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EST. 1902

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JULY 2, 1953
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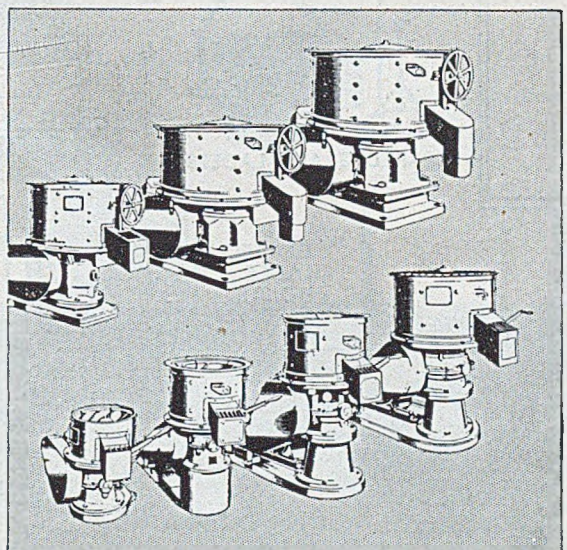
TWO FOUNDRY MACHINES OF EXCEPTIONAL MERIT

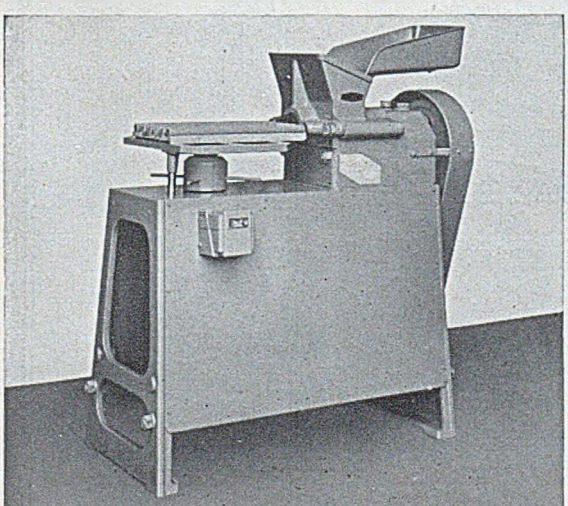
Sand/Binder Mixing without crushing

ACCURATE CORE EXTRUSION WITH ANY GRADE SANDS

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



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



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

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

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Full details from :

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THE FORDATH ENGINEERING CO. LTD.
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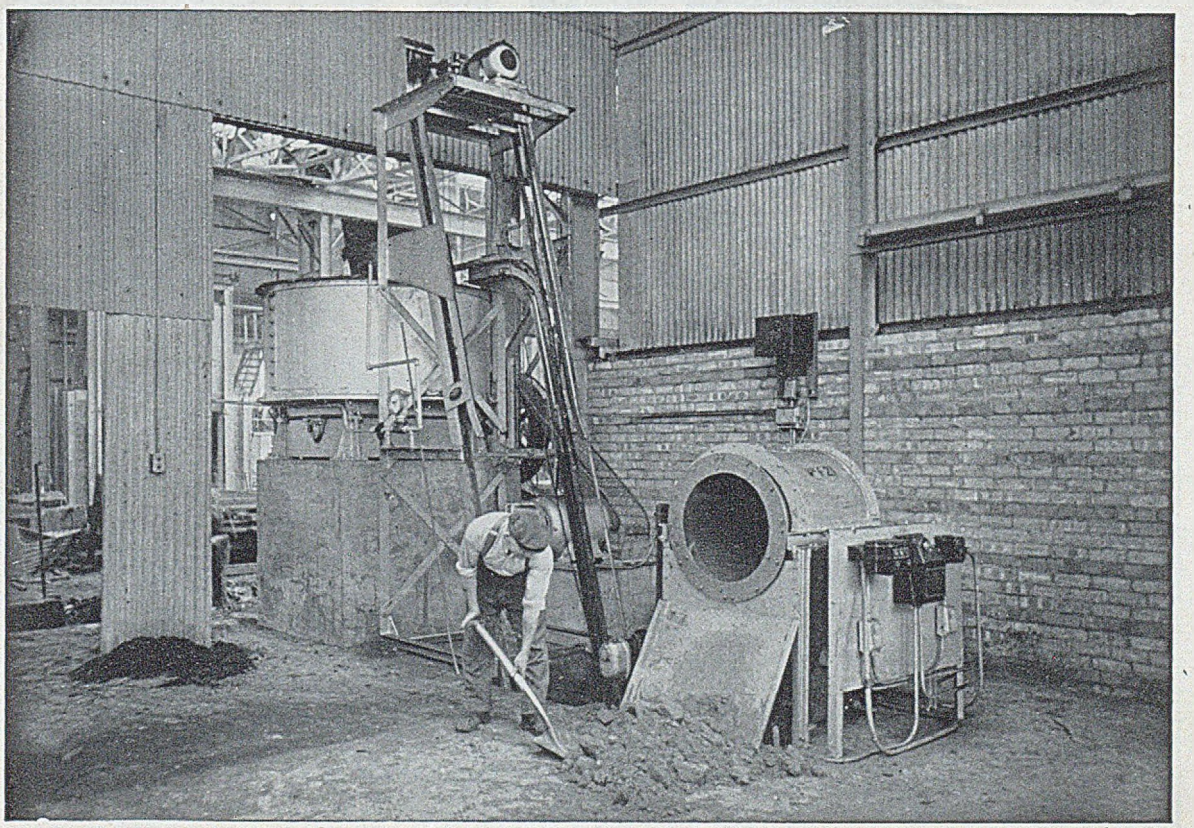
GRAMS: Metallical, West Bromwich

PNEULEC *facing sand plant unit*

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



Built in England by

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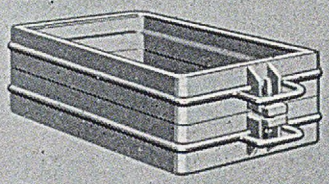
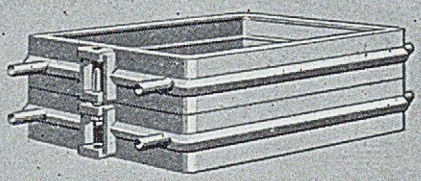
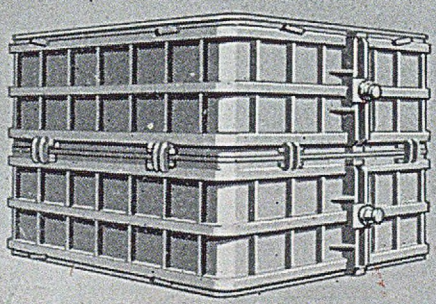


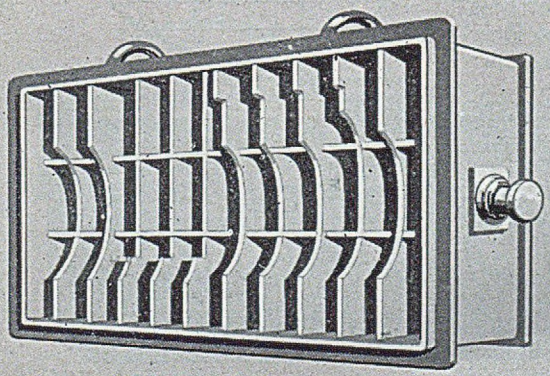
LIGHT WORK - 1 MAN LIFT



MEDIUM WORK - 2 MEN LIFT

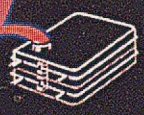


MEDIUM WORK - CRANE LIFT



HEAVY WORK

Sterling



MOULDING BOXES FOR ALL TYPES OF FOUNDRY WORK

seasoned in foundry service

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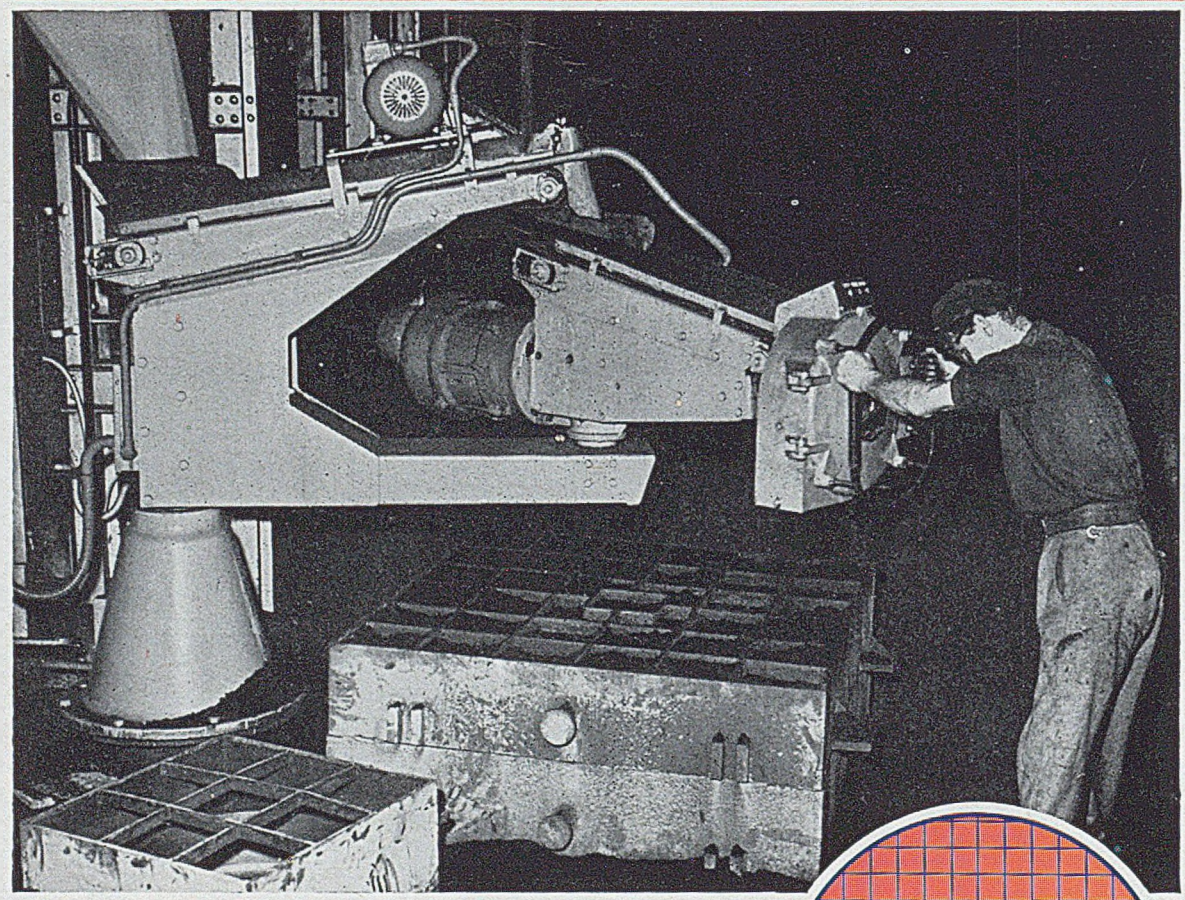
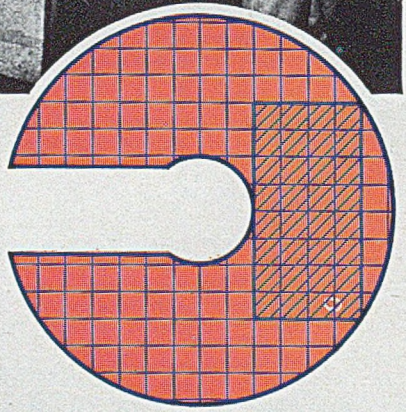
THE JUNIOR SANDRAMMER AT WORK



Ramming a 4 ft. 6 in. square by 2 ft. deep box in a Grey Iron Jobbing Foundry

- Improved design for strength and efficiency
- High output—600 lbs. of sand rammed per minute (maximum)
- Generous box coverage—see diagram
- Equally suitable for repetition or jobbing work
- Supplied with or without Integral Hopper and Feeder Belt
- Skip Loader or Elevator available to form completely independent unit

FE for Foundry Efficiency



Box coverage diagram. Each division represents one square foot. Shaded area represents box 8 ft. x 4 ft.

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LEIGHTON BUZZARD, BEDFORDSHIRE, ENGLAND.

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This crane we want!!

" It must stand up to hard work under severe conditions. We can't afford breakdowns so it must be reliable, and also easy for our own people to maintain, and, of course, the price must be right. Now then, is there such a crane?

" Yes, we would be on a safe wicket with Clayton—their range of overhead cranes goes up to ten tons, and that Micro-Speed Unit of theirs is the very thing for our foundry. As a matter of fact I know of one concern which has over 200 of their cranes and hoists in daily use on most punishing work. I will write for a copy of their crane catalogue and ask them to send their local man round."

