IN STOCK**, 2 c.f.m. to 3,000 c.f.m.

**THOS W. WARD LTD.**  
**ALBION WORKS : SHEFFIELD**  
 Phone 26311 'Grams: "Forward."  
 Remember Wards might have it!

**DELIVERY EX STOCK**

**New shot blast cabinets complete with Dust Extractors, etc., size 5ft. x 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.

SAND MIXERS and DISINTEGRATORS for Foundry and Quarry; capacities from 10 cwt. to 10 tons per hr.—W. & A. E. BREALEY (MACHINERY), LTD., Misterton, nr. Doncaster. Tel.: Misterton 202.

THE FURNACE EXCHANGE, Lewes & Harpers Road Corner, Newhaven, Sussex. Telephone: 414.

SURPLUS NEW AND SECOND-HAND PLANT FOR IMMEDIATE DISPOSAL.

- 1. ONE fully geared Semi-Rotary Furnace, 1 ton Aluminium Capacity, complete with Oil Fuel Burners, new, make L.H. & S. Price £425 0s. 0d.
2. One 10 cwt. Capacity Cupola, make L.H. & S. Junior, complete with air equalizing Belt, Drop Bottom Firebricks, etc. Price £147 10s. 0d.
3. One new L.H. & S. Lift-Out Crucible Furnace, 200 lbs. Brass Capacity, Oil or Gas Fired, new. Price £115 0s. 0d.
4. One 200 lbs. Aluminium Capacity Standard Bale-Out Furnace, new, Side Flue Type, Gas or Oil Fired. Price £112 10s. 0d.
5. One Lead Melting Furnace, 12 cwt. capacity, town's Gas Fired. Price £75 0s. 0d.
6. One Lead Melting Furnace, 2 1/2 tons capacity, Valve Outlet, 3-4 weeks delivery. Price on application.
7. One small Gas Fired Lead Melting Furnace, 100 lbs. capacity. Price £37 10s. 0d.
8. One second-hand Coke Fired Lift-Out Crucible Furnace, 200 lbs. Brass Capacity, complete with Air Equalizing Belt, Indestructible Fire-Bars, Swinging Type Top Cover, complete with Motorised Fan. Price £120 0s. 0d. less fan £80.
9. One 400 lbs. Brass Capacity Central Axis Tilting Furnace, new, delivery 2 weeks. Price £265 0s. 0d.
10. One new L.H. & S. Central Axis Tilting Furnace, 600 lbs. Brass Capacity, complete with Motorised Fan and arranged for Oil or Gas Firing. Price £325 0s. 0d.
11. One set of 5 Throw-over type Ingot Moulds on stand, suitable for Zinc and Lead Casting (Small Ingots). Price £27 10s. 0d.
12. One Motorised Gear Unit suitable for 4-ton Rotary Furnace or similar proposition. Price £175 0s. 0d.
13. Heat Resisting Iron Crucibles (Pots) for Aluminium, Zinc and Lead, etc. All sizes.
14. Slightly used, 3-ton Central Axis Tilting Furnace, Oil Fired, of the Tube or Spout Pour Type. Price complete with Motorised Fan £575 0s. 0d.

THE FURNACE EXCHANGE, Lewes & Harpers Road Corner, Newhaven, Sussex. Telephone: 414.

pulverite

COAL DUST

lowest in ash

The STANDARD PULVERISED FUEL Co. Ltd.

Head Office:

166 VICTORIA STREET, WESTMINSTER, LONDON, S.W.1. Tel.: VICTORIA 3121/2/3

MACHINERY FOR SALE—contd.

ONE 5-TON GEARED CRANE LADLE. In excellent condition.—FRANK SALT & Co., Ltd., Station Road, Blackheath, Staffs.

600

AIR COMPRESSORS.

- 665-C.F.M. SULLIVAN, type WJ3, vert., high pressure, right angle, watercooled, 125 lb. W.P., speed 188 r.p.m. Direct coupled 170-h.p. auto. synch. Motor by Crompton, 415/3/50, with control gear.
600-c.f.m. INGERSOLL RAND, model 10XB, horiz., 2 stage, 110 lb. W.P., speed 185 r.p.m., with Intercooler between the 2 cyls., Automatic Unloader. Driven by 127-h.p. S/R Induction Motor by L.S.E., 415/3/50, with Control Gear.
530-c.f.m. BELLISS & MORCOM, vert., 2 stage, single acting, watercooled, W.P. 100 lb., speed 415 r.p.m., fitted Intercooler. "V" belt driven by 80-h.p. S.R. Crompton Motor, 400/3/50.
250-c.f.m. BROWETT LINDLEY, Monobloc type, vert., 2 stage, watercooled, W.P. 100 lb., speed 660 r.p.m., fitted internal Intercooler. "V" belt driven from 65-h.p. S.R. Induction Motor by L.D. & C., 415/3/50, with Control Gear.
175-c.f.m. WORTHINGTON (U.S.A.) 2 stage, air cooled, with radiator fan cooled Intercooler. "V" belt driven from 40-h.p. S.C. Motor 220/440/3/50/60. Speed 50 cycles, 1,465 r.p.m. Speed at 60 cycles 1,760 r.p.m.
142-c.f.m. HOLMAN, type TH18S, vert., 2 stage, single crank, watercooled, speed 965 r.p.m., W.P. 60 lb., direct coupled 30-h.p. S.R. Bruce Peebles Motor 400/3/50.

GEORGE COHEN

SONS & CO., LTD.

WOOD LANE, LONDON, W.12

Tel: Shepherds Bush 2070

and STANNINGLEY nr. LEEDS

Tel: Pudsey 2241

NEW motorised Ingersoll-Rand, three cylinder, air cooled, two-stage Compressor, with inter-cooler. Cost £600; will accept £200.

Coleman Core Blowing Machine, seen little use, condition as new, £375.

Portable electric sieve, A.C. motorised, £33.

Fordath Senior Sand Drier, £85. Also August Sand Drier, £30.

Core Oven coke-fired "August" drawer type, £85.

Osborn Jolt Roll-over moulding machine, £225.

New Broomwade Compressors. New Keith Blackman Fans.

Morgan Tilting Furnaces. Two new 1/2 ton aluminium capacity Lip Axis Tilting Furnaces by British Furnaces, complete with all equipment, cheap.

Spare firebrick linings. Shot Blast Plant and general plant.

Immediate attention to all enquiries.

ELECTROGENERATORS LTD., Australia Road, Slough.

Telephone: Slough 22877.

MACHINERY FOR SALE—contd.

One excellent, Massey, 10-cwt. Clear Space type, Pneumatic Power Hammer, complete with 400 volts, 3-phase, 50 cycles Motor and Starter.

One practically new Sand Mixer, by Alldays & Onions, with 1 1/2 h.p., 400 volts, 3-phase, 50 cycles Motor and Starter. Low price to clear.

MESSRS. G. E. SIMM (Machinery), LTD., East Parade, Sheffield, 1.

'Phone 25032 (3 lines).

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.

CAPACITY AVAILABLE

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

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

CASTINGS.—We can save your porous castings, ferrous or non-ferrous, by an approved Impregnation Process; sample castings treated.—RECPRO, LTD., 66, South Harrow Viaduct, Harrow, Middx. Phone: Byron 1178.

NEW Foundry, starting for the sole production of Shell Moulded Castings, ferrous and non-ferrous, invites enquiries for Castings suitable for this process.—Replies in first instance to Box 3735, FOUNDRY TRADE JOURNAL.

H. G. 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

**CAPACITY AVAILABLE—contd.**

**F**OUNDRY capacity available. For up to 5 cwt.s., machine moulded; for up to 2 tons, floor moulded. Prompt delivery.—LEWIS' FOUNDRY Co., LTD., Ammanford.

**C**APACITY available for castings weighing from 1 lb. to 15 tons, including Quasi-Bessermised ingot moulds up to 10,000 tons per annum.—THE CROSS FOUNDRY & ENGINEERING Co., LTD., Gorseinon, near Swansea.

**M**ECHANISED FOUNDRY.—Malleable and Grey Iron Castings offers 20 tons per week free capacity at early date. Preference for boxes up to 28 in. by 16 in. by 5 in. by 5 in. Snap Flasks up to 14 in. by 14 in. by 3 in. by 3 in. Hand moulding capacity also available. Cast Iron Pipes flanged and specials. Patternmaking facilities if required.—E. J. WALLACE, 39, Constitution Street, Dundee.

**CAPACITY AVAILABLE—contd.**

**C**APACITY available for Gravity and Pressure Dies in Brass, Aluminium, Zinc; also Patterns for Shell Moulds.—NEVSTANE FITMENTS, LTD., Sheephouse Farm, St. Annes Road, London Colney, Herts.

**MISCELLANEOUS**

**R**ECLAIMED SILLIMANITE £6 per ton.—Box 3722, FOUNDRY TRADE JOURNAL.

**M**ANURE, 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.

**F**IREWOOD for Cupolas. Sleepers and Sleeper Wood in wagon loads.—TILLEY'S (WOLVERTON), LTD., Wolverton, Bucks.

**MISCELLANEOUS—contd.**

**R**EFRACTORY MATERIALS.—Moulding Sand, Ganister, Limestone, Core Gum; competitive prices quoted.—HENSALL SAND Co., LTD., Silver Street, Halifax.

**N**OW is the time to change your Supplier of Sand. Try Southport Wind Blown Sea Sand for castings, free from shell. Any quantity, Road or Rail.—JOHN LIVESKY (AINSDALE), LIMITED, Ainsdale, Southport. Telephone: Southport 77489.

**G**RAPHITE / PLUMBAGO: Qualities available for every industry; special Foundry Plumbago; your enquiries are welcomed and will receive personal service.—WOODSTOCK (LONDON), LIMITED, 33, The Little Boltons, London, S.W.10. FREmantle 6646-7.

**PATTERNMAKING**

**P**ATTERNS for all branches of Engineering for Hand and Machine Moulding.—FURMSTON AND LAWLOR, LTD., Letchworth.

**P**ATTERN EQUIPMENT of all types and sizes. Accurate workmanship. Quotations by return.—HAYWOOD BROS., Victoria Works, Littleborough, Lancs. Tel. 8543.

**P**ATTERN Equipments, Machined Plates, Castings, Components, Assemblies, Jigs, Fixtures, Corebox Air Vents and Dowels. Developing firm requests enquiries. Keen personal attention.—BOOTH BROS. ENGINEERING, Baggrave Street, Leicester.

**FLAME CUTTING OF STAINLESS STEEL** demands an Iron powder specially manufactured for the job which

**POWDER METALLURGY LTD.,**  
59-62, High Holborn, W.C.1  
can supply you at approximately 7d. per lb.

**SMELTING AND REFINING CAPACITY**

Firm in the Midlands with comprehensive Furnace installation including large capacity most modern oilfired rotary furnaces would be interested in the following :

- (a) co-operation with individual who has some good and preferably new ideas of making good use of the facilities available.
- (b) co-operation with well-established firm of merchants or manufacturers.

*Offers which will be treated as strictly confidential (our own staff have been informed) to Box 3715 F.T.J.*

**PATTERNMAKERS' Section**

**PATTERNMAKING**  
**LARGE CAPACITY AVAILABLE**  
**IN ALL BRANCHES OF THE TRADE**  
**MARSDEN HIND & SON LTD.**  
GUIDE BRIDGE WORKS,  
JOHN ST., ASHTON-U-LYNE.  
EST. 1929 TEL.: ASH 2426

**PATTERNMAKERS**  
(Engineering) CO. LTD.  
Shrewsbury Road, London, N.W.10  
**HIGH-CLASS PATTERNS**  
**NON-FERROUS**  
**CASTINGS**  
Phone: ELGAR 8031/2

**ALL TYPES OF WOOD**  
**& METAL PATTERNS**  
**COOKE, BAILEY LTD.**  
MORLEY ST., HANLEY, STOKE-ON-TRENT  
Telephone: Stoke-on-Trent 2427

**PATTERNS (DERBY) LIMITED**  
SPECIALISTS IN HIGH CLASS PRECISION PATTERNMAKING  
ALL BRANCHES OF THE TRADE CATERED FOR  
KEEN QUOTATIONS GOOD DELIVERY  
**DARLEY STREET, DARLEY ABBEY, DERBY**  
TELEPHONE: DERBY 58165

**PATTERNMAKERS***Section*

TOOL ROOM PATTERN  
EQUIPMENT  
FOR  
**SHELL  
MOULDS**

**HARGREAVES & GOTT LTD.**  
PRINCESS STREET,  
ROCHDALE, LANCS.  
PHONE: ROCHDALE 3223  
STOKE-ON-TRENT 29154

THE  
LARGEST  
**WOOD  
PATTERNS**  
IN THE  
**INDUSTRY**

We have pleasure in announcing that our capacity to manufacture the wide range of pattern equipment for the older and conventional foundry practices has now been augmented by further facilities to embrace precision class

**SHELL MOULDING PATTERNS**

Layouts and design-methods prepared in our own drawing office embody technical "know-how", and our specialised machinery and equipment provides the tools for the job.

**B. LEVY & CO. (PATTERNS) LTD., OSBERT STREET,  
LONDON, S.W.1.**

Telephones: Victoria 1073 & Victoria 7486

**PRESSURE CAST MATCH PLATES**

**SINGLE OR DOUBLE SIDED**

**OUTSTANDING  
ADVANTAGES**

- ★ HIGH DIMENSIONAL ACCURACY
- ★ MIRROR FINISH
- ★ LOW COST
- ★ QUICK DELIVERY

SUITABLE FOR SHELL MOULDS AND CONVENTIONAL MOULDING METHODS  
WHATEVER YOUR REQUIREMENTS  
WE CAN PRODUCE TO YOUR  
SPECIFICATION. OUR TECHNICAL  
REPRESENTATIVE WILL CALL AT YOUR REQUEST, OR SEND YOUR ENQUIRIES TO :

*The* **UNIVERSAL PATTERN CO. (LONDON) LTD.**

269 ROTHERHITHE NEW ROAD,  
LONDON, S.E.16

Phone: BER 1337/8

**PATTERNMAKERS' Section**

**ASBESTOS  
CORE DRYING  
PLATES  
&  
MOULDING BOARDS**

- LOW PRICED
- NON-BRITTLE
- LIGHT TO HANDLE

**CENTRAL MANUFACTURING &  
TRADING CO. (DUDLEY) LTD.**

**OLD HILL, STAFFS.**


Phone: CRADLEY HEATH 69434 (6 lines)

**PATTERNMAKERS**

*Serving all  
branches of  
Engineering  
and  
Shipbuilding*

**J. F. PASSE & CO**  
8-12, FORBES PLACE, PAISLEY, SCOTLAND. Tel: PAISLEY 2553

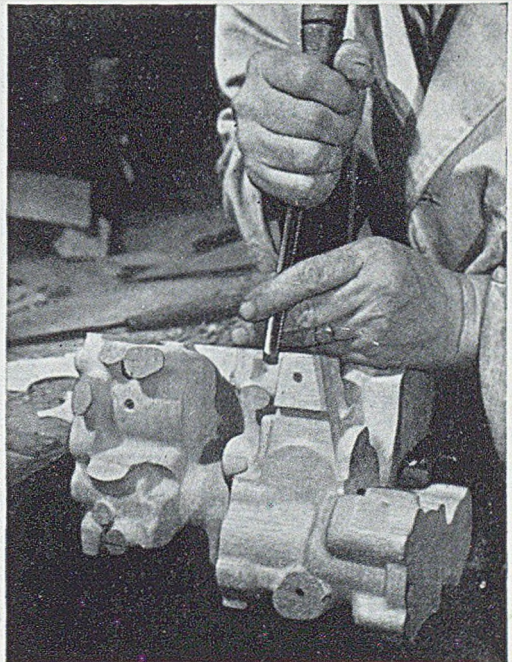
*For the world's finest*  
\* **HARDWOODS**  
*for patternmaking*

\* Including the famous  British  
Honduras Mahogany

**Call in**

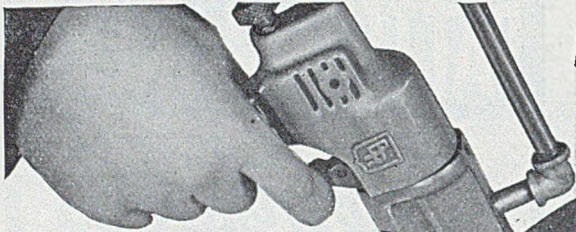


**THE FOREMOST NAME IN TIMBER**



**J. GLIKSTEN & SON LIMITED**, Carpenters Road, London E.15 Telephone: AMHerst 4444  
Liverpool Office: 37, Lord Street. Telephone: Central 7576.

# RECLAIM your defective castings by **DOT-WELD**



The photograph shows a casting being reclaimed by the DOT-WELD process.

*This new, improved technique of fusing metal by a low temperature arc, assisted by an air cooled process, eliminates the usual residual stresses and contractions resulting from high-temperature welding.*

Many leading engineering concerns in this country and abroad are able to testify to the savings in time, money and materials effected by the installation of the DOT-WELD process in their Foundries and Machine Shops. One user assesses the reduction of scrap rate at 90 per cent. and another reports savings of 3½ tons of castings per day due to DOT-WELD.

Holes, hair-lines and other surface faults are filled in without any burning or oxidation by this process and the parent body is not subject to the risk of distortion, cracking, or the formation of hard spots. The surface of the weld can be finished off where necessary by filing, grinding or machining on a light cut.

DOT-WELD can be applied to castings of Steel, Malleable Iron, Grey Iron, Aluminium (Sand and Die Castings) and Bronze. It does not require a skilled operator, is extremely mobile and costs very little to maintain. It offers to Foundries and allied trades an economical method of reclaiming castings and retrieving the high cost of machining, thereby reducing costs and increasing output.



*The DOT-WELD Pistol is light and easy to manipulate. The finger-trigger controls the electrode feed and complete control over the air-supply is ensured by use of a needle valve screw on the gun itself. The complete equipment includes the DOT-WELD Pistol, the quench-arc machine encased in a trolley-cabinet, pneumatic peening hammer, earth clamp, goggles, files, etc.*



Demonstration of the DOT-WELD process can be arranged in your own works. Write to-day for further particulars to

## BRITISH RONCERAY LTD

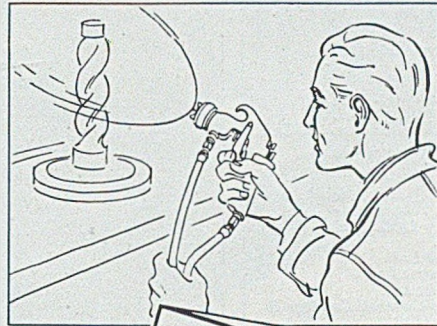
14, WOLSELEY ROAD, SHEFFIELD 8

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

**SPRAYLOGICS**—the Facts of Spray Painting

**What is wrong with this picture?**

There are no prizes for guessing. But the answers are worth a lot to everyone concerned with spray finishing. You'll find them and many others leading to improved quality of finishing and greatly increased production—in this exclusive DeVilbiss · Aerograph publication. Write for your copy to Dept. 42 S.

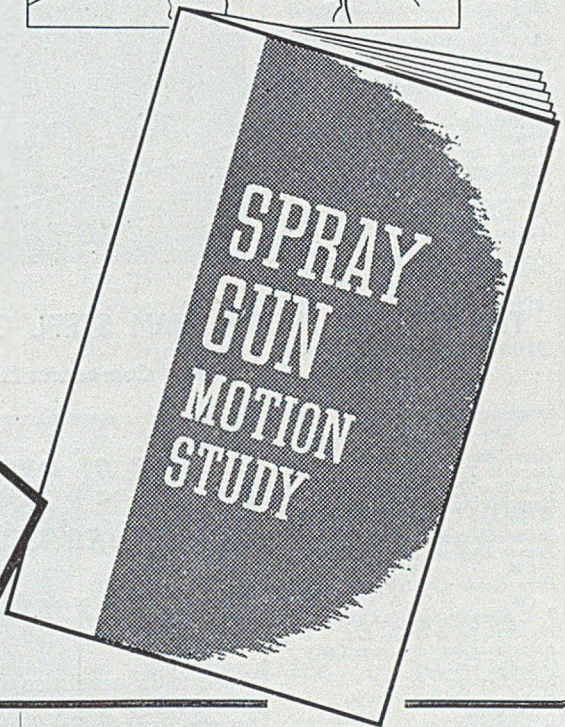


Send for

**“SPRAY GUN  
MOTION STUDY”**

*(No. 3 of a series)*

**Now ready  
—FREE!**



**TWO OTHER PRACTICAL GUIDES**

which have already proved a boon to users of Spray Finishing

**1. “A.B.C. of Spray Painting Equipment”**

Answers 144 questions on use, care and adjustment of spray finishing equipment.

**2. “Spray Gun Selection Guide”**

Guide to the right gun for every spray finishing need.