Going up everywhere!

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ALL BRITISH HOISTING & HANDLING EQUIPMENT OF ENDURING QUALITY

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SINEX HIGH FREQUENCY VIBRATORS AND VIBRATING SCREENS

3 Ton Model Illustrated

Larger and smaller machines available

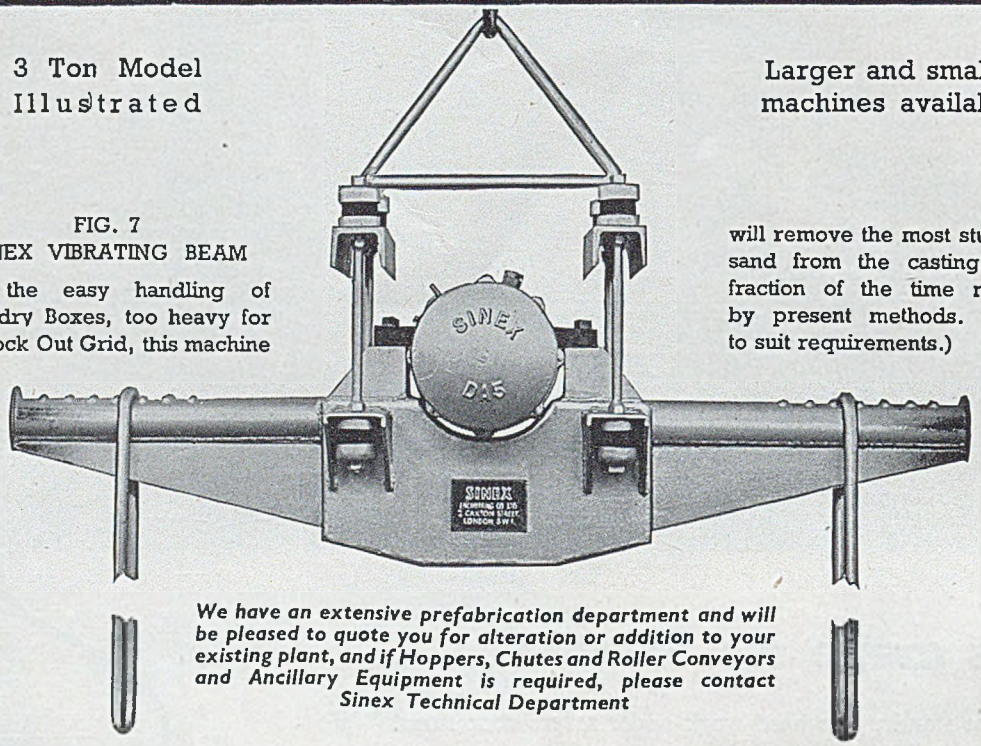


FIG. 7
SINEX VIBRATING BEAM

For the easy handling of Foundry Boxes, too heavy for a Knock Out Grid, this machine will remove the most stubborn sand from the casting, in a fraction of the time needed by present methods. (Links to suit requirements.)

We have an extensive prefabrication department and will be pleased to quote you for alteration or addition to your existing plant, and if Hoppers, Chutes and Roller Conveyors and Ancillary Equipment is required, please contact Sinex Technical Department

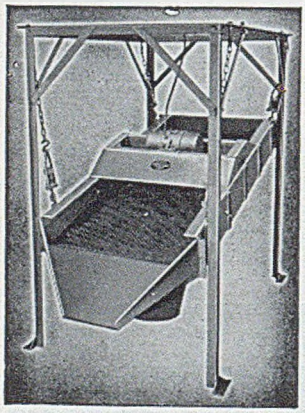


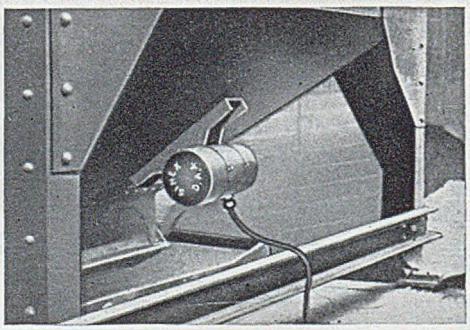
FIG. 10 (on left)

Sinex Vibrating Screen 6ft. × 3ft. Single Deck. Hourly output—15 tons of sand through ⅜in. mesh.

This screen is also manufactured in sizes to suit requirements.

FIG. 8 (illustrated below)

An important function of Sinex High Frequency Vibrators is the application to Sand and Storage Hoppers. To facilitate the rapid discharge of the material, long experience has shown that the fitting of a Sinex Vibrator to a Hopper containing the most stubborn material will avoid "arching" or "funnelling" of the material in the neck of the Hopper and assure a regular flow. Fig. 8 shows a Sand Hopper fitted with Sinex Vibrator. Manufactured in various sizes suitable to the capacity of the Hopper, and wound suitable for any electric supply, single or 3-phase A.C.

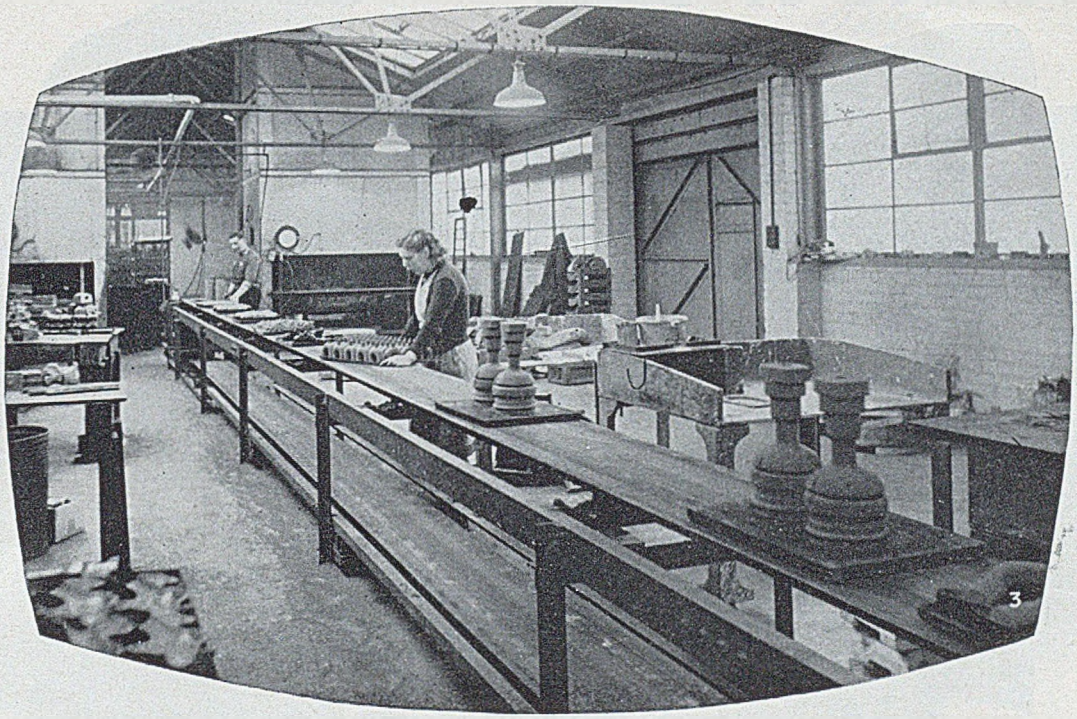


THE **Sinex** ENGINEERING CO., LTD.

Telegrams: VICTORIA 7503 *Telephone: VICtoria 7503-4-5*

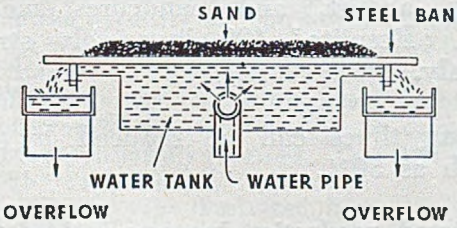
12 ROCHESTER ROW, WESTMINSTER, LONDON, S.W.1

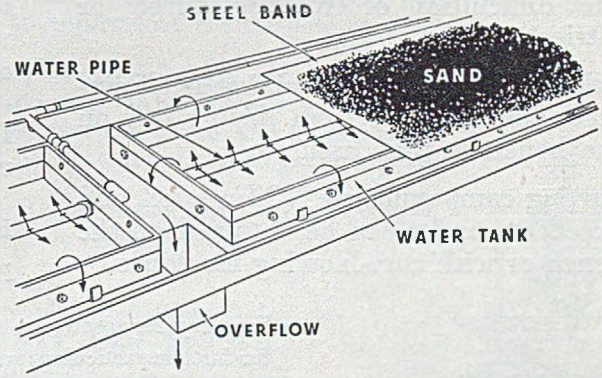
MODERNISE YOUR CORE SHOP . . .



This photograph shows one of our many conveyors conveying cores from the benches to the drying stove.

WITH STEEL BAND CONVEYORS





If you have difficulty with your warm sand adhering to patterns why not cool it on our patented water-cooled steel band conveyor as illustrated by diagrams above and on right.

SSBC

SANDVIK STEEL BAND CONVEYORS LTD

B.F.T. Division

DAWLISH ROAD, SELLY OAK, BIRMINGHAM, 29

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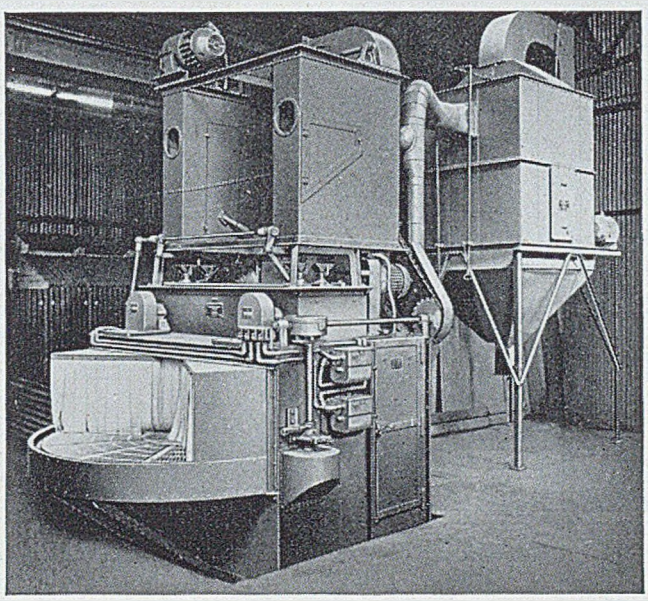
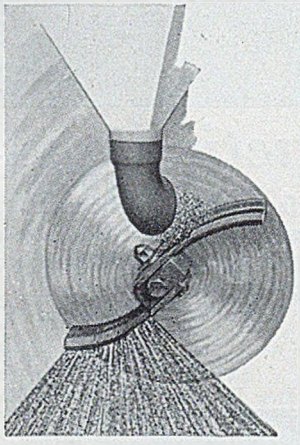
"SAND WIZARD" SHOTBLASTING MACHINES *and*



Rotary Table Type Machine



their service to industry

The high standard of castings demanded today focuses attention on the fettling shop and the necessity for up-to-date equipment to ensure that the cleaning costs are kept at an economical and competitive level.

"Sand Wizard" Airless Shotblasting Machines have for many years provided the efficient answer to this important problem and their faithful service to Industry is reflected in the large numbers in daily use all over the world, and by the repeat orders continually received. One firm alone has recently placed an order for their 27th "Sand Wizard."

Besides the type illustrated, Rotary Barrel and Continuous Machines are available, and are fully described in separate folders available on application.