**Have you sent for your copies yet?  
STILL AVAILABLE FREE ON REQUEST**

**DEVILBISS  
AEROGRAPH**

The SYMBOL  of SERVICE

The Aerograph Co. Ltd., Lower Sydenham, London, S.E.26 Phone: Sydenham 6060 (8 lines)

Branches and Showrooms: LONDON  
BIRMINGHAM · BRISTOL · GLASGOW · MANCHESTER

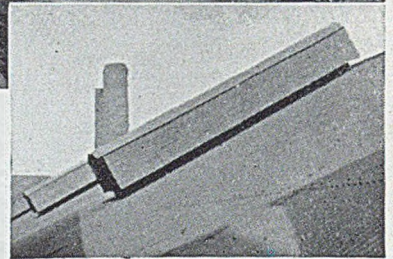
**IS YOUR  
NAME IN  
THIS LIST OF  
COLT USERS**

Baker Perkins Ltd.  
Bective Shoemakers.  
British Piston Ring Co. Ltd.  
British Thomson-Houston Co. Ltd.  
Fillerys Toffees Ltd.  
Carbodies Ltd.  
Fisher & Ludlow Ltd.  
Follain-Wychiffe Foundries Ltd.  
Hard Metal Tools Ltd.  
A. E. Hawley & Co. Ltd.  
Humber Ltd.  
James Pascall Ltd.  
Lester & Harris Ltd.  
G. H. Hughes Ltd.  
Metropolitan-Cammell Carriage & Wagon Co. Ltd.  
Colville Constructional Co. Ltd.  
Samuel Jones & Co. Ltd.  
Maconochie Bros. Ltd.  
Cooper McDougall & Robertson Ltd.  
Ferranti Ltd.  
National Coal Board.  
United Dairies Ltd.  
Atlas Sprinkler Co. Ltd.  
Cardiff New Era Laundry Ltd.  
Crompton Parkinson Ltd.  
The Mond Nickel Co. Ltd.  
Adrema Limited.



**The APPLEBY-FRODINGHAM STEEL COMPANY**

Branch of the United Steel Companies Limited



Aquascutum Ltd.  
Baird & Tatlock (London) Ltd.  
Bonallack & Sons Ltd.  
Cannon Rubber Manufacturers Ltd.  
British Oxygen Co. Ltd.  
Powell Duffryn Carbon Products Ltd.  
Ever Ready Co. (Great Britain) Ltd.  
J. T. Hart & Sons Ltd.  
W. & R. Jacob & Co. Ltd.  
Bowaters Fibre Containers Ltd.  
Cow and Gate Ltd.  
Esher Laundry Ltd.  
Friary, Holroyd & Healy's Breweries.  
Leyland Motors Ltd.  
Powers-Samas Accounting Machines Ltd.  
Sorbo Ltd.  
Laurence Scott & Electromotors Ltd.  
Chivers & Sons Ltd.  
Alpha Cement Ltd.  
British Vegetable Parchment Mills Ltd.  
British Oil & Cake Mills Ltd.  
Briggs Motor Bodies Ltd.  
City Glass Bottle Co. Ltd.  
Epping Sanitary Steam Laundry Co. Ltd.  
Elton Laundry Ltd.  
Ford Motor Co. Ltd.  
Hambrook & Johns Ltd.

**A FRESH LIST  
APPEARS IN  
EACH ISSUE**

**... one of over 5,000**

**major industrial organisations with**

**natural ventilation planned by COLT**

Prior to the installation of Colt Ventilation equipment in the main sinter plant at the Appleby-Frodingham Steel Co. Ltd., steam and sinter dust made it impossible to see across the bay. Continuous S.R. Type ventilators were erected which effectively provided for the immediate removal of the steam and dust.

This is only one of some thirty contracts carried out for this Company during the

past three years and this fact bears testimony of the efficiency of the Colt equipment installed.

Our wide experience in the ventilation of all types of buildings throughout industry is at your disposal. Why not take advantage of it?

**FREE MANUAL with full specifications of the wide range of Colt ventilators is available on request. Write for Manual G 27/302.**

**COLT**



**THE SPECIALISTS IN PLANNED NATURAL**

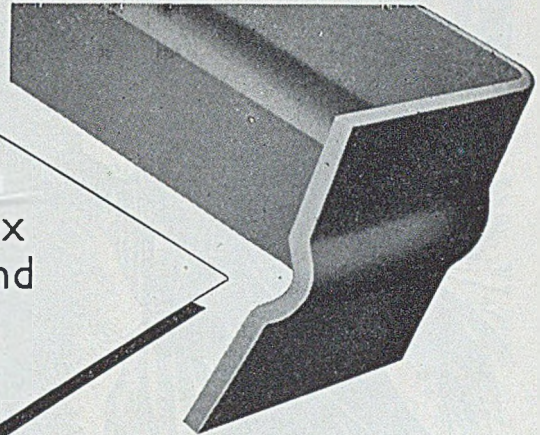
**VENTILATION**

**COLT VENTILATION LTD • SURBITON • SURREY • TELEPHONE: ELMbridge 6511-5**

Also at: Birmingham, Bradford, Bridgend (Glam.), Bristol, Dublin, Edinburgh, Liverpool, London, Manchester, Newcastle-on-Tyne, Sheffield and Warwick. G.27



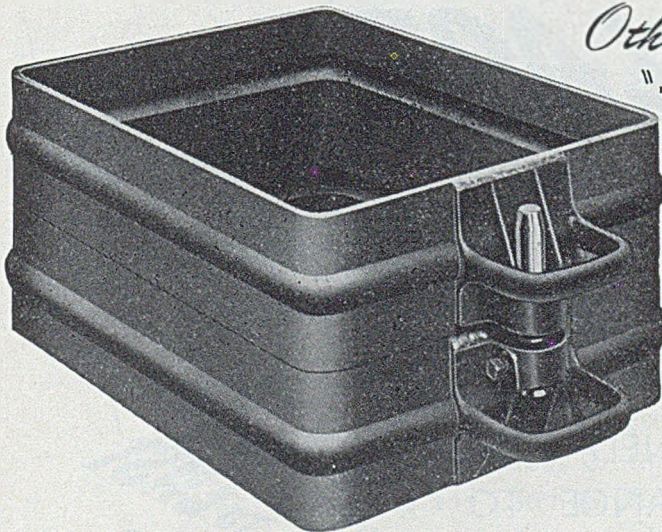
This special corrugated section of the "Talbard" Moulding Box affords strength, lightness and rigidity with **MAXIMUM SAND RETENTION**



Talbard Moulding Boxes are precision manufactured from rolled steel of special analysis and are available in a full range of sizes from 8in. by 6in. to 48in. by 30in.

These boxes are standardised for interchangeability of moulding-box equipment but special boxes can be made for individual requirements.

*Other special features of*  
**"TALBARD" Moulding Boxes**



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

**E. TALLIS & SONS LIMITED**

**TALBARD WORKS, CHARLES HENRY STREET, BIRMINGHAM 12**

(Phone : MIDland 4387 and VICtoria 2072)

London Office : 47, WHITEHALL, S.W.1

Phone : WHITEHALL 7740



# COLD BLAST

ENDURANCE

&

STRENGTH

## IRON

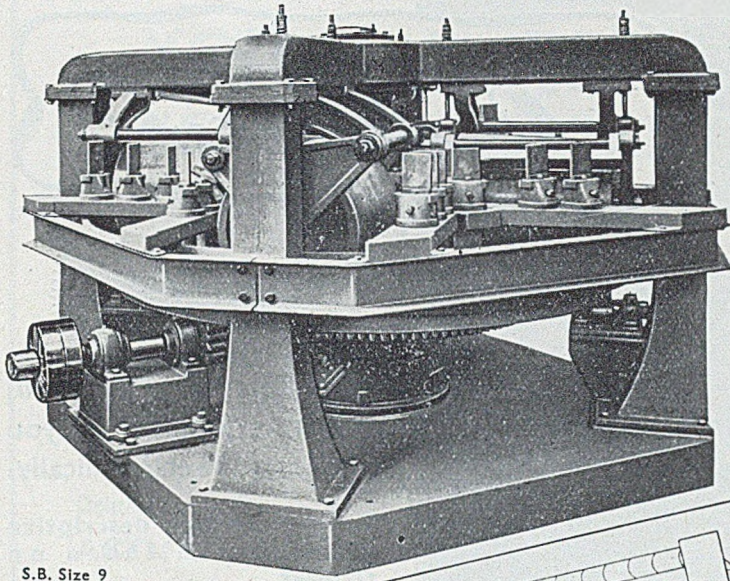
GENUINE COLD BLAST PIG IRON  
ENSURES STRENGTH AND EN-  
DURANCE. RENOWNED FOR  
TOUGHNESS, RESISTANCE TO  
WEAR AND CHILLING PROPERTIES

**CAST  
TO LAST**

**ROUND OAK STEEL WORKS, LTD.**  
BRIERLEY HILL, STAFFS.

TELEPHONE: BRIERLEY HILL 7231

Brand: "DUD-L.N.F.'ces'DUD"

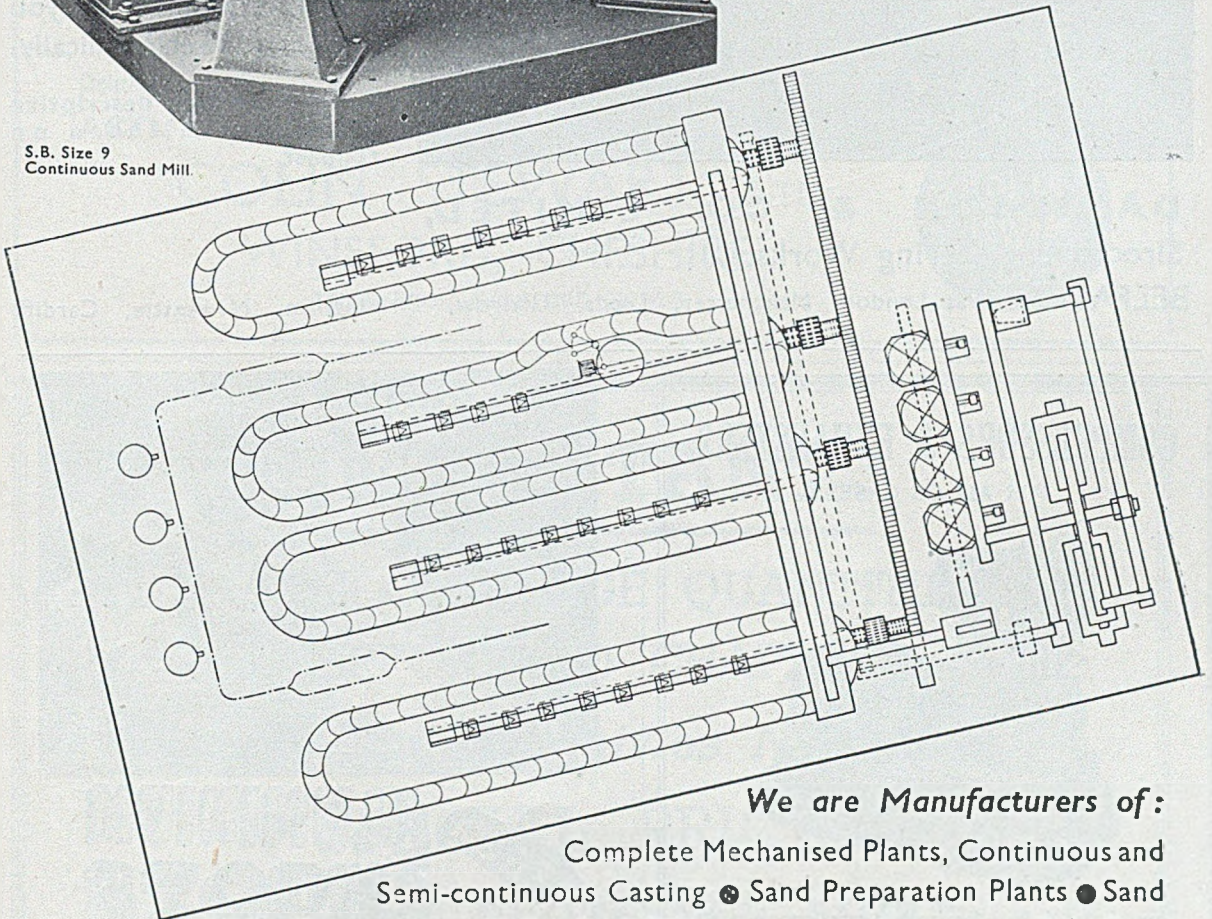


S.B. Size 9  
Continuous Sand Mill.

Please write  
for details  
of our  
products  
and/or

**"FOUMEC"**

for a  
visit from  
one of our  
representatives



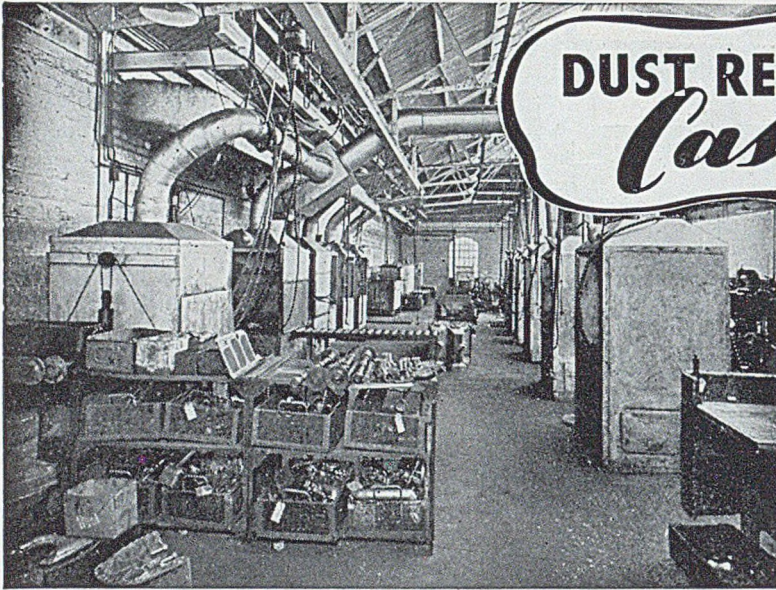
*We are Manufacturers of:*

Complete Mechanised Plants, Continuous and  
Semi-continuous Casting ● Sand Preparation Plants ● Sand  
Mills, Continuous and Batch ● Disintegrators ● Screens ● Belt Con-  
veyors ● Elevators ● Mould Conveyors ● Moulding Machines ● Sand Dryers, etc.

# FOUNDRY MECHANISATIONS (BAILLOT) LTD

19 VICTORIA STREET, LONDON, S.W.1

Phone : ABBey 6644 — Grams : Foumec, Phone, London



# DUST REMOVAL FROM *Castings*



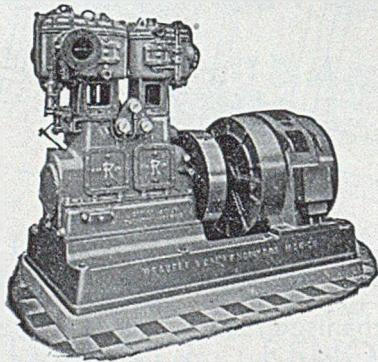
Dust Removal Plant will solve this problem for you efficiently and economically.

Fully illustrated descriptive literature available on request.

**DAVIDSON & CO. LIMITED,**  
Sirocco Engineering Works,  
**BELFAST.** and at London, Manchester, Leeds, Glasgow, Birmingham, Newcastle, Cardiff.

## COMPRESSORS & EXHAUSTERS

FOR AIR OR GASES

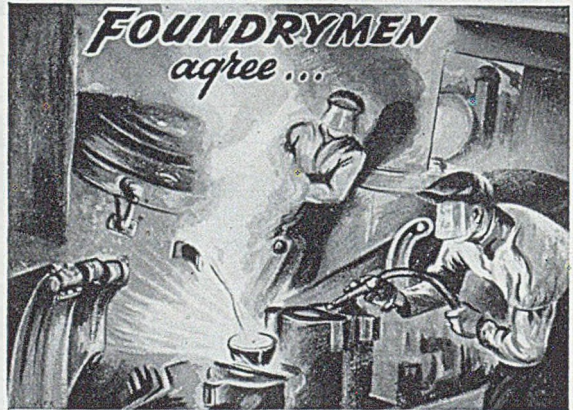


These Vertical double-acting crosshead type compressors are built as single and two-stage machines for pressures up to 40 and 120 lbs. per sq. in. They are built in a range of sizes for capacities up to 10,000 and 5,000 cu. ft. per minute respectively.

For particulars of these machines and for other types write to: Ref. Y

**REAVELL & CO., LTD,**  
**RANELAGH WORKS, IPSWICH**

Telegrams: "Reavell Ipswich." Phone: 2124 Ipswich



## **D.C.M.** ALUMINIUM INGOTS

Are the BEST for EVERY job  
Pressure Casting Gravity Casting Sand Casting  
And to ALL Specifications  
A.I.D. Approved

**D.C.M. METALS (SALES) LTD.**

LONGLEE WORKS, BAILLIESTON, GLASGOW.  
PHONE BAILLIESTON 1061.

# YOU CAN DEPEND ON IT QUEST STANDARD BENTONITE

THIS IS  
THE  
BENTONITE  
WHICH

HAS A REPUTATION FOR CONSISTENCY  
IS USED BY MOST OF THE LEADING  
IRON AND STEEL FOUNDRIES  
IS MADE IN ENGLAND WITH  
BRITISH CAPITAL  
IS IN **REGULAR** SUPPLY

Details from the

**ACTUAL** Manufacturers:

**COLIN STEWART LTD**  
**WINSFORD, CHESHIRE**

TELEPHONE: WINSFORD 2291-2-3



## IMPORTANT!

TO USERS OF LARGE QUANTITIES OF  
PERFORATED CHAPLETS

*Send your enquiries NOW for*

**SPECIAL PRICES**

WE CAN QUOTE YOU RIGHT

ON ADMIRALTY LIST

•  
ALSO  
SUPPLIERS TO VARIOUS  
DEPARTMENTS OF  
H.M. GOVERNMENT

**PRECISION PRESSWORK CO. LTD.**

CLIMAX WORKS, COLESHILL STREET,  
BIRMINGHAM 4

Phone: ASTON CROSS 1402

Grams: "Precico, Phone, Birmingham"

PATENTEES

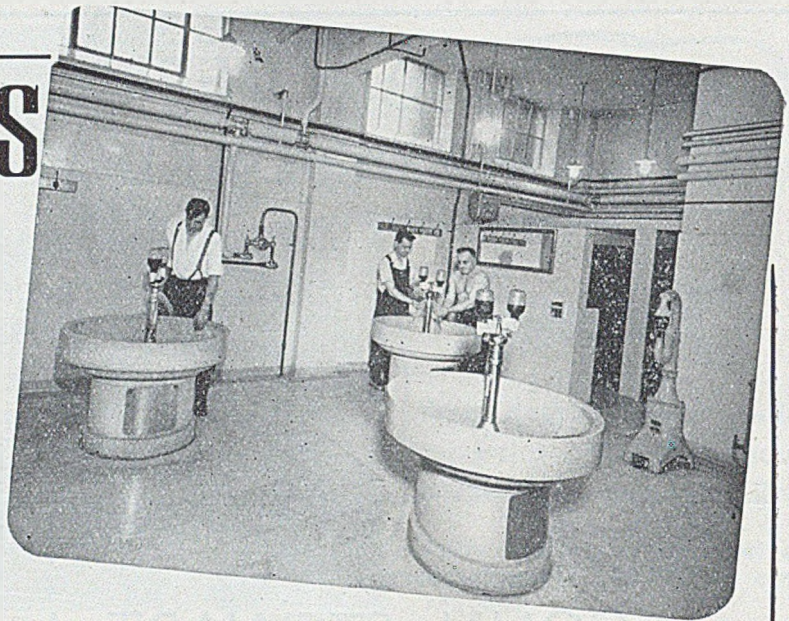
•  
ESTABLISHED

1874

# GUMMERS

## Shower Equipment

The washing facilities in the amenities centre at the works of the Park Gate Iron & Steel Co. Ltd., are controlled by Gummers "Security" thermo-static mixing valves.