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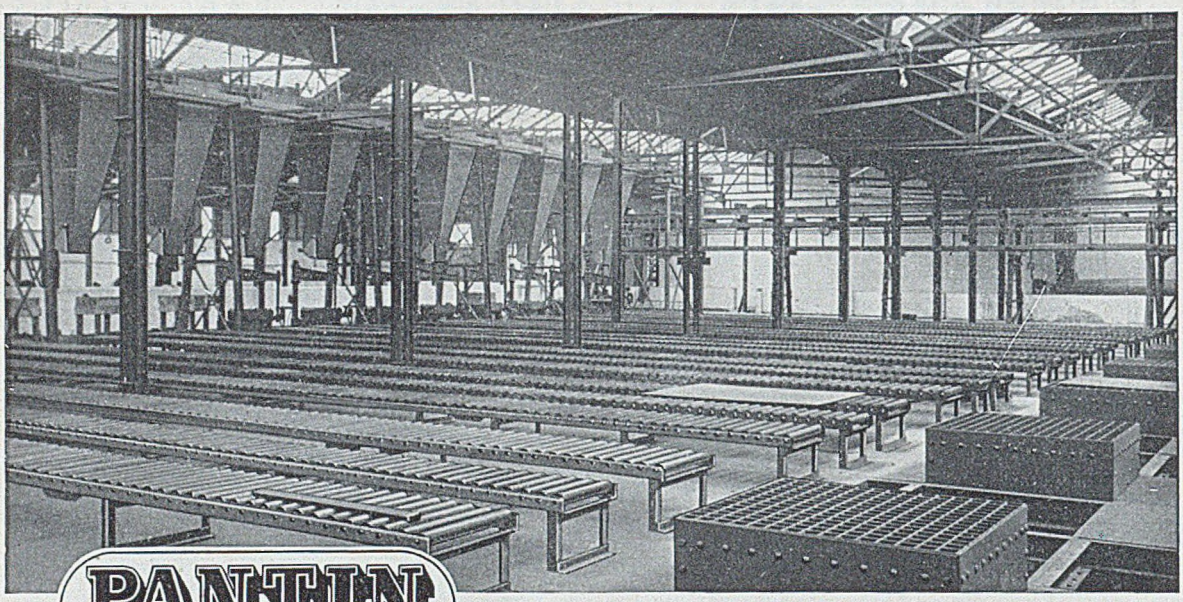
Other Products include: Centrifugal Casting Machines, Core Blowing Machines, Sand Dryers and Mixers, Cupolas, Drying Ovens, Mechanical Chargers, Spark Arresters, Ladles and Rumblers

D



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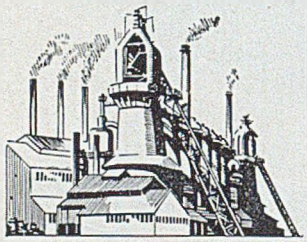
Whatever your product . . . however it is manufactured and delivered . . . you will find a Pantin Conveying System will make tremendous inroads into reducing production costs. The Pantin range of conveying equipment is designed and installed to give trouble-free service over prolonged periods.
For reliable uninterrupted product flow . . . it pays to choose a Pantin conveying system.



Heavy Duty Roller Conveyors

In the handling of the steel products or castings at the mill or foundry, Pantin heavy duty roller conveyors are effecting substantial economies at every stage of production.

Pantin engineers are keen to co-operate in the design of heavy duty conveying equipment to suit your requirements.

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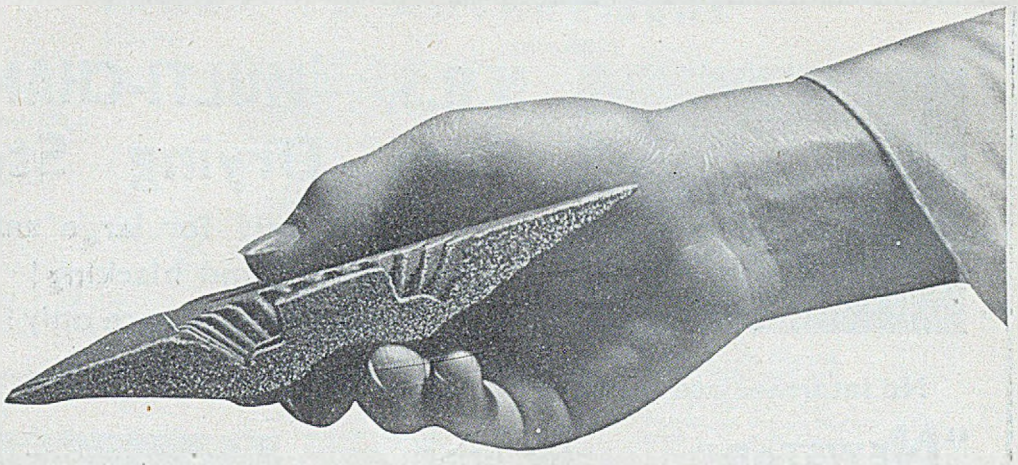
ASSOCIATED COMPANY THE BRITISH MATHEWS LIMITED.



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—a complete resin service from I.C.I.

PRODUCTS 'Mouldrite' PF 422 Resin Binder, Silicone-oil mould lubricant and resin-base wetting agent.

SERVICE based on practical experience with the Sand-shell process over a wide range of metal casting at an I.C.I. foundry, which is carrying out extensive research on shell moulding.

INFORMATION on the uses of synthetic resins in the foundry from the Technical Service and Development Department of I.C.I. Plastics Division.

Send for 'Synthetic Resins for the Foundry'

'Mouldrite' is the registered trade mark of the thermosetting resins manufactured by I.C.I.

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FOUNDRY TRADE JOURNAL

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PRINCIPAL CONTENTS

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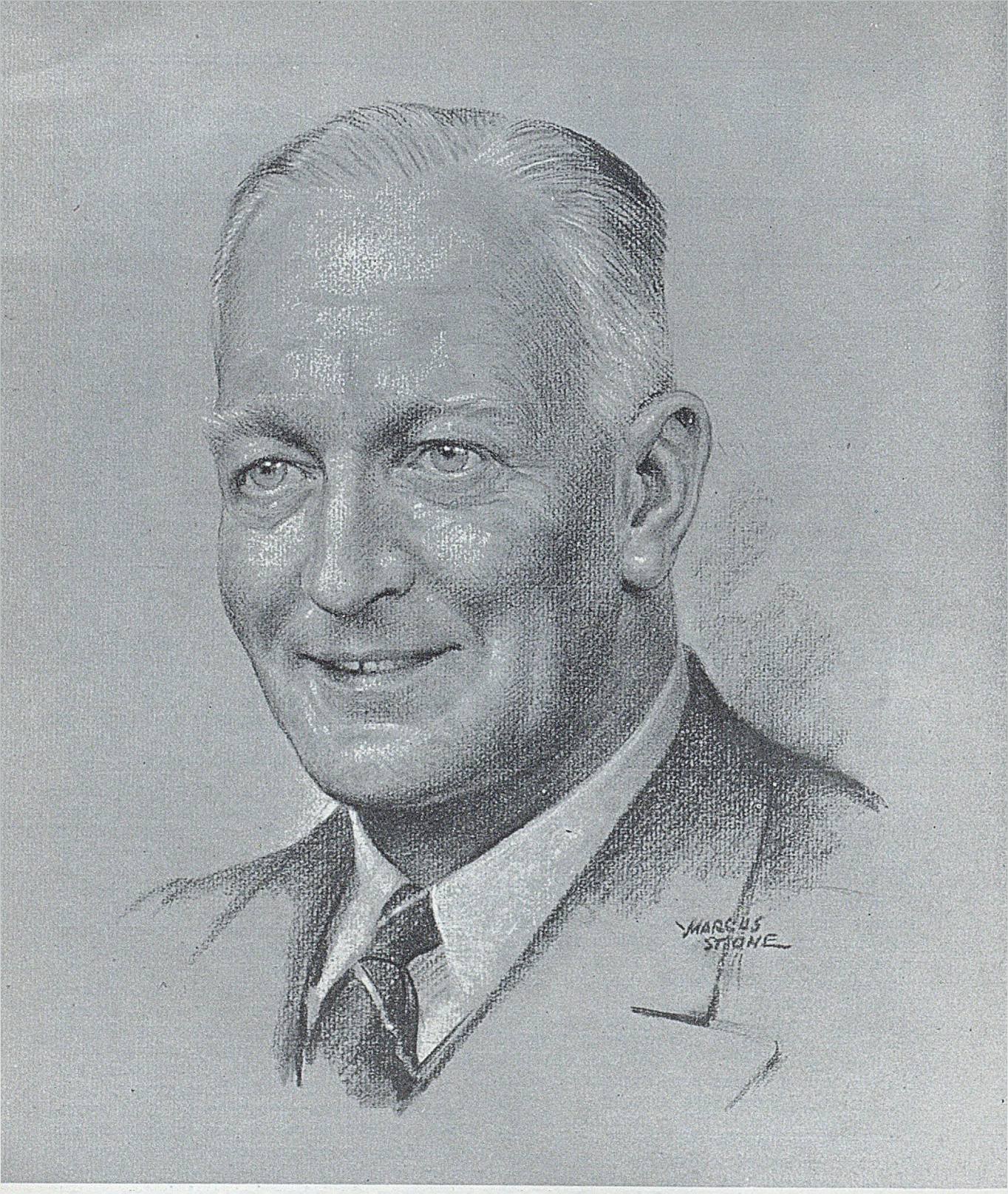
Approach to Increased Productivity

Mr. S. H. Russell as chairman of the Development Panel of the Council of Ironfoundry Associations has made an analysis of the main factors responsible for high American productivity as noted in the reports of the various teams which have visited that country. A Table printed elsewhere in this issue has been prepared covering 58 reports. This Table needs careful interpretation, because there must be numerous cases where, under any one heading, there was no need for comment by the visiting teams, as conditions were the same in both countries. The object in compiling this Table was to stress factors influencing productivity upon which the various teams reported. So far as the foundry industry is concerned, it is the figures derived for the heavy industries which to a large extent apply, as in the case of the foundry there is a higher percentage of skilled men, and fewer "machine minders."

The first lesson to be drawn is the necessity for making the whole of the staff appreciate the need for higher productivity. As most large foundry concerns have their own publicity agent or utilize the services of independent agencies, we suggest the problem be placed before them for solution. It is not an easy one, but we are of opinion that the whole subject of productivity is, in the last analysis, a personal one. For instance, one may cite as an example the case of the mechanization of the motor-car industry creating wide employment in the service stations and garages. Many others also come to mind, which properly presented could have a beneficial effect. The second outstanding factor, listed high in practically all the reports, is the imperative need for the extensive use of mechanical aids. Yet crushing taxation in this country makes the finding of money for the installation of new plant extremely difficult.

However, there are many other factors listed, which can and should receive attention where merited. We should pick, as our number three in the order of importance, modern methods of costing, because sensible people want to know how much money has been saved through any innovation. Only recently, a director of a very large foundry concern on being asked whether his new department devoted to shell moulding was turning out castings—after machining—cheaper than the traditional method, could only give an intelligent guess, as the costing system was only of help after prolonged exploitation. This is all wrong. From a perusal of the Table, there comes to mind a number of subjects most of which are of profound interest to those responsible for the future progress of a foundry business as a whole or one of its departments. Finally, we would point out that 53 per cent. of the reports commented favourably on the progressive attitude of heavy industry management, and maybe the others just took it for granted. There is pressing need for 100 per cent. progressive managements in this country.



MR. R. C. SHEPHERD

Director of Ruston & Hornsby, Limited, Lincoln.

Leaders of the Industry

R. C. SHEPHERD

MR. R. C. SHEPHERD'S career is an example of a metallurgist turning foundryman. Early in his career he joined his present firm, Ruston & Hornsby, Lincoln, and it might well be said that mutual progress resulted. He has risen from being laboratory assistant to occupying a seat on the Board and in the last 20 years the value of the firm's output of castings has multiplied enormously.

Following his education at Smethwick and Birmingham Technical Colleges, he entered the laboratory of E. G. Wrigley & Company, Limited, Smethwick, Birmingham. In the later period of his association with this company he specialized in the heat-treatment of high-speed tool-steels, automobile and tank gears, gauges and other engineering work. In 1920, he joined Ruston & Hornsby as laboratory assistant, and in 1924 was made chief metallurgist and took charge of heat-treatment in connection with the manufacture of oil engines, excavators, motor-cars, tractors, steam engines and agricultural machinery. Subsequently the manufacture of motor-cars, tractors, steam engines and agricultural machinery was discontinued and the company then devoted the greater part of its activities and capital to the rapidly-expanding world demand for oil engines. It must be gratifying to Mr. Shepherd to have been so closely associated with this considerable development programme, and to know that production from foundries with which his life's activities have been linked has contributed so largely to the firm's world-wide reputation.

In 1932, Mr. Shepherd was appointed foundry manager of the company's Lincoln foundry, with an output at that time of some 7,000 tons per annum. In 1934, he was made general foundries manager of the Lincoln and Grantham foundries, the combined output of which has now grown to 25,000 tons per annum. In 1951, he was appointed a full member of the Ruston & Hornsby board of directors, whilst retaining the position of general foundries manager and consultant metallurgist. Mr. Shepherd has always been production minded and, in 1936, first installed a small mechanized moulding unit for making small castings. In 1950, under the guidance of Mr. Shepherd, the company built their latest mechanized foundry at Lincoln (which was fully described in the Press at that time).

Until this year, he was an elected member of Council of the Institute of British Foundrymen, but owing to pressure of business he found he had to resign this appointment, though he still continues to take a most active interest in his local (Lincolnshire) branch, he joined in 1936—and is a member of the Council of the branch. He was awarded the British Foundry Medal of the Institute in 1948. One of the founder members of the Lincoln Engineering Society in 1921, he is their president this year and, incidentally, is the first foundryman to hold this office. In 1946 he was leader of the B.I.O.S. Engineering Grey Iron Team assigned to investigate German grey iron foundries. He has visited foundries in America, France, Germany, Holland and Switzerland and, in 1949, he delivered the official I.B.F. exchange paper to the French foundry association. He has always taken an active interest in the affairs of the B.C.I.R.A. and is a Council member of this Association.

His hobbies are golf and shooting and he is a vice-president of the I.B.F. Golfing Society.

I.B.F. Golf Meeting

Non-playing members of the Institute of British Foundrymen and their wives are particularly welcome at the annual golf meeting to be held at Woodhall Spa, Lincolnshire, from September 26 to 27. All will stay at the Golf Hotel in one party.

Details of the arrangements are as follow:—

The meeting lasts from Friday evening to Sunday afternoon, for which inclusive terms are offered at the hotel.

The standard scratch score is 74 and handicaps are limited to 24. A course allowance will be made, for which purpose competitors are asked to provide a score card of the course on which they are handicapped.

Saturday morning.—This will comprise a medal round of 18 holes; couples will be arranged on a similar handicap basis; the lowest net score returned wins the I.B.F. Handicap Challenge Cup to be held for one year (present holder—Mr. E. G. Evans) and the lowest gross score returned wins the I.B.F. Scratch Challenge Cup to be held for one year (present holder—Mr. M. H. Hillman). The two winners will also be presented with the usual I.B.F. tankard prizes kindly presented by the past-president of the Institute, Dr. Cyril Dadswell. No competitor can win more than one prize in the morning. Ties, if any, will be decided on the last nine holes, or if necessary on the last 12 or 15 holes played; sweepstakes will be divided. There will be a veterans' prize, for which those aged 55 and over are eligible.

Concurrently with this competition, the Coronation Shield, kindly presented by Mr. P. B. Higgins, will be competed for. Teams of three from each branch of the Institute to be nominated by 10 p.m. on the Friday, and the branch team with the lowest net aggregate wins and holds the shield for one year.

Saturday afternoon.—Greensome foursomes against "bogey," under ¾ of combined handicaps for a 5s. per head entrance fee and sweepstake—two-thirds to winners, one-third to runners up. Two "Lincoln Imps" will be awarded to the winners, kindly presented by the Lincolnshire branch. Partners will be drawn on the "sheep and goats" basis.

Sunday, September 27.—Four-ball foursomes against "bogey," ¾ handicaps, partners to be arranged by individual choice, for one dozen golf balls, kindly presented by Mr. Frank Webster; sweepstake arrangements to be the same as for Saturday afternoon.

Green fees of 7s. 6d. per day to be paid to the I.B.F. golf secretary (one round 5s.); starting times—mornings 8.30 a.m. and Saturday afternoon 2 p.m. A time sheet for Saturday morning will be posted in the hotel on Friday night.

Ladies' Competition for the Coronation Rose Bowl, kindly presented by Mr. E. G. Evans—the highest Stableford score wins and the winner keeps the bowl for one year.

Entrance forms and details of accommodation are now available from the hon. secretary, I.B.F. Golfing Society, Mr. F. Arnold Wilson, c/o William Jacks & Company, Limited, Winchester House, Old Broad Street, London, E.C.2.

Members of the Birmingham Association of Mechanical Engineers on June 20 visited the King's Norton factory of Burman & Sons, Limited. The visitors were received by Mr. S. F. Burman, managing director, and Mr. J. W. Day, works director. Mr. Day is president elect of the Birmingham Association of Mechanical Engineers. Details were given of how the factory was built in a great hustle; in September, 1949, the site was a farm; in August, 1950, full production was started.

Fined for Hoist Offences

At Bradford City Court, last week, the engineering firm of John T. Hardaker, Limited, East Bowling Works, Bowling Back Lane, Bradford, were fined £50 for contravening the Factories Act by failing to maintain a hoist in efficient working order, and also an additional £10 because the hoist, used for carrying persons, was not fitted with a gate. The prosecution arose from an accident in which three of the firm's employees, including the foundry foreman and assistant storekeeper, were seriously injured when the rope of the hoist in which they were travelling snapped and the lift fell to the basement some feet below. It was stated by Miss E. J. Forrest, factories inspector, prosecuting, that the hoist gave access from the basement to the ground floor, 9 ft. above, and at the time of the accident the three men were using the hoist which should have been used for carrying goods only. Some three months previously, the firm had been warned that the rope was in bad condition, requiring renewal, but nothing had been done in the matter.

"Country of Origin" Marks

In the Dominions and some foreign countries "British Made" means "Made in the Empire" rather than "Made in Britain," Mr. R. P. S. Bache said at a meeting of the Council of the Birmingham Chamber of Commerce on June 22. Mr. Bache said that he came across several examples in Australia recently of goods marked "British Made" which were made in India or the Far East. He suggested that the words "Made in England" or "Made in Scotland" should be used. Mr. Bache was commenting on a report of the Patents, Trade Marks and Designs Committee which recommended that all imported goods should be marked at the time of importation and sale with the name of the country of origin. The report was adopted by the Council and copies are to be sent to the President of the Board of Trade and the Association of British Chambers of Commerce.

Surface Defects

Mr. Jörgen Drachman and Mr. H. Pettersson have in *Gjuteriet* summarized the paper on "Defects in Castings—Protruding Surface Defects" in the following statement:—

In a fourth part of its report the Swedish Committee on Defects in Castings gives a detailed analysis of the causes of the nine primary defects in the group "Protruding Surface Defects," *i.e.*, rough surface, burn-on, metal penetration, flash, strain, swell, cuts and washes. The problems of burn-on are discussed most thoroughly and two principal causes are distinguished: adherence through a layer of slag and fusing of a layer of sand to the casting through metal penetration.

Forty Years Ago

The FOUNDRY TRADE JOURNAL for July, 1913, was an important issue, for it contained full stories of the annual meeting in London of the British Foundrymen's Association and the first Foundry Exhibition which was organized by the late Mr. F. W. Bridges and held at the Agricultural Hall. It had quite a large number of exhibitors, but they were not quite all strictly foundry equipment companies, yet it was a very representative show. Mr. S. A. Gimson, of Leicester, was elected president of the Association and a new secretary was appointed—Mr. E. A. Pilkington. The membership was then 923.

Norwegian Vanadium/titanium Pig-iron

By J. Sissener

The most important characteristics of Norwegian pig-iron are:—A high carbon content; a high alloy content; low phosphorus and sulphur; composition according to user-specification, and the smelting process which gives a dense clean structure and a cast product of high quality. The high carbon content is a great asset, so this iron is capable of mixing with greater quantities of steel and cast-iron scrap. It is usually accepted that the value of alloy additions is not limited to an increase in strength, but that it is still more important to employ alloys for the definite object of resisting corrosion, high temperature or wear, or even to give increased machinability.

In general, the combination titanium/vanadium is not too well known amongst founders. The cost of vanadium in 50 to 60 per cent. ferro-vanadium is of the order 20s. 6d. per lb. Thus 0.6 to 0.7 per cent. vanadium adds nearly £15 to each ton of pig-iron, ignoring the titanium content, which also is not cheap. However, titanium protects the vanadium from being oxidized in the cupola, and very little remains in the alloy.

It is safe to count upon 80 per cent. of the charged vanadium remaining in the castings. The titanium has a tendency to adjust itself to between 0.07 and 0.10 per cent. in the final castings when 40 to 45 per cent. of this pig-iron is used in the mixes. Titanium even in very small amounts is strongly graphitizing, graphite-refining and deoxidizing. As a graphitizer it has more than twice the effect of silicon. Vanadium is a carbide stabilizer and one of the most powerful alloy additions known for increasing the strength of cast iron and is equally deoxidizing. Moreover, it is highly efficient in increasing wear-resistance.

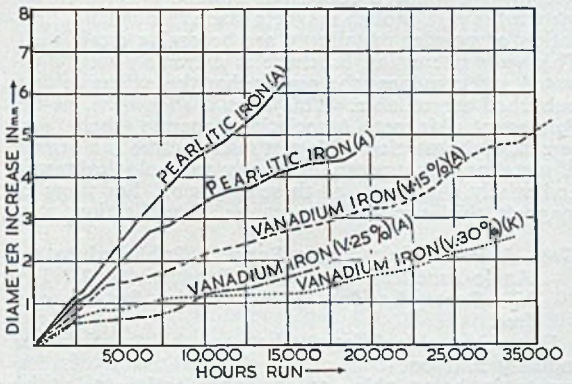


FIG. 1.—*Wearing Qualities of Diesel-engine Cylinder Liners in Relation to Vanadium Content. The Figures relate to the Engines of the Motor-ships Atlantic (A) and Kim (K).*

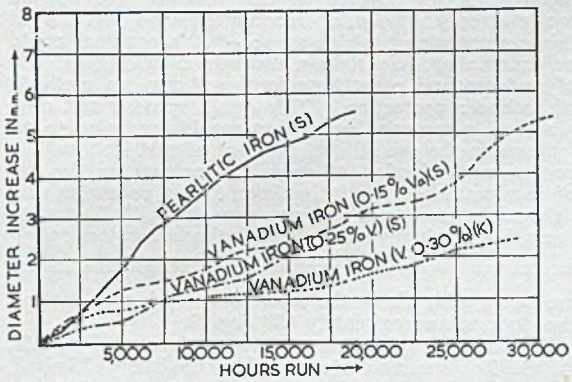


FIG. 2.—*Other Comparative Results for Non-alloyed and Vanadium-alloyed Diesel-engine Liners. Plots (S) relate to the Motor-ship Sildra, and (K) to the Motor-ship Kim.*

Casting Properties

One property of the Norwegian iron not so well known is the low shrinkage of the iron and the freedom from porosity in the castings made from this iron. This is generally accepted by Norwegian founders using this iron. They have far less trouble with shrinkage and porosity than those using only imported iron. The following experience has been obtained with liners containing vanadium and titanium in practical trials in Diesel-engine cylinders. Figs. 1 and 2 show how the wear is notably reduced by increasing the vanadium content in the castings. The graphs show the wear of the liners in the motor-ships Sildra, Atlantic, and Kim. Some of these liners were made with an addition of Norwegian vanadium/titanium iron, and others were made without any alloy additions. This trend is confirmed in an article by C. Englisch.* Fig. 3 is taken from "Vanadium

* "Der Werkstoffbedingte Verschleiss in Grauguss-zylindern von Dieselmotoren." *MTZ*, No. 12, December, 1952.

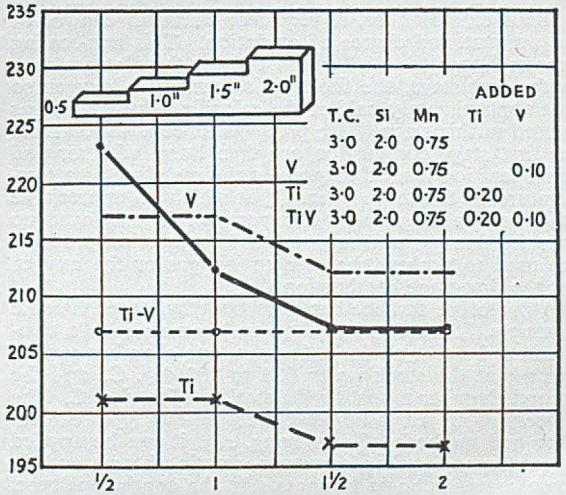


FIG. 3.—*Effect of Vanadium and Titanium on Brinell Hardness of Cast Iron (Vanadium Corporation of America).*

Norwegian Vanadium/titanium Pig-iron

Steel and Irons" and shows the combined effect of both elements. It is shown that vanadium *per se* decreases the hardness differential, at a high level of hardness. Titanium acts similarly, but at a much lower level, whereas the two together eliminate the differential at a reasonably high hardness. With very high carbon and silicon, thin sections of titanium/vanadium iron do not chill readily and large-scale successful use has been made of this combination in such applications as piston rings.

As to tensile strength, the A.F.S. alloy castings handbook indicates that vanadium is particularly helpful when added to irons with less than 3.25 per cent. carbon. Increase of 2.2 tons per sq. in. can be expected with an addition of 0.10 per cent. vanadium. Associated with other alloys and with properly selected inoculation methods, much better results can be expected. A third feature is chill, as a small addition of 0.10 per cent. vanadium affects chilling so much that the Brinell hardness increases from 490 to 510 on the surface. At $\frac{1}{8}$-in. depth the hardness normally decreases to 300, but with 0.10 per cent. added, the hardness is still 480 Brinell at a depth of $\frac{1}{4}$ in. Small additions of Norwegian pig-iron up to 10 per cent. have been used with success in chilled rolls.

The major part of the production of Norwegian pig-iron is exported, reaching all parts of the world, the steel trade and the Diesel-engine field being the largest consumers. Many foundries are finding that this iron, as an additional pig added in quantity of 10 to 20 per cent. to their mixes, helps them to get cleaner and stronger castings.