**GUMMERS LIMITED ROTHERHAM**

TELEPHONES: ROTHERHAM 4865-6-7

TELEGRAMS: GUMMER ROTHERHAM

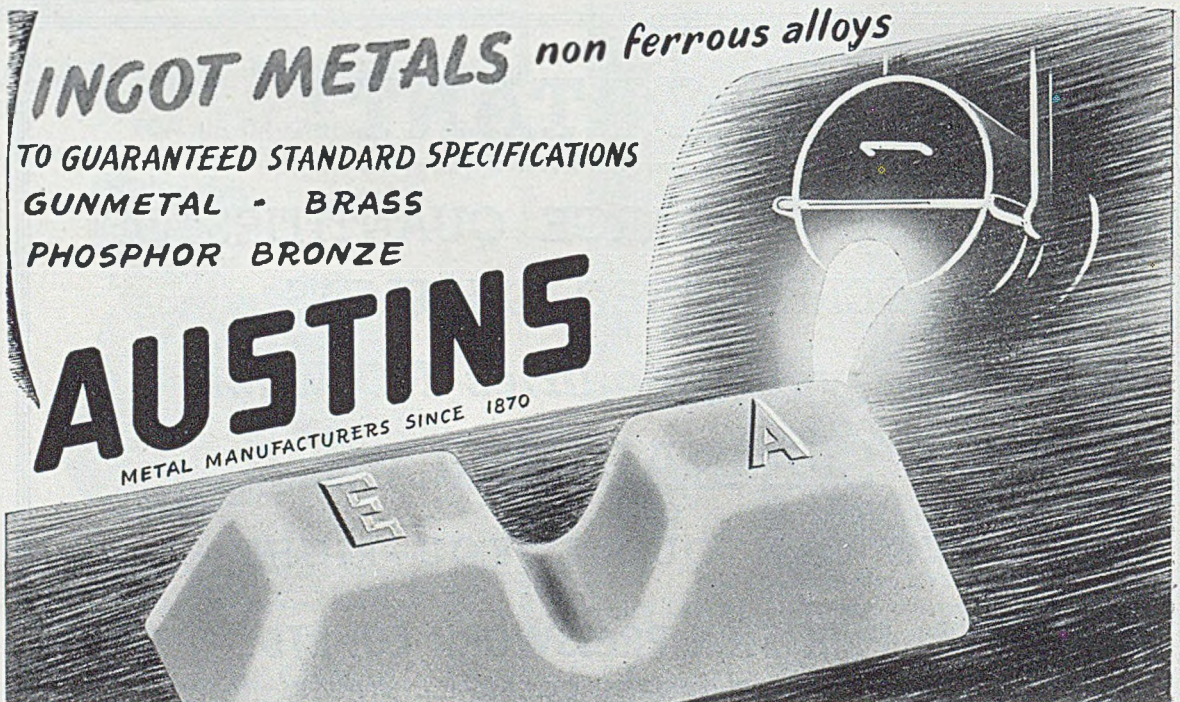
**INGOT METALS** *non ferrous alloys*

TO GUARANTEED STANDARD SPECIFICATIONS

GUNMETAL - BRASS

PHOSPHOR BRONZE

**AUSTINS**  
METAL MANUFACTURERS SINCE 1870

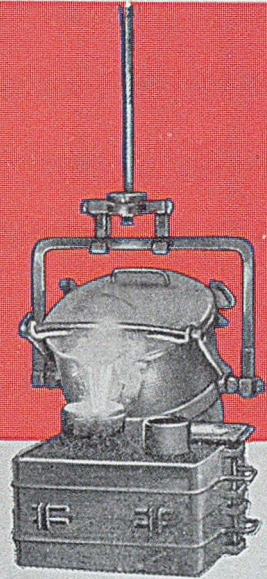


E. AUSTIN & SONS LTD., HACKNEY WICK, LONDON, E.9.

Tel. AMHerst 2211




*Moulding Box Bushes*



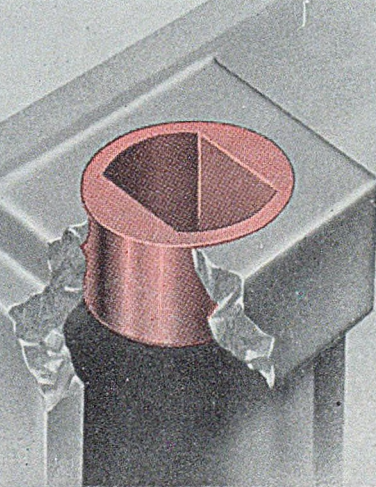
R E D U C E

*SCRAP  
CROSS JOINTS  
FETTLING  
IDLE BOXES*

*Nitrided! LAST LONGER!*

Specify  Bushes  
when ordering new  
boxes or when rebushing.

BRITISH AERO COMPONENTS, LTD.  
HOLBROOKS LANE, COVENTRY



# NO MORE "Blind" CORE BLOWING!

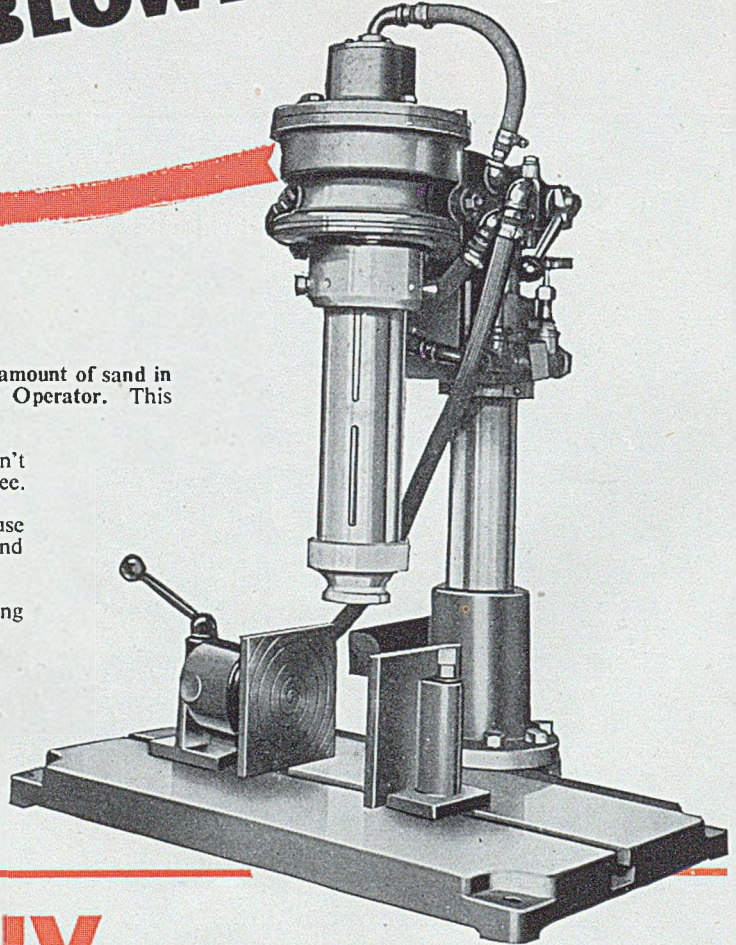


With the "Molineux" Core Blower, the amount of sand in the Cartridge is always visible to the Operator. This effects three notable improvements:—

- 1—Time saved because the Operator doesn't have to guess when to refill—he can see.
- 2—Longer Life for Core Boxes, because blowing an insufficient quantity of sand is avoided.
- 3—Operators protected from sand blowing over them when box is nearly empty.

In brief, the Operator has complete control of the sand, in a way not possible with most Core Blowers. There are other advantages in ease of operation, little maintenance, and low cost.

*Send for full particulars to:—*



# MOLINEUX

## FOUNDRY EQUIPMENT LTD.

Marlborough Works, Marlborough Road, London, N.19

Phone: ARChway 4127

Scottish Representative: L. A. WITHAM & CO., 51 Vine Street, Glasgow, W.I.





CHARGING



MELTING



OBSERVING



CHECKING



CLEANING

# THE NEW SKLENAR TYPE O50

NO CRUCIBLE—ONE MAN POUR  
GAS OR OIL FIRED  
LOW MELTING LOSS



50 LBS. OF BRASS  
TO 1130° C. IN 20 MINS.  
—LOSS 1.25%

50 LBS. OF BRONZE  
TO 1130° C. IN 20 MINS.  
—LOSS 1.0%

20 LBS. OF ALUMINIUM  
TO 730° C. IN 9 MINS.  
—LOSS 0.5%

Write today for Free Booklet :—

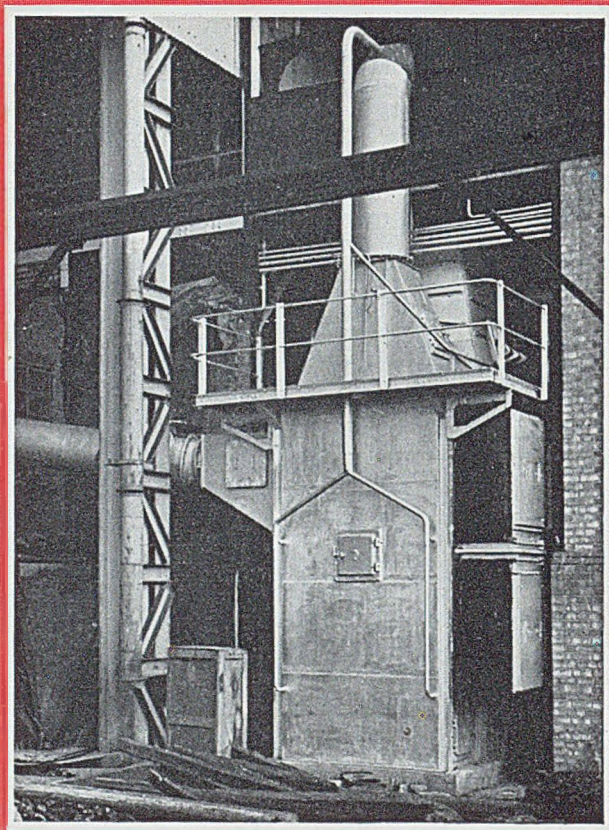
“EFFICIENT MELTING IN THE JOBBING FOUNDRY”

**SKLENAR FURNACES LTD., COLCHESTER AVENUE CARDIFF.**

TELEPHONE 45645/6

# CUPODEL

## HOT BLAST FOR CUPOLAS

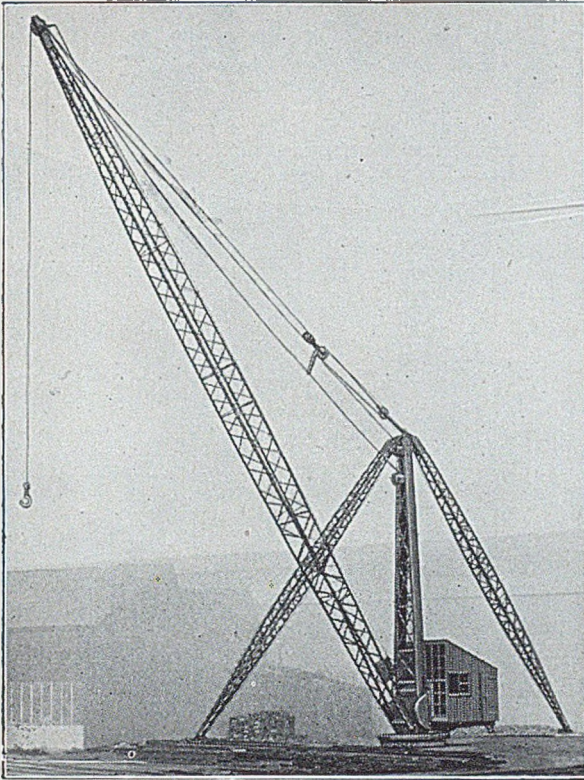


**T**HE recuperator used in CUPODEL hot blast cupola installations is the result of extensive experience and is designed to give trouble-free operation with minimum maintenance costs over a long period. The cleaning of the recuperator illustrated (in a 15 tons per hour installation) and of the offtakes, gas mains, etc., takes 10 man-hours per week or about one per cent. of the savings resulting from the conversion.



CUPODEL LIMITED, 86 SOUTH RD., BIRMINGHAM 31  
and at ABFORD HOUSE, WILTON ROAD, LONDON, S.W.1

(Photograph) By courtesy of Dartmouth Auto Castings Limited



# ANDERSON DERRICK CRANES

**Outstanding Features :**

- UNIT GEARING
- SUPERIOR VISIBILITY
- HIGH SPEED OPERATION
- RELIABILITY
- ECONOMY

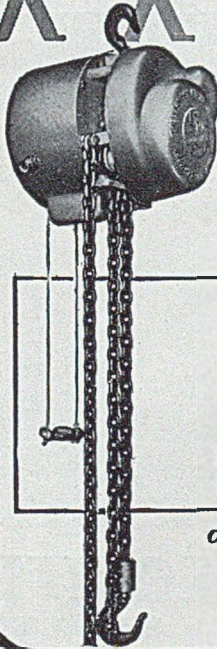
**THE ANDERSON - GRICE CO. LTD.**

Taymouth Engineering Works - Carnoustie - Scotland

Tel: 2214 Carnoustie

Grams: Diamond Carnoustie

10-ton Electric Derrick — 100ft. jib.