Non-scaling Furnace

A new process for reheating steel to temperatures up to the 1,250 or 1,300 deg. C. region, with oxidation control, has recently been developed. It is claimed to be the first direct-fired heating system which can heat steel without oxidation or, if required, with full control of the amount and degree of oxidation. This non-scaling process burns the fuel gas in two or three stages and, in the first stage, the fuel gas is burnt with oxygen so that approximately half of the calorific value of the gas is used in this stage. The products of combustion from the first stage combustion are then burnt with air and this operation is used to preheat the metal up to a temperature of 600 to 700 deg. C., at which no appreciable oxidation takes place. Recuperation is employed so that the flue gas and any residual combustion products are used to preheat the combustion gas or the oxygen for the first-stage combustion.

A prototype furnace has been built by Royce Electric Furnaces, Limited, of Walton-on-Thames; it is a two-chamber batch-type forge furnace, one chamber serving to preheat the stock up to 650 to 700 deg. C., and the second chamber reheating the steel to 1,250 deg. C. The process, however, is applicable to various types of furnace and methods of conveying, *e.g.*, it can be applied to continuous pusher, conveyor, rotating hearth and, in some cases, to bogie furnaces. In the continuous type, the chamber is divided into two zones, the final heating zone being fired by the first stage combustion with oxygen, and the products from this first-stage combustion are burnt with air in the inlet zone serving to preheat the stock to approximately 650 deg. C.

This method of heating has been developed by Mr. A. G. Robiette and Metallurgical Engineers, Limited. The licensees for batch and small continuous furnaces are Royce Electric Furnaces, Limited, while Stein & Atkinson, Limited, are to manufacture the large reheating units.

Publications Received

Research. Published by Hadfields, Limited, East Hecla Works, Sheffield.

It is appropriate that Hadfields, Limited, being amongst the pioneers of industrial research, should make known to the public the continuous and noteworthy progress they have made. The beginning made with the discovery and development of manganese steel has ever since animated the direction of the company and this well-presented, and excellently-illustrated brochure tells of the stage now reached. The contents list is illustrated with appropriate symbols indicating where the 21 sections are to be found. Amongst the most interesting departments is the experimental foundry, where tests on such factors as hot-tearing, grain size, feeding and gating are undertaken. The laboratories are extremely well equipped and their description does credit to those responsible for this brochure.

Permanent Magnets. Published by the Permanent Magnet Association, 301, Glossop Road, Sheffield, 10.

It is doubtful if the average foundryman realizes that the making of permanent magnets is, if not wholly, at least very largely foundrywork. An earlier type (as, for instance, the 6 per cent. tungsten steel) was a rolled product, but nowadays much of the material is cast, though magnets made through the application of powder metallurgy are becoming established. This very interesting brochure is extremely well illustrated and convinces the reader that the extensive data published are reliable. This is as it should be, as the Permanent Magnet Association operate their own research laboratories. Magnet manufacture is a branch of metallurgy that possesses its own technological terms, and wisely a glossary of these is given. For users of magnets, this is indeed a most useful publication.

Gas—A Productivity Team Report. Published by the Anglo-American Council on Productivity, 21, Tothill Street, London, S.W.1. Price 8s. 6d. post free.

There is a wide difference between the American gas industry and our own as the former country is fortunate in being able—on a large scale—to utilize natural-gas resources. Yet the two industries have much in common; there are the problems connected with metering; mains; sales and maintenance. For our readers the question of the pipes is of interest and those foundries devoted to this product will not be too pleased to learn of recommendation No. 22 of this current report which says:—"A great deal could be accomplished in Britain towards extending the life of underground plant by adopting American methods of cathodic protection. This could provide not only a saving in material *per se* but would lead also to an increase in the use of steel in place of cast iron, with a consequent reduction of some 50 per cent. in the use of raw material . . . It is claimed that comparatively lightweight steel tube can give a useful "life" of sixty years by relatively inexpensive cathodic protection."

Survey of the Shell-moulding Method of Casting Production*

By Bernard N. Ames

This Paper summarizes and surveys the shell-moulding process and is based primarily on data developed in research and production activities at the New York Naval Shipyard. Data are included herein on the mechanics of the process, metallurgical evaluations of the process, mechanization, plant safety, dimensional tolerance, gating and heading, applications, and economics. It was concluded that the shell-moulding process when used on the proper application is an economical foundry technique which permits the utilization of lower-grade skills; frequently will improve metal yield; and will reduce machine-shop time and cleaning costs.

Introduction

In the last few years, shell moulding, sometimes referred to as the "C" process, has been recognized as one of the major technological advancements in the foundry industry. It is perhaps the first basic change in the method of mould construction since the inception of the foundry art.

The process, although promising, should not be considered a panacea for all foundry ills. Casting defects resulting from improper gating and heading techniques, malpractices in melting, or sand-resin processing, are just as apt to occur in shell-moulded castings as in conventional sand castings unless sound fundamental principles are applied. However, when the proper casting application is selected and the shell-moulding method is utilized correctly in the production of this casting, the process can be an economic tool geared to high production requirements.

History of the Process

A U.S. Department of Commerce bulletin[1] by R. W. Tindula describes that a method of making thin shell moulds and cores for smooth, accurate casting of metals was developed during World War II by Johannes Croning, of Hamburg, Germany. A patent application[2] (No. 48679) was filed in the German patent office on February 1, 1944, which described essentially, the shell-moulding process. The patent application was kept in a secret status by the German Government and copied in microfilm by allied technical intelligence at the end of the war. The microfilm is filed as PB-83891 (in German) at the Library of Congress, Washington 25, D.C. It was reported[3] that the process was in production in a number of places in Germany, particularly for the production of cores. It was indicated for example, that the firm of Haller Werke A. G. in Hamburg-Altona was producing the cores for eight-centimetre hand grenades by the Croning process and had reached a capacity of 6,000 components per day.

The process itself was examined by W. W. McCulloch,[4] a member of a United States technical intelligence team of the Department of Commerce. The detailed report of this inspection was published by the Department of Commerce as F.I.A.T. Final Report No. 1168, dated May 30, 1947. As indicated in Tindula's report, the assignment files of the U.S. Patent Office reveal that J. Croning filed applications for patents[5] dated December 3, 1947, assigned to the Crown Castings Corporation, Philadelphia, Pennsylvania, on foundry moulds and cores from preheated sands and plastics and a process for the manufacture of foundry moulds and cores. At the present time no patents have been granted on either of these applications. Processes employed by Germany during World War II and up to January 1, 1946, are available to industry and not patentable in the United States or any other allied nation. However, patents may be issued of course on specific improvements and an industrial user may not employ such improvements without obtaining a license from the patent holder. However, a company is not charged with infringement until the patent comes into effect on the date of issue. In the interim, intensive development work in this country, which it is estimated has become the subject of hundreds of patent applications, has made this process an economic and useful foundry tool.

Literature Review

Tindula's[1] report lists an extensive bibliography pertaining to shell moulds. This bibliography is repeated in part in this Paper and recent publications which have been published since the date of the U.S. Department of Commerce bulletin have been added. Only those articles which it is believed have technological significance are listed. The majority of these articles deal with the mechanics of the shell-moulding process, the foundry technology involved, metallurgical aspects, mechanization and possible applications.

Raw Materials

The raw materials currently employed in the investment formulation for the shell-moulding process are generally washed and dried silica sands or bank sand containing a small percentage of clay and a "B" stage phenol-formaldehyde resin. Occasionally additive materials such as silica or zircon flour (in the range of 5 to 10 per cent.) are employed to

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

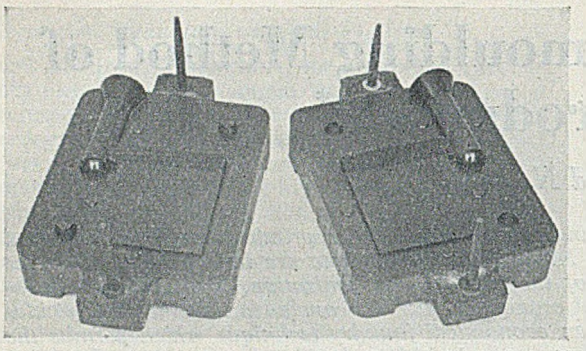


FIG. 1.—*Wedge Patternplates, size* 10 *by* 12 *in.*

improve the surface finish of the casting, particularly in the higher temperature alloys.

Sands which are being utilized for this process range in A.F.S. fineness from 75 to 230 and are either round, angular or sub-angular in grain shape. The clay content should generally be under 3 per cent. and the sand should be low in metallic oxides or fluxing agents. Sands with a wide grain distribution (five or six screens) seem to yield superior finishes, as compared with three-screen sands. As a general rule, the finer the sand, the smoother the resultant surface of the casting. Zircon sands can be employed satisfactorily in this process and will yield a smoother shell mould as compared with the silica sand shell moulds. However, this apparent greater degree of smoothness is not fully transmitted to the actual casting and castings manufactured with zircon sands are not superior in surface finish in all alloys to castings made with properly selected silica sands. In addition their relatively high cost per unit volume may make the utilization of zircon sands impractical except for special applications.

Shell moulding, itself, has opened a wide avenue of investigation on the utilization of numerous types of moulding materials. In many instances it may be feasible and economical, in order to achieve certain properties, to deviate from the use of silica sands as a basic moulding medium and to employ other basic materials.

The amount of resin employed is approximately 5 to 9 per cent. by weight of the sand utilized and is dependent upon the sand fineness and the amount and fineness of the additive employed. As indicated above " B " stage phenol-formaldehyde resins are being used almost exclusively in shell-moulding operations in this country. Phenol-formaldehyde resins may be either a single or two-step formulation. In the former case, the necessary excess of formaldehyde to complete the reaction is contained in the formulation and in the latter case an accelerating material is added, usually hexamethylenetetramine. Approximately 10 to 15 per cent. of the " hexa " is employed. The two-step resins are being utilized almost exclusively since they possess better storage characteristics and shelf life.

In the early stages of shell-moulding development work at the laboratory and shipyard with which the Author is associated, it was found necessary to conduct a long-range series of practical resin tests and evaluations with a view toward determining which group of resins performed most satisfactorily as a bonding agent and to establish the range of properties most suitable for overall shell-moulding operations. A large number of resin products have been tested, evaluated and catalogued. The majority of these resins were of the phenol-formaldehyde class, one-step or two-step type. Tests were also performed upon resins of the melamine-formaldehyde, urea-formaldehyde, melamine-urea-formaldehyde and epoxy resin types.

The method of test and evaluation consisted of:—

(*a*) *Mixing the resin under test with the base sand,* which was in practically all cases a washed and dried sub-angular-grain silica sand of approximately 150 A.F.S. fineness. In the case of the phenol-formaldehyde resins the basic formula for test purposes was 91 per cent. silica sand to 9 per cent. resin although this varied in some instances particularly with other resin types. Mixing of the resin-sand mixture was accomplished in a commercial dough mixer for a period of ten minutes.

(*b*) *Manufacture of a number of moulds,* using a 10 by 12 in. test patternplate (Fig. 1), gated in such a manner as to enhance the tendency of the mould material to cut or wash, and incorporating a number of knife-edge corners for pattern reproducibility evaluations. In moulding, the dwell and cure cycles were standardized, except where a specific recommendation was made by the manufacturer as to the most suitable cycle, or where deviations from the above were found to yield superior results. The test moulds were inspected and evaluated, during the moulding process and after curing, for such characteristics as: (1) Odour; (2) shell thickness; (3) ease of stripping; (4) sharpness and detail; (5) glaze and smoothness; (6) strength; (7) flowability; and (8) tendency to " peel " or drop prematurely. During the later production operations in the New York Naval Shipyard Foundry, an intricate production casting was substituted for the test plate, although the method of test and evaluation of moulds remained substantially identical.

(*c*) *Casting the assembled and bedded test moulds* in an aluminium alloy (Navy Department Specification 46A1, class 3 or Alcoa 356) at 1,250 deg. F. (675 deg. C.); cleaning by soft brushing, and evaluating the casting products for: (1) Sharpness and detail; (2) washing and impingement defects; (3) metal penetration; (4) premature mould failure; and (5) general surface finish. The later tests which made use of the production pattern exhibited a tendency of some resins to promote premature mould breakdown.

The melamine and urea formaldehyde resins tested in accordance with the above programme proved to be inferior to the phenol-formaldehyde types. Moulds made with these resins were characterized by rougher surfaces, excessive edge friability, disagreeable and in some instances toxic odours and comparatively low strengths, while the castings, with the exception of those produced by some melamine resins displayed rougher surfaces, and occasional defects due to premature mould collapse. These resins at present are not considered entirely suitable for shell moulding. A few preliminary tests with

resins of the epoxy group produced inferior shells of poor strength.