*Pep - up productivity  
in YOUR foundry! by using a*



**TYPE CL49 ELECTRIC HOISTBLOCK**

is an ideal machine for  
powerlifting and for  
saving man-hours every day.

Good counsel on CL49 from

THE VAUGHAN CRANE COMPANY LTD.  
MANCHESTER 12 ENGLAND  
Telephone EAST 1473

and the cost?

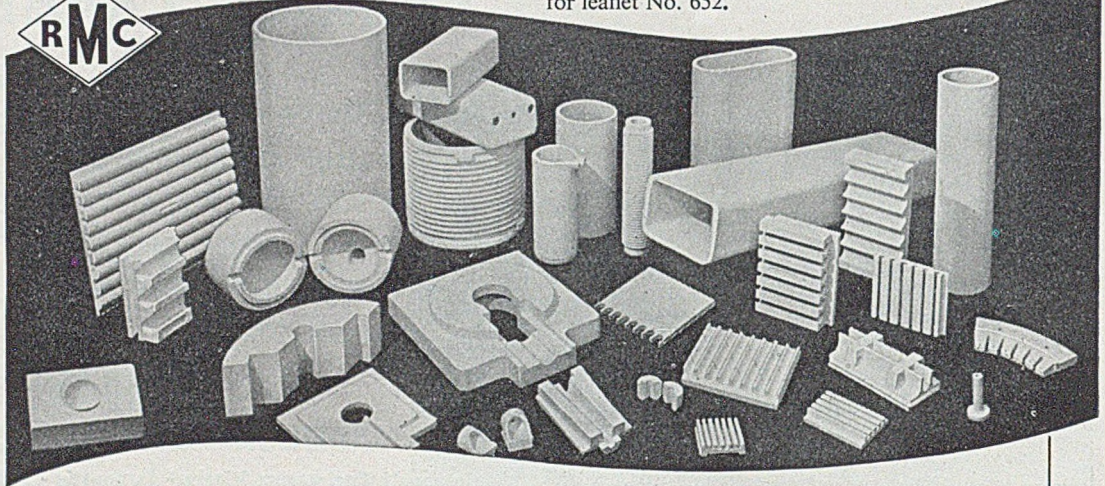
½ Ton	£75
¾ Ton	£81
1 Ton	£87
1½ Ton	£98
For 3-phase A.C. Supply 10ft. hook to hook lift	

*other details on  
application*

## TAILOR-MADE *Refractories*

For special shapes of composite or clad refractories, in fireclay, molochite, sillimanite, silicon carbide, alumina or zircon-zirconia, for purposes such as

steel research, etc., we offer a specialised 28 day service of extreme accuracy. Write for leaflet No. 652.



### REFRACTORY MOULDINGS & CASTINGS LTD.

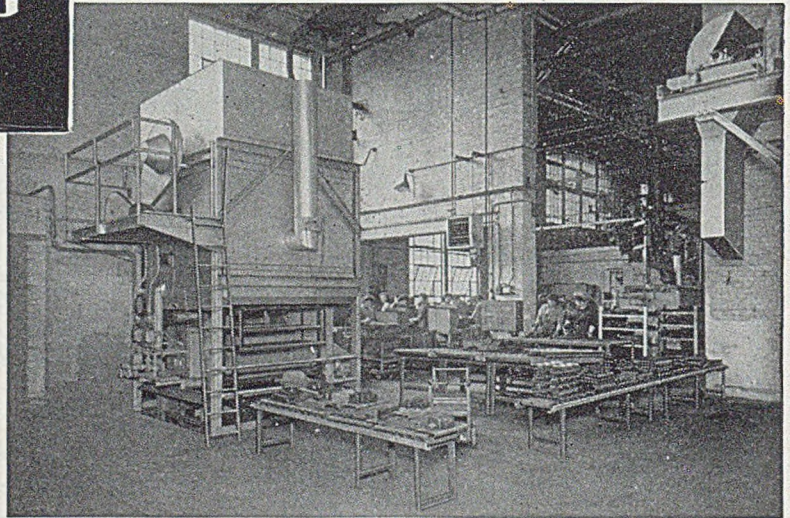
10 MARKET PLACE, KEGWORTH, NR. DERBY.

TEL.: KEGWORTH 429

## VERTICAL CONTINUOUS CORE DRYING OVENS

ALSO MANUFACTURERS OF  
SHELF TYPE, DRAWER  
TYPE, AND BOGIE TYPE  
OVENS. WITH OR  
WITHOUT FORCED AIR  
CIRCULATION. GAS  
OR COKE FIRED.

*Materially Reduces drying times*



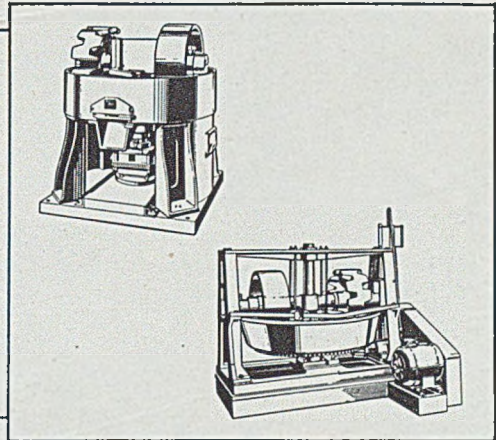
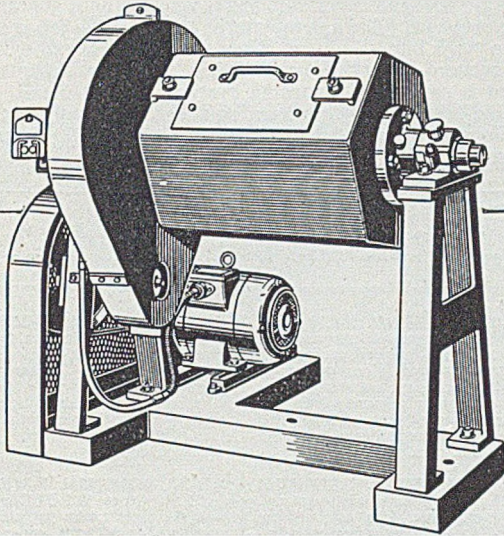
PHONE Tipton 1281/3

**F·J·BALLARD & CO. LTD.**  
TIVIDALE • TIPTON • STAFFS •

## Shaking and Polishing Barrels for all purposes

Illustrated: Motorised Rumbling or Polishing Barrel.  
All size bodies to 36in. by 24in. Hexagon, octagon,  
round, or square. Can be fitted for dust extraction.

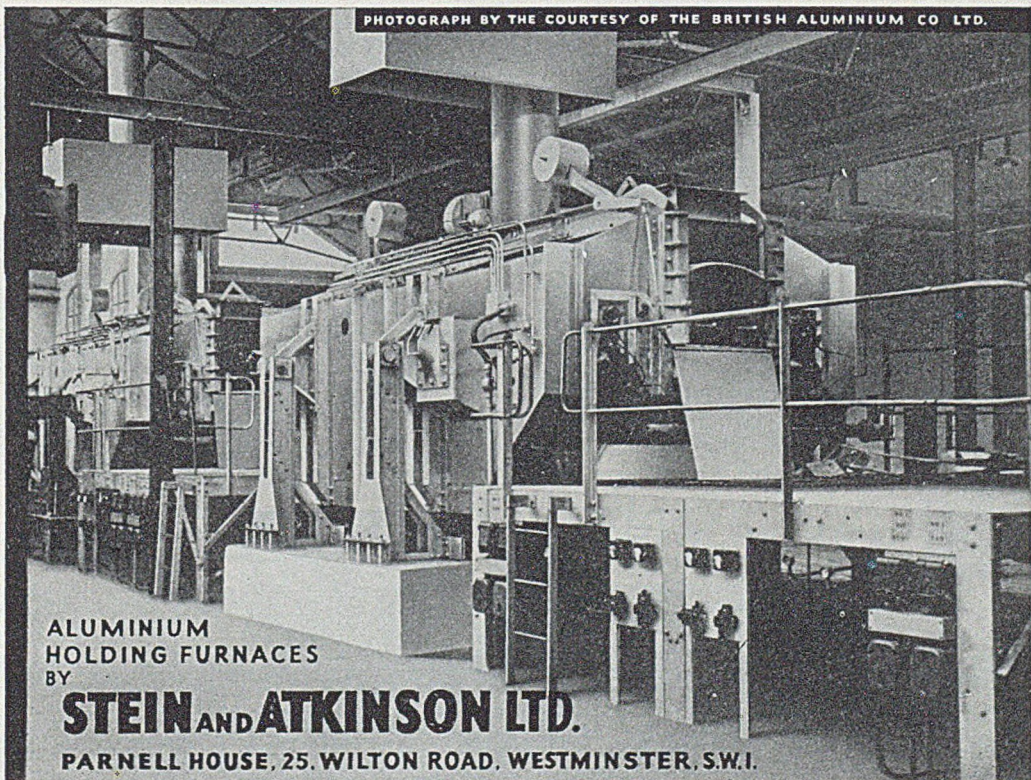
—●—  
Sand Mills of all types: 2ft. 6in. to 6ft. 0in.



**Nevilles**  
*of* **WALSALL**

*We invite Enquiries for Castings of all kinds*

**T. C. NEVILLE & SONS LTD**  
ENGINEERS AND GENERAL IRONFOUNDERS.  
HATHERTON STREET FOUNDRY, WALSALL.  
TELEPHONE: WALSALL 2327



PHOTOGRAPH BY THE COURTESY OF THE BRITISH ALUMINIUM CO. LTD.

ALUMINIUM  
HOLDING FURNACES  
BY

**STEIN AND ATKINSON LTD.**

PARNELL HOUSE, 25, WILTON ROAD, WESTMINSTER, S.W.1.



All the skill and experience in the world cannot guarantee a perfect weld. The only way to be sure that the job is sound is to "look into it" with an X-ray eye. But even radiographic inspection is of little avail unless the sensitised material used is capable of recording every significant detail. This amounts to saying that here, as with other applications of radiography in the field of engineering, ILFORD Industrial X-ray films are indispensable.

...this needs looking into...

**ILFORD INDUSTRIAL X-RAY FILM TYPE A** A general-purpose film whose very high speed, exceptional latitude and good contrast when used with calcium tungstate screens make it particularly suitable for the examination of ferrous welds and heavy castings whether with X-rays or gamma rays.

**ILFORD INDUSTRIAL X-RAY FILM TYPE C** A special high-contrast, direct-exposure film of medium speed and extremely fine grain, intended for the radiography of magnesium and aluminium castings where very fine detail must be recorded, and for the examination of all materials having a low X-ray absorption coefficient.

**ILFORD INDUSTRIAL X-RAY FILM TYPE B** A fast film designed for direct exposure to X-rays or for use with lead screens. Recommended for the radiography of a wide range of castings and welds in light alloy or steel where the aim is the detection of fine detail with economical exposure times.

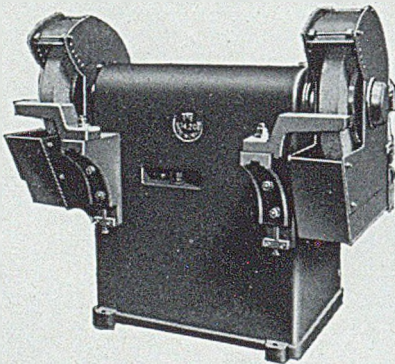
**ILFORD INDUSTRIAL X-RAY FILM TYPE G** A new ILFORD product and the fastest film yet made for use with or without lead screens. Three times as fast as the Type B film, yet with very little increase in graininess, it is ideal for the examination of heavy castings and assemblies in steel or bronze either with X-rays or gamma rays.

**INDUSTRIAL X-RAY FILMS**

ILFORD LIMITED · ILFORD · LONDON

**FETTLE YOUR CASTINGS WITH T.T. GRINDERS**

Specially designed and sturdily built for continuous operation in foundries, forges, steelworks, shipyards, railway and heavy engineering workshops. T.T. Heavy duty, motor driven, double ended, cabinet type, tool and Fettleing Grinders. Medium speed and high speed wet or dry grinding models, taking 12in. dia. to 30in. dia. grinding wheels.



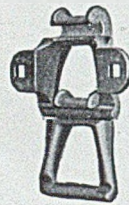
T.T. 14/20. 20in. Double ended, dry Grinder.

Contact your usual machine tool merchant or:—

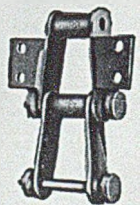


**TURNER MACHINE TOOLS LTD.**  
63-68, PRINCIP STREET · BIRMINGHAM · 4

**CLIMAX** Tested  
**CHAINS**  
FOR YOUR  
**MECHANISED PLANT**



**EWART TYPE GRAY PIN STEEL BUSHED CHAINS** Etc.



**OVERHEAD CONVEYOR CHAINS and TROLLEYS**

ELEVATOR BUCKETS

SPROCKET WHEELS

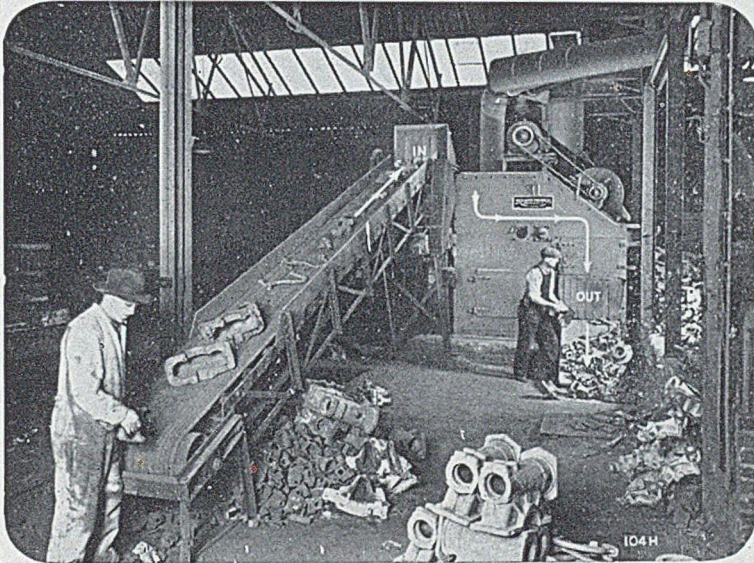


INTERCHANGEABLE WITH THOSE OF OTHER MAKES WHICH YOU MAY BE USING

Actual Manufacturers  
**JOHN KING & CO (LEEDS) LTD.**  
Climax Malleable Works, Leeds, 11  
'Phone' Leeds 75414 (3 Lines) Grams Malleable Leeds 11

**You cannot afford to be without a ST. GEORGE'S**  
• AIR OR WHEEL BLAST TYPES

**SHOT BLAST PLANT**



**CONTINUOUS  
WHEEL  
BLASTING**

**ONE CLIENT IS SAVING  
£1500 PER YEAR.  
CAN WE DO THE SAME  
FOR YOU ?**

Telephone :  
TRAFFORD PARK 1207  
(4 lines)

Telegrams :  
'GEORGIC' MANCHESTER  
BUY BRITISH MACHINES

Over 50 years experience embodied  
in all our plants

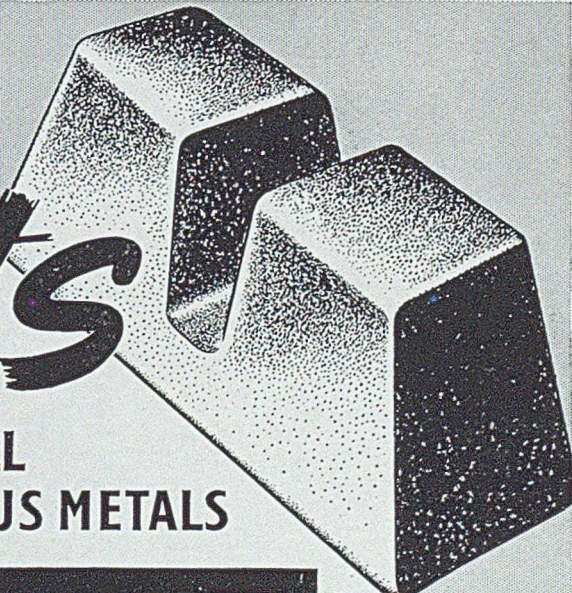
**ST. GEORGE'S ENGINEERS LTD., ORDSALL LANE, MANCHESTER. 5**

**MANUFACTURERS**

*of*

**Ingots**

**IN ALL  
NON-FERROUS METALS**

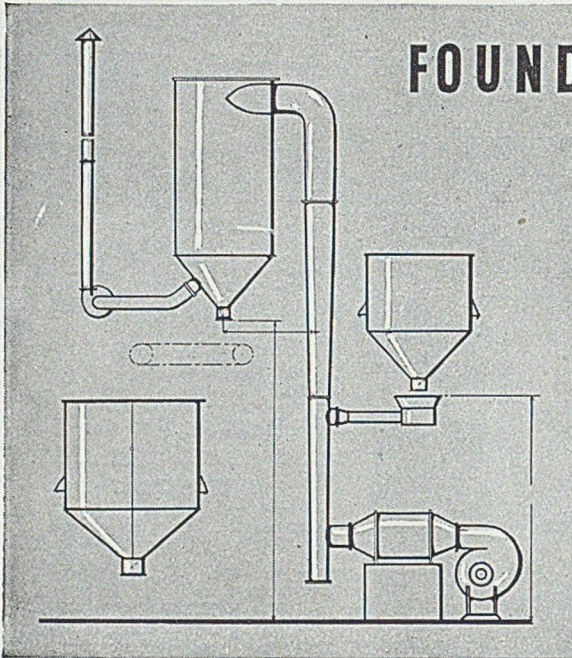


**ALLCOCK & CO (METALS) LTD**

**HOCKLEY HILL • BIRMINGHAM • 18**

Phones : NOR. 2981-2, NOR. 0619.

Grams : " PLODDING " , BIRMINGHAM



## FOUNDRY SAND DRYING

*for perfect castings*

Several years of research and development work in our Laboratories combined with operational experience allows us to offer a FOUNDRY SAND DRYER based on Aerodynamic and Thermogravic principles and possessing the following outstanding advantages.

1. Complete absence of large rotating parts.
2. Small floor area occupied.
3. Easily handled by unskilled labour.
4. High Thermal efficiency.
5. Low maintenance costs.
6. Continuous operation.
7. Adaptable for use with most heating media.

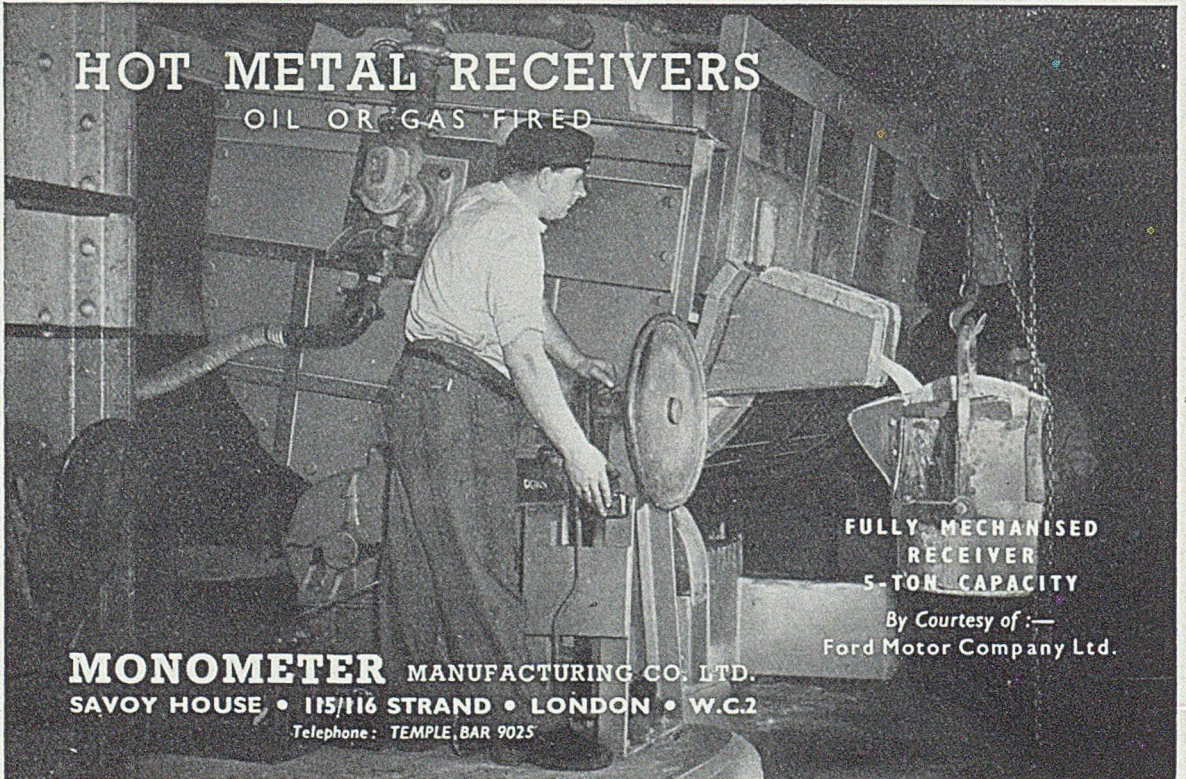
We shall be happy to advise you on the specific requirements of your particular application.