The results obtained with the phenol-formaldehyde resins indicated that the most generally satisfactory resins for moulds are those with low to moderate flow characteristics, high melting points and fast cure rates. The most important variables affecting resin suitability are flow, cure, cure rates, melt viscosity and melting point. It is entirely conceivable that resins with different physical properties may be required for certain casting designs. Resin producers are currently making a great deal of progress, since the advent of mechanized equipment, in designing resins for specific production applications. Improvements have been effected in cure rates, flow and anti-distortion characteristics to the point where in most instances selected resins from most producers may be interchanged in production without affecting shell or casting quality. Considerable development work is also under-way in determining, quantitatively, physical property characteristics such as tensile and flexural strength of various resin-sand mixtures in varying concentrations.

Cores made by the shell-moulding process may require resins of different characteristics from those employed for moulds. In the experience of the Author, cores with sharp radii require a resin with longer flow properties to avoid surface tearing. This applies whether the core is made by the "blowing" or "dumping" technique.

Parting Agents

A silicone water emulsion (2 to 5 per cent. by volume) is being utilized almost exclusively on "seasoned" patterns, as a mould release agent. The practice employed by the New York Naval Shipyard is to spray this emulsion on the hot pattern plate after four to five mould halves have been made. In some commercial operations the hot pattern-face is dipped into the mould release solution.

In the initial development work conducted at the Material Laboratory many compounds were investigated by a practical performance evaluation test for their suitability as a mould release agent. Those compounds investigated were:—(*a*) Paraffin wax; (*b*) silicone jelly; (*c*) polyethylene glycol products (*d*) silicone oil and water emulsions; (*e*) polytetrafluoroethylene; (*f*) butyl stearate; and (*g*) finely divided molybdenum in a carrier.

The method of test employed in evaluating the liquid compounds consisted of applying the lubricant to the hot pattern-plate surface by brush coating or spraying and subjecting the patterns to standardized and repetition mould-making cycles. Observations were then made of the following factors:—

(*a*) The relative amount and method of application required for the best performance.
(*b*) Ease of stripping.
(*c*) Cleanliness of pattern surface after stripping.
(*d*) Sharpness of mould edges.
(*e*) Mould smoothness.
(*f*) Number of successful strips for each application.

In the case of the polytetrafluoroethylene product, a preparation which was applied as a semi-permanent fused plastic coat, an additional life-test was performed to evaluate this compound. In general, the silicone group displayed the best performance from the standpoint of ease of application, number of strips per application, cleanliness of moulds and patterns, sharpness of moulds, lack of carbon deposition, resistance to the cycling temperatures involved, and chemical inertness.

The most favourable results were obtained with silicone water emulsion concentrates. The polyethylene glycol products in alcohol and aqueous solutions proved to be undesirable in that considerable sticking was experienced. The polytetrafluoroethylene coat yielded excellent results from the standpoint of stripping ease over a long run during which more than 175 moulds were made and stripped with a single application, but the mode of application is tedious and time-consuming, requiring careful preparation and successive oven-cured coatings. Some difficulty was experienced in obtaining a satisfactory coating on sharp corners. Once applied, however, it is extremely tenacious and resists a 600 deg. F. (190 deg. C.) curing cycle satisfactorily. Ultimate local decomposition, however, and the resultant labour in stripping off the remaining coating in order to fuse a new coating on the patternplate, makes the method generally undesirable. Butyl stearate decomposed readily at working temperatures, accompanied by dense fumes and staining of the patterns. Stripping performance was exceedingly poor. The preparations of finely divided molybdenum in a carrier, applied by spray and by swab, were similarly poor in performance, with considerable mould sticking experienced.

Mechanics of the Process

Basically, the shell-moulding method utilizes the thermosetting properties of phenolic resins to provide a bond material for silica grains in the construction of a mould. The use of urea and phenolic resins is by no means novel in the production of sand cores and moulds. However, shell-moulding techniques are unique in that neither temper water nor additional bond materials are employed. In fact, at the present state of development, a dry, free-flowing mixture is considered essential in the production of shell moulds with good surface qualities.

The equipment necessary in the manufacture of shell moulds may range from the simple "dump-box" rigging as utilized for jobbing operations in the New York Naval Shipyard Foundry and illustrated in Figs. 2, 3, 4 and 5, or to highly-mechanized and fully-automatic machinery. One advantage of the shell-moulding process is that it is adaptable to highly-mechanized operations.

The mould-making operation is neither involved nor difficult and should not exceed two minutes per cycle with the crudest rigging. Metal half patterns and attached runners and gates are utilized which are mounted accurately on metal patternplates, as

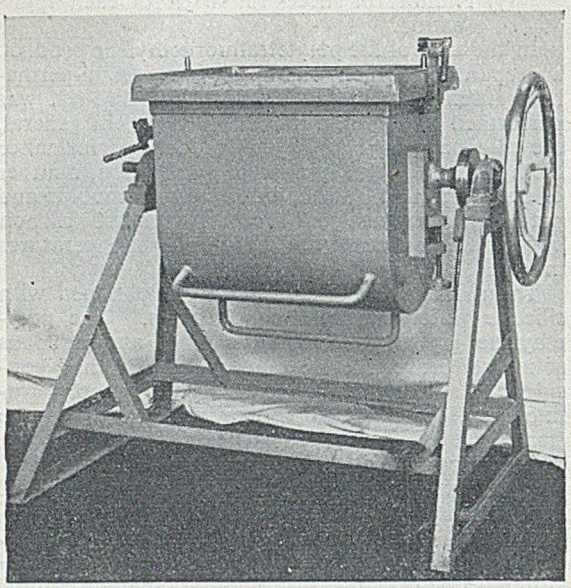


FIG. 2.—*Roll-over Machine, size* 18 *by* 22 *in.*

shown in Fig. 6, in much the same manner as in long-run moulding-machine practice. A set of bevelled bosses on one plate and a corresponding set of cavities on the other make for accurate registration in assembling mould halves, and practically eliminate shifts. In some instances registration grooves deployed around the periphery of the pattern plate are used for assembling mould halves.

The pattern assembly is brought to a suitable temperature for forming the mould in a heating unit or with heating elements. In general, pattern temperatures range from 350 to 500 deg. F. (175 to 260 deg. C.) for this phase of the process and may be heated with strip heater units in a dutch-type oven as illustrated in Fig. 3 or by ceramic gas burners or conventional gas burners. Occasionally, heating elements or gas burners are used underneath the plate and employed with a curing oven in order to maintain the desired temperature head of the pattern material so that a continuous operation may be maintained with one patternplate. In some instances, heating devices underneath the plates are utilized in conjunction with infra-red heating installations for curing the shell mould.

After the patternplate has attained the desired temperature, it is sprayed with or dipped in a mould release agent and positioned pattern down over the " dump-box," as illustrated previously in Fig. 2, which contains the resin-sand mixture. The " dump-box " is then inverted quickly, which causes the investment to fall and envelop the pattern and plate. The resinous binder material melts and flows under the influence of the heat of the plate causing the resin-sand mixture to adjust itself closely to the outline of the pattern, building up a uniform coating as the heat penetrates the mass. After approximately a 6 to 15 second dwell or contact period for a $\frac{3}{16}$ to $\frac{1}{4}$ in. thick shell, depending on the practice employed and the casting design, the patternplate with the coating of set but uncured investment is removed from the dump-box and is ready for the curing operation. It is obvious that in this stage of the process the character of the sand and the flow, melting point, melt viscosity and curing rate properties of the resin are important variables in relation to a specific casting design.

The plate and adhering coating are then placed in a heating unit for curing. For the particular sand and resin combinations employed at the New York Naval Shipyard one minute at 600 deg. F. (315 deg. C.) has been found to be sufficient for curing. At higher or lower temperatures the curing cycle is correspondingly shorter or longer. During curing, the resin component in the investment material is converted into a hard, insoluble plastic which holds the silica grains together strongly. After curing, the half-moulds are stripped from the plate with the aid of spring return stripping pins as illustrated previously in Fig. 4. In some instances, it has been found necessary to place the stripped moulds on bottom boards immediately and to weight them in order to minimize distortion and to reproduce close dimensional tolerances. Mould halves are closed in a variety of ways such as bolting, pasting, spring clamps or by sealing tape and backed up with a vibrated material such as steel shot or sand for casting. Cores can be produced with a cycle very similar to that employed for moulds, the investment generally being blown or dumped into a heated core-box, with the excess mould material being slushed out to provide a thin, hollow core.

It is essential that the shell mould or core be cured uniformly and sufficiently. Undercuring may result in some degree of dimensional instability during the casting operation. The control of the curing operation is best determined by control tests of tensile and flexural strength of the investment mixture. Some operators, however, depend on a particular colour characteristic in determining the degree of cure when the sand and resin utilized are standardized.

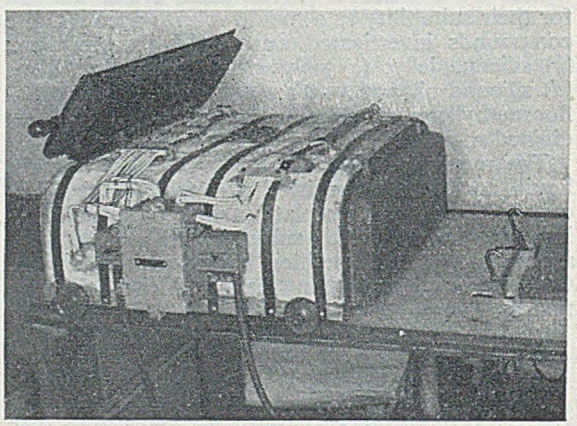


FIG. 3.—*Curing Oven containing Electric Strip-type Heating Elements.*

PROCESS TECHNIQUES

Resin/Sand Blending

The blending of the resin/sand mixture may be accomplished satisfactorily in a variety of ways. Suitable mixtures have been prepared in bakery dough mixers, concrete mixers, pharmaceutical dry blenders and conventional sand mullers. At the New York Naval Shipyard Foundry a conventional type sand muller is utilized for blending. In the operation of this muller for this purpose, the wheels are raised approximately 1 inch from the pan. The pan temperature should not be permitted to reach the point where the resin will flow excessively and start a premature cure. Generally, about seven minutes is sufficient time for mulling although additional time may be necessary if the resin is lumped.

The muller or mixing apparatus if not totally enclosed should be provided with a ventilating hood to prevent dust reaching the surrounding area. In that regard, some studies were made to determine the effect of wetting agents on investment mixes as a means of reducing the resin dusting and segregation encountered in mixing and mould-making. Two liquid phenol-formaldehyde resin types were tested by adding 0.25 to 1 per cent. to the dry base sand, and mulling, before adding the resin bond. Observations were made on the tendencies of the mixer to dust and segregate during and after the mixing cycle. The results indicated that dust production was inhibited appreciably by the addition of 1 per cent. of liquid resin, with little effect noted in quantities of the order of 0.25 per cent. A tendency of the resin-sand mix to lump with liquid phenol-formaldehyde resin was noted but continued mixing abated this condition. Small quantities of kerosene (0.25 per cent.) in the formulations inhibited dust production more successfully than equal percentage additions of the liquid phenol-formaldehyde resins.

Other investigators are currently exploring methods of improving resin efficiency by coating the sand grain with a resin film or a polar compound. While none of these techniques is in current use in volume on production operations, it is believed that ultimately significant reductions in the amount of resin utilized may be effected. Some development work on resin/sand additives was conducted at the New York Naval Shipyard to determine the effect of certain types of additive materials on shell-mould and casting quality. The materials tested were of the following general classes:—(*a*) Silica and zircon flours; and (*b*) iron oxide.

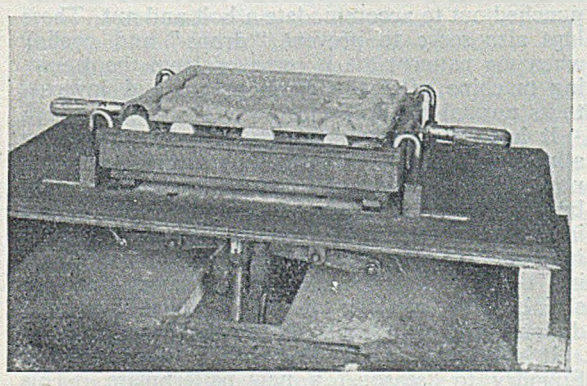


FIG. 4.—*Stripping a Cured Half mould, using Spring-loaded Pins.*

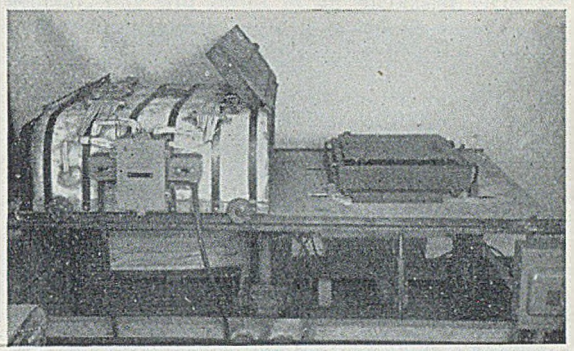


FIG. 5.—*Oven and Stripper-table Unit.*

The results of a series of mould-making and casting tests indicated that there was a slight improvement in surface finish on castings in which 10 per cent. by weight of silica flour had been added to the shell mould. On medium carbon steel castings zircon flour additions of the order of 7.5 to 10 per cent. substantially improved surface quality conditions. Large numbers of production castings have been cast successfully at New York Naval Shipyard in aluminium alloys, grey iron, ductile iron, medium carbon steel and 410 stainless steel in which the indicated zircon flour additions have been made to a base sand of A.F.S. 230 with a resin content of 10.5 per cent.

No significant improvement in surface finish was noted with iron-oxide additions up to 5 per cent. However, iron-oxide additions did appear to benefit resin/sand mixtures which had a tendency to "peel" when the patternplate was inverted after the "contact" period.

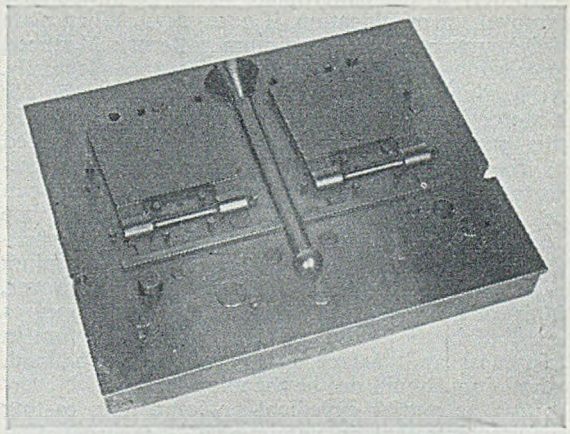


FIG. 6.—*Bronze Double Test-bar Patternplate, size 14 by 18 in.*

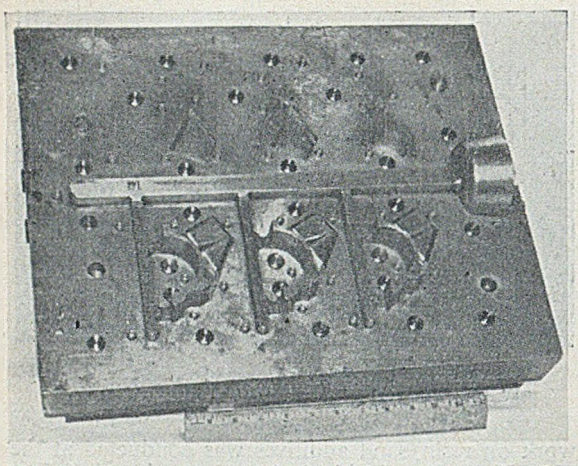


FIG. 7.—*Patternplate 18 by 22 in. for a Motor Bracket.*

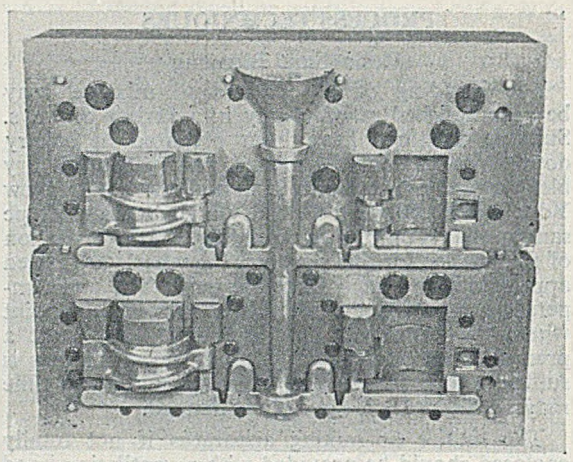


FIG. 8.—*Example of a Gating System for a Typical Ductile-iron Shell Mould.*

Pattern Equipment

The pattern and plate material used principally, to date, in the shell-moulding process are alloy cast iron, the so-called "non-shrink" steels and a heat-treatable copper-nickel-silicon alloy. At the New York Naval Shipyard, cast-iron patterns are preferred and are utilized, wherever possible. Excellent overall performance was obtained with cast-iron patterns, particularly in resistance to "sticking" which is probably due to its high graphite population on the surface. On occasion, hand finished bronze castings were utilized and operated satisfactorily, but proved to be subject to scratching, nicking or swaging, to a degree not normally experienced with iron or steel. Patternplates were made depending upon the design, either by hand finishing cast metal patterns and mounting on a machined patternplate or by machining from plate or bar stock with a pantograph unit. The cycling temperatures developed and practised at the New York Naval Shipyard permitted the use of aluminium sprues, runner bars and risers with cast-iron patternplates. They were attached separately to the patternplate which permitted easy removal for modification, if necessary. When plate weight was a factor, aluminium patterns and ribbed aluminium patternplates were utilized satisfactorily. An example of an all-aluminium patternplate for a motor bracket casting is illustrated in Fig. 7. In this particular casting no draft can be tolerated on the mounting face of the bracket which represents a $1\frac{1}{2}$ inch draw. As little as $\frac{1}{4}$ in. draft can be employed successfully in some patternplate designs where necessary. As many as 1,000 shell-mould halves have been made with this aluminium patternplate and it is still serviceable. However, it is obvious that in view of the temperatures involved in the cycling, wherever the maximum in tolerances and surface quality are to be obtained, aluminium should not be the alloy selected. Nevertheless, as a trial expedient or for certain casting requirements that do not involve large production runs, aluminium matchplates may be utilized.

The patternplate is the heart of the shell-moulding process and must be well engineered if production difficulties are to be avoided. The availability of the right kind of machine tools and of personnel skilled in tool and die or metal pattern making are essential for manufacturing the patterns or effecting quick changes in gating and heading. The patternplate should be ribbed, and designed with uniform sections and sufficient thickness to retain the proper temperature head for setting the investment on a continuous operating basis. Frequently, on single stage machines, electric strip heaters or gas burners are incorporated on the underside of the plate. Generally, rivet-type heads are utilized for stripping pins, and the greater the area of each head, the more efficient the stripping action, provided they are spaced uniformly around the pattern. Stripping pins should be outside the mould cavity and equipped with properly tempered springs, preferably of stainless steel, or a mechanical arrangement for automatic return after the release of the mould. Bolting lugs have also been employed on patterns manufactured at the New York Naval Shipyard. These are illustrated in the patternplate in Fig. 7 These lugs are about $\frac{5}{16}$ inch high and $\frac{1}{4}$ inch in diameter, with a generous draft and can be punched out to accommodate a bolt and nut. These lugs also serve to prevent "drops" and peeling when the patternplate is removed from the moulding machine after the dwell period and inverted to its normal position.

It has been determined that for the aluminium alloys, tin bronzes, cast iron and carbon steels that normal linear shrinkage for the alloy involved may be employed. However, it should be noted that in any precision casting process direct experience involving shrinkage characteristics of different casting designs must be developed, since the total shrinkage in castings will differ depending upon design, size and restraint during solidification.

It is the practice at the New York Naval Shipyard Foundry to "season" a new patternplate. This is accomplished by (1) Removing all grease and oil from the pattern with a solvent; (2) Heating the

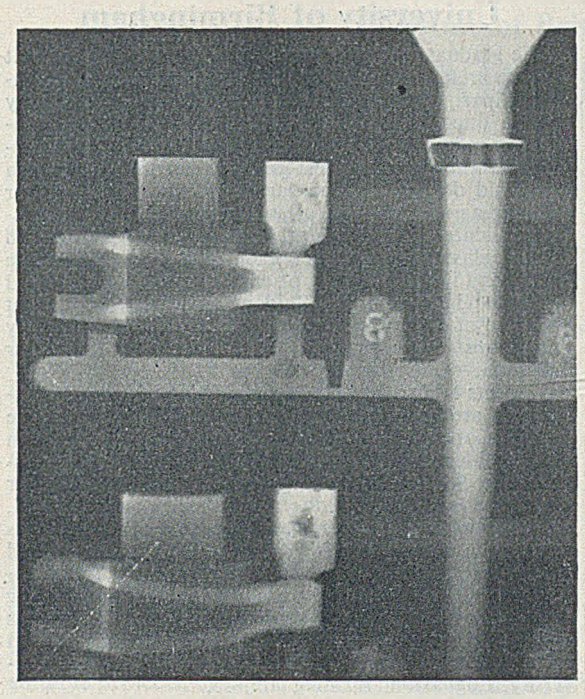


FIG. 9.—*Positive Print of a Gamma-radiograph illustrating Dross Catchers in a Gating System for Ductile-iron.*

pattern to 600 deg. F. (315 deg. C.) and holding at that temperature for 3 to 4 hours; (3) Removing additional grease and oil on face of pattern with a solvent; (4) Applying by rubbing a thin film of silicone grease; (5) Reheating pattern to 600 deg. F., and (6) Manufacturing several moulds which generally are destroyed. Once a patternplate has been seasoned it is cleaned with a solvent at the end of a shift. To prepare it for operation at the beginning of a shift a 50 per cent. solution of a silicone water emulsion is sprayed on the hot face of the pattern.

Gating and Heading

Sound principles of gating and heading cannot be ignored in this casting process, if castings free from objectionable internal defects are to be manufactured. However, the principle difficulty surrounding shell moulding in the early stages of development was that new principles of gating had to be adopted. The pouring rate for shell-moulded castings is considerably increased as compared with green sand castings for the same gating system primarily because of the lessened resistance of the mould wall and increased permeability of the shell. As a result, the best performance for a shell-moulded gating system in all alloys is obtained with areas of sprues, runner bars and ingates which are considerably less in volume than the system ordinarily applied to the alloy involved in conventional practice. Generally, for aluminium alloys, tin bronzes, malleable, grey and ductile iron, choked ingates and the judicious use of dross catchers must be practised at all times. In addition, the volume of riser metal may be reduced for some alloys. In general, this will result in an increased yield for shell-moulded castings as opposed to conventional practice.

Gating methods which provide for pouring moulds on end will lend themselves to the best productive arrangement for supporting the moulds and pouring off either with or without backup. However, there are instances in the aluminium alloys and tin bronzes for smaller castings which are "treed" and poured vertically where penetration is evidenced on the castings in the lower part of the mould. The casting surface generally improves on castings in this category from the bottom to the top of the mould. In some cases, this has been corrected by adding silica flour to the investment formulation or by drastic modification in the gating system. However, it has been found most expedient to pour these castings horizontally. The medium carbon steels produced in shell moulds at the New York Naval Shipyard Foundry are all poured on the flat for optimum results in surface finish.

No specific area relationships for sprue, runner bar and ingate have been decided for all alloys. Generally, however, it has been found desirable to taper the downsprue in an area ratio of 4:1. The runner bar should be greater in area than the sprue and the total area of the ingates should be at least as great as the total runner-bar area. Dross catchers should be provided in strategic locations in the system for the high-drossing alloys. An example of a shell-moulding gating system for a ductile-iron staging clamp casting, which incorporates extensive choking and dross-catching arrangements is illustrated in Fig. 8. The effectiveness of the dross catcher is illustrated in the positive print of a radiograph of this gating system shown in Fig. 9.

An example of increased yield which may be obtained in shell-moulded castings as compared with green-sand castings is shown in Fig. 10 which is a photograph of the master patternplate arrangement for a 0.45 per cent. carbon steel, 12 inch wire rope block sheave wheel. To produce this casting radiographically sound by green sand

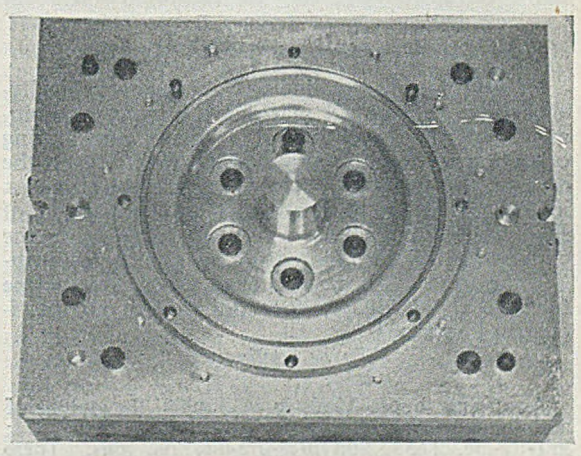


FIG. 10.—*Patternplate 18 by 22 in. for a 12-in. dia. Wire-rope Sheave.*

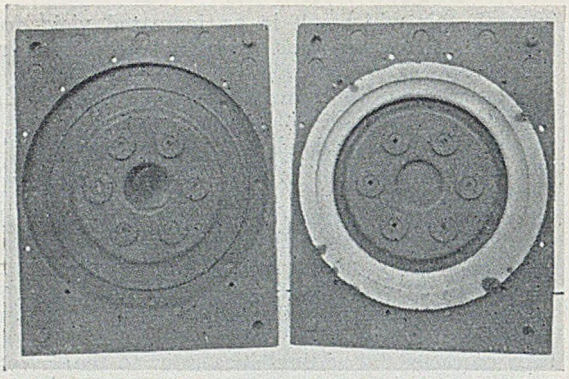


FIG. 11.—*Mould Halves for the Wire-rope Sheave, with a Zircon Core.*

practice necessitated risers on the periphery or chill inserts in the core around the root of the groove. As illustrated in Fig. 11, this casting is currently being shell moulded with a conventional zircon core and no chills.