**LENNOX FOUNDRY CO. LTD.**  
Tantiron Foundry,  
Glenville Grove, London, S.E.8



## HOT METAL RECEIVERS

OIL OR GAS FIRED

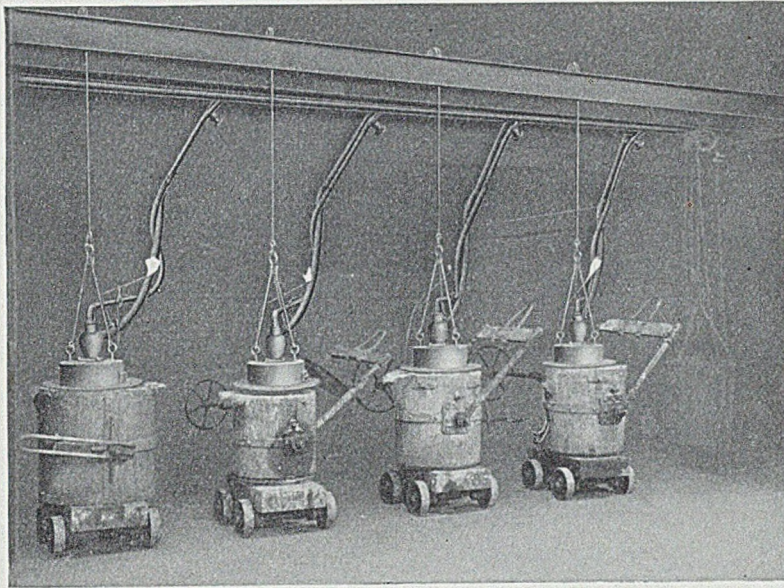


**FULLY MECHANISED  
RECEIVER  
5-TON CAPACITY**

By Courtesy of:—  
Ford Motor Company Ltd.

**MONOMETER MANUFACTURING CO. LTD.**  
SAVOY HOUSE • 115/116 STRAND • LONDON • W.C.2  
Telephone: TEMPLE BAR 9025





# “VORTEX”

LADLE DRYER AND  
PREHEATER

800°C. PREHEAT  
Quickly and Economically  
obtained

NO SMOKE

PRAISED BY EVERY USER

BY COURTESY OF MESSRS. STERLING METALS LTD., COVENTRY.

SOLE SUPPLIERS:

**MODERN FURNACES & STOVES LTD.**  
BOOTH STREET - HANDSWORTH - BIRMINGHAM 21  
TELEPHONE: SMETHWICK 1691-2.

ALLOW US TO  
ADD BEAUTY TO UTILITY BY

**VITREOUS ENAMELLING**  
YOUR CASTINGS

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

FOUNDRY AND FACTORY

**PAINING and  
LIMEWASHING**

SERVICE

Immediate Capacity—Countrywide Service

**Grove**

**PAINTING AND DECORATING CO. LTD.**

Ruby Triangle,  
London, S.E. 15  
New Cross 2187

AND  
LEEDS

Regd. Office: Sackville St.,  
Salford 3, Lancs.  
BLA 6098/9

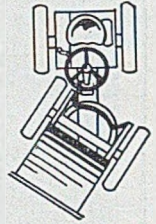
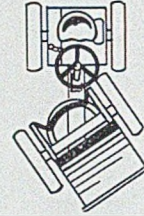
*Rolled Steel*  
**MOULDING BOXES**  
SPECIALLY DESIGNED CHANNEL SECTION



ACCURATELY DRILLED AND REAMERED  
ALL BOXES INTERCHANGEABLE  
SIZES & SHAPES TO REQUIREMENTS

**BILSTON STOVE & STEEL TRUCK CO LTD**  
BILSTON PHONE: BILSTON 41921. STAFFS.

*Everywhere in the Foundry are jobs for the* **G. F. LIGHT DUMPER**



The hopper can be tipped even when it is turned at an angle of 35° to the chassis.

Black Sand for the mill, castings from the moulding shop, sand and supplies for the core shop—the G.F. Light Dumper carries them all. It carries up to 10 cwt., reaches the most inaccessible places, and tips its load where it is required. Designed for hard work it can be used safely by unskilled labour. Maintenance is negligible. Running Costs are extremely low. Demonstrations arranged without obligation by our local agents.

Manufactured by George Fowell Ltd. (Smethwick and Walsall) and distributed by:

**GEORGE FOWELL (SALES) LTD.**

23 NEWTON STREET, BIRMINGHAM 4

Local Agents:

Witlor Ltd., cover Lancs., Wales, N.E. Counties and the Midlands.

Kwikform Ltd., cover London and the Home Counties, and Yorkshire.

Caledonian Tractors & Equipment Co., Ltd., covering Scotland.



10.

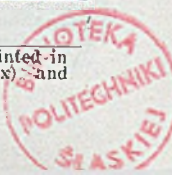
# Foundry Equipment

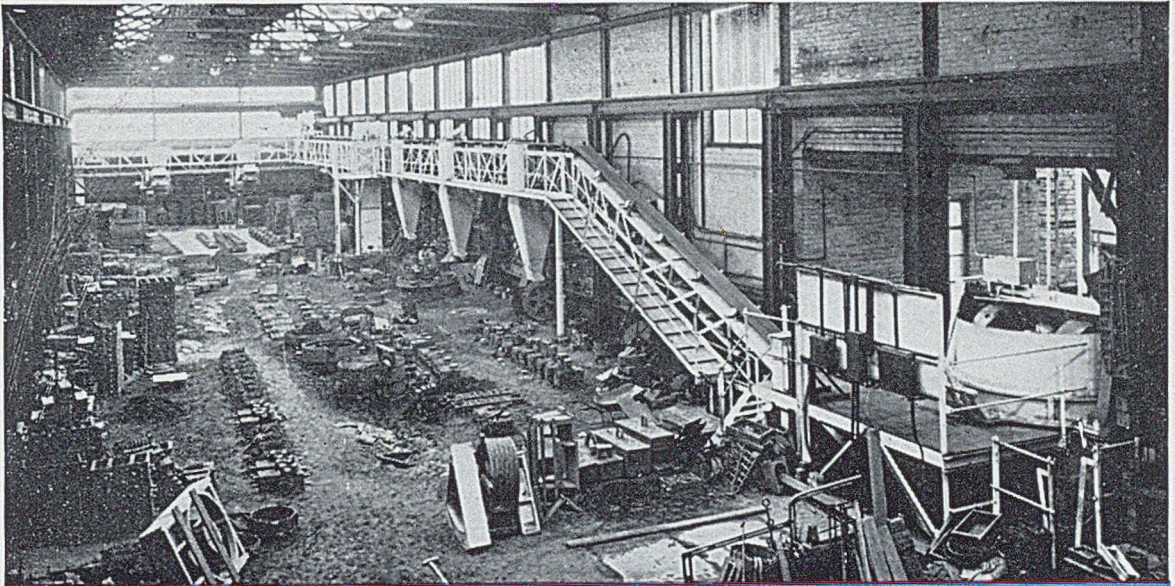


CUPOLAS . FANS  
 CHARGING MACHINES  
 MOULDING MACHINES  
 ROOTS . BLOWERS  
 SANDS MILLS . ETC.

## ALLDAYS & ONIONS LTD

GREAT WESTERN WORKS · SMALL HEATH · BIRMINGHAM 11  
 London Office 2, QUEEN ANNE'S GATE, WESTMINSTER, LONDON S.W. 1





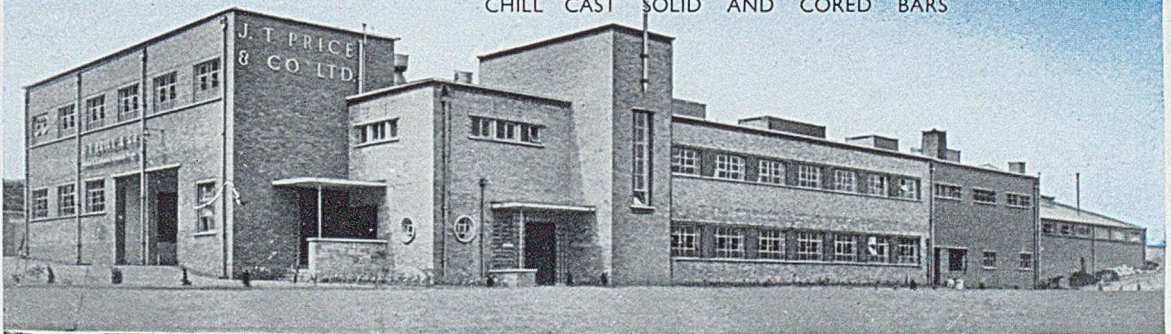
SAND TREATMENT PLANT FOR IRON FOUNDRY. PHOTOGRAPH BY PERMISSION OF BRADLEY & CRAVEN LTD., WAKEFIELD.

• GAS OR OIL FIRED EFFICIENT SAND DRYERS •  
 COOLING & DESILTING UNITS "COLHEP" PATENT No. 558806

**HEPBURN CONVEYOR CO. LTD.**  
 ROSA WORKS Phone: 3695-6-7 Grams: Conveyor WAKEFIELD

*The Home of..*  
*Reputable Non-ferrous Foundrywork*

HEAVY, MEDIUM AND LIGHT SAND CASTINGS  
 IN ALUMINIUM BRONZES - MANGANESE  
 BRONZES - NICKEL BRONZES - PHOSPHOR  
 BRONZES - GUN METALS - ALUMINIUM, ETC.  
 PATTERN MAKING AND MACHINING  
 CHILL CAST SOLID AND CORED BARS



**J.T. PRICE & CO. [BRASS AND ALUMINIUM FOUNDERS] LTD.**  
 NEWCASTLE · UNDER · LYME + STAFFORDSHIRE

PHONE  
 68011/2&3  
 GRAMS

7/4

# FOUNDRY

EST. 1902

TRADE JOURNAL

VOL. 95  
No. 1933

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

SEPTEMBER 17, 1953

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

WITH WHICH IS INCORPORATED THE IRON AND STEEL TRADES JOURNAL

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

# BLACKING

*and all Foundry Requisites*



COAL DUST, CHARCOAL  
PLUMBAGO, BLACKLEAD  
CORE GUMS, "COREITE"  
LIQUID CORE BINDER  
*Plumbago Facings*

ESTABLISHED 1831

**ISAAC & ISRAEL WALKER LTD**  
**EFFINGHAM MILLS • ROTHERHAM**

Telephone: —ROTHERHAM 4033

Telegrams: —WALKERS, ROTHERHAM.

## THE ERITH RANGE OF SANDS

Combine a variety of selected LOAMS and SILICA SANDS of guaranteed quality, suitable for every appropriate foundry requirement. In all fundamental respects they are the outstanding sands for present-day practice and are tried and proved by performance and results.

Write for illustrated Brochure and Free Samples to:  
J. PAPISH & CO., ERITH, KENT

ESTABLISHED 1805  
Telephone No.: ERITH 2056

BY FAR THE MOST POPULAR IN THE TRADE

*Sterling*  
ROLLED STEEL MOULDING  BOXES

STERLING FOUNDRY SPECIALTIES LTD. BEDFORD, ENGLAND.