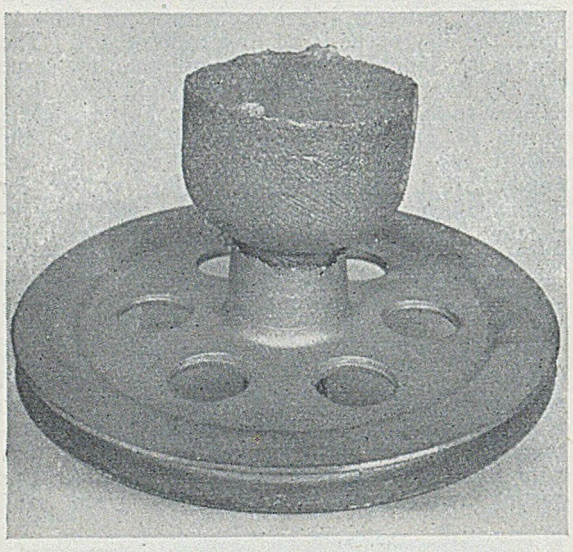


FIG. 12.—*Wire-rope Sheave, As-cast.*

In addition to producing a radiographically-acceptable casting, all machining has been eliminated with the exception of a facing and boring operation on the hub and a filing operation on the root of the groove. This casting, shown as-cast in Fig. 12, is an illustration of an application of shell moulding where improved yield and the elimination of certain machining operations justified the use of this method even though very close tolerances and high surface finish were not particularly important.

(To be continued)

According to the Ministry of Supply, the output of aluminium castings during April was:—Sand cast, 1,571; gravity-die, 2,655; and pressure-die, 792 tons. There were 339 tons of magnesium castings made.

University of Birmingham

The graduate course in metallurgy at the Department of Industrial Metallurgy of the University of Birmingham is part of a national scheme to maintain a supply of men fitted for technical positions of major responsibility in industry. It provides a year's training in industrial metallurgy at a post-graduate standard for men who hold degrees in metallurgy, physics, chemistry, or engineering and who are already engaged in, or proposing to enter, metallurgical industry. Lectures and tutorial classes are given on each of the 30 appropriate topics, and in the majority of cases these will be covered in six to eight lectures. Students are invited to select about 20 of the topics for study during the session. By this means it is possible to cater to a great extent for individual needs and preferences.

Students taking the course are members of the University and are encouraged to take their full share in the activities of university life. On satisfactory completion of the course, students receive the Diploma in Post-Graduate Studies (Metallurgy). The inclusive fee for the course is £71 1s., and the course begins on October 5, 1953. Provision has been made for some of the students to live in a hostel established by the University at Chad Hill, where students from the other graduate schools—mechanical and chemical engineering and engineering production—and research students in other departments and faculties will be in residence. Forms of application may be obtained from the Registrar, Birmingham University, Edgbaston, Birmingham, 15.

Change of Status

"Industry is beginning to conceive itself not as a machine for making profits but as the only means of maintaining the national standard of living," Prof. Humphrey Humphreys, vice-chancellor and principal of Birmingham University said on June 26. He was lecturing on the purpose of education at the opening of the conference of the Midland group of the British Association for Commercial and Industrial Education, at Ashorne Hill, near Leamington.

Industry, he said, was acquiring a sense of vocation which was formerly the preserve of the professions. There was scope for closer understanding between industry and the universities. The United States had boldly faced up to the need for sending business executives to undergo post-graduate courses. The idea was taking root in this country and in July new premises were being opened at Birmingham University.

Plea for More Craftsmen

Employers and trade unions should make a joint effort to see that young people were trained to become craftsmen, said Mr. Douglas J. Ault, secretary of Tangyes Limited, Smethwick, in his presidential address to West Bromwich, Smethwick and District Manufacturers' Association at the annual luncheon on June 25. He suggested that schools and colleges could play a very important part in seeing that young people were adequately informed and enlightened as to the advantages of apprenticeships. Mr. Ault agreed, however, that a hindrance to industry during the past few years had been the present scheme of National Service. He also deplored the continued employment of "surplus" civil servants. If the ability and manpower "wasted through those channels" were used in industry and agriculture, he said, the country's economic position would quickly improve.

Institute of British Foundrymen

TECHNICAL COUNCIL

Twenty-first Annual Report

That only one sub-committee of the Institute of British Foundrymen completed its work during the year ended April 30, 1953, does not reflect any diminution in the activities of the Technical Council and its sub-committees. Most of the active sub-committees have made substantial progress and, at the close of the period under review, one has prepared an interim report for presentation at the annual conference, and four others have reached advanced stages of their work and will submit their reports to the Technical Council during the early part of the coming year.

Scope for New Work

Arising from the anticipated completion of the work of so many sub-committees, the Technical Council expects shortly to be able to embark upon a number of new investigations. In this connection, to enable a wide survey to be made of the most suitable projects, branch Councils have been asked to obtain the views of members on current problems in the foundry industry which urgently call for study.

The resources of the Technical Council have been employed to the fullest extent during the past year. As a consequence, the chairman's advisory panel, consisting of the chairman (Mr. A. E. Peace), Mr. L. W. Bolton, Dr. A. B. Everest and Mr. A. Tipper, has only tentatively reviewed possibilities for future work during this period. A marked increase can be foreshadowed in the activities of the panel during the coming 12 months.

The renewal of the Joint Iron Council grant has enabled expenditure again to be sanctioned for important laboratory and research work at universities, the provision of essential literature, extra clerical assistance and other similar services, which are of immense value in facilitating the work of the sub-committees. The Joint Iron Council's financial contribution to this work calls for the fullest acknowledgment.

Co-operating Bodies

Co-operation on an *ad hoc* basis in matters of mutual interest has continued during the past year with the British Cast Iron Research Association, the British Steel Castings Research Association, the British Non-Ferrous Metals Research Association, the Light Metal Founders' Association, and the Association of Bronze and Brass Founders. It is also pleasing to record that a similar liaison has developed with the technical committee of the British Bronze and Brass Ingot Manufacturers' Association, who have contributed to the work of two sub-committees. The Technical Council looks forward to the continuance of this co-operation when other matters of common interest arise.

The Technical Council wishes to acknowledge the invaluable services of the many members who have represented the Institute on many important external committees, including numerous committees of the British Standards Institution concerned with the foundry industry, the joint I.B.F./B.C.I.R.A. committee on Gases in Cast Iron, and the joint Sands committee, representation on which has been fully maintained during the past year.

The valuable privilege of taking part in technical sub-committee work has again been afforded to a number of students by the provision of financial assistance from the J. W. Gardom Students Fund scheme. The opportunity which this scheme provides to obtain a broader outlook on the problems of the foundry industry is greatly appreciated by the participants.

Earlier Reports

The submission of the reports of sub-committees T.S.23 (Reclamation of Iron Castings) and T.S.26 (Salvage of Non-Ferrous Castings) to the British Standards Institution for consideration as the bases of standard codes of practice was referred to in the preceding report of the Technical Council. The British Standards Institution has not accepted the recommendation as far as sub-committee T.S.23's report is concerned, and a decision has not been reached in the case of T.S.26's report. The ultimate disposal of these reports is therefore a matter which remains to be decided.

It is gratifying to record that sub-committee T.S.35's film (Flow of Metal into Moulds) in addition to having been exhibited at the Buxton and Sheffield conference, has been presented at no less than eighteen branch and section meetings during the past session, and has been loaned to a number of outside organizations and commercial firms. The Technical Council wishes to express its warmest appreciation of the work of the members of sub-committee T.S.35, of which Mr. E. M. Currie is chairman, in discharging the somewhat burdensome duty of presenting the film at so many centres.

Participating Members

The Technical Council also wishes to record its thanks for the efforts of the many members who have advanced the aims of the Institute by taking part in technical sub-committee work, and particularly of the inspiring contributions, of a value which cannot be over-estimated, made by the respective chairmen of the committees. Warmest acknowledgments are also due to the many firms who pursue the policy of allowing members of their staffs to attend meetings and to carry out experiments in their laboratories or foundries. It does not admit of question that the Institute's con-

tribution to the technical progress of the foundry industry would be seriously diminished without this generous assistance of the firms and members concerned.

The resources of Birmingham University, of King's College, Newcastle-upon-Tyne (University of Durham), and of University College, Cardiff, have been extended to the Technical Council on various aspects of technical sub-committee work, and opportunity is taken to express appreciation of the valuable assistance rendered.

It is gratifying to record that a continued demand for the *Atlas of Defects in Castings*, which was compiled by sub-committee T.S.9 and which is now out of print, has resulted in a decision to print a third impression.

Completed Work

The following sub-committee has completed its work during the year: *T.S.* 33—*Pyrometric Method of Investigating the Rate of Solidification of Cast Iron* (*chairman—Mr. J. Hird*).

The summary of the final report of this sub-committee, arising from which the sub-committee T.S.46 has been formed, was published in the January issue of the *Journal*. The sub-committee has now been dissolved.

Work in Progress

Work during the year of the remaining active sub-committees, as well as that of two newly-formed sub-committees, is summarized in what follows:—

*T.S.*24—*Ingates* (*chairman—Mr. F. J. McCulloch*).

Owing to the resignation of Mr. R. C. Shepherd as chairman because of the overwhelming pressure of other activities, this sub-committee has not yet completed the compilation of its report on the work done so far. Steps are now being taken to finalize the work and, when ready, the report will refer mainly to fundamental factors controlling the rate of flow in runner systems and will give actual loss coefficients which have been determined experimentally for several basic runner designs. The practical application of the data has been confirmed by tests on production castings in the foundry. The data are by no means complete. To complete tests on the innumerable known variations of runner design would be, in the opinion of the sub-committee, an impossible task. It is considered, however, that much of the fundamental data given may be capable of being applied, within practical limits, to any runner system. The secondary term of reference for the sub-committee related to turbulence effects within the runner. Preliminary tests have shown that to determine these effects will require an exhaustive investigation and that the effects cannot be divorced from what takes place in the mould cavity.

*T.S.*32.—*Internal Stress* (*chairman—Mr. M. M. Hallett, M.Sc.*).

This sub-committee was formed in March, 1949, with the following terms of reference:

"To investigate the problems of internal stress in castings and to co-operate with Mr. R. A. Dodd of Birmingham University by the provision of assistance and guidance in his work on this subject."

An interim report of the sub-committee was presented and discussed at the Buxton and Sheffield Conference in June, 1952. Since then, work has been completed at Birmingham University on stresses in cast discs of 30 per cent. chrome iron. This gives a qualitative picture of the stress distribution, but the design of the castings appears to have led to much lack of reproducibility in the results. Experience at King's College, Newcastle-upon-Tyne, confirms this. Reports on further work carried out at King's College, on the rate of cooling of the grid test-piece provides some more evidence on the magnitude of stresses due to friction in the mould, while work at the B.C.I.R.A. has demonstrated a substantial reduction in stress in castings made in warm moulds. King's College research workers have undertaken further work in studying the influence of the type of sand on the postulated frictional effects and will also look into the question of different designs of discs. Attention is also being given to the possibility of studying size-effect, by producing grid castings in two sizes of pattern, designed to suit available equipment, determining in each case the internal stresses resulting from progressive changes in the ratio of the volume: area ratios of the outside limbs and the central member of the grid. This will be done by altering the size of the centre member over a range in each size of grid casting. It is hoped that this work will be completed in the Autumn, when it may be possible to compile a final report.

*T.S.*35—*Flow of Metal* (*chairman—Mr. E. M. Currie*).

The members of this sub-committee have been very active during the past year in presenting the film "Flow of Metal into Moulds" at eighteen branch and section meetings. Now that this duty has been discharged, it is anticipated that the sub-committee will meet to consider whether or not to recommend to the Technical Council that the work should be pursued, possibly by the preparation of a further film.

*T.S.*37—*Cast-iron Tests and Specifications* (*chairman—Mr. J. E. O. Little*).

Certain aspects of the British Standards Institution specifications for cast iron having been challenged, the Technical Council in March, 1951, decided—not with the express intention of initiating alterations to the specification, but rather to examine the position as far as concerned the points which have been challenged—to appoint this sub-committee with the following terms of reference:—

"To review the British Standards Institution's test specification for cast iron with special reference to: (i) The transverse test for grey iron, with particular reference to the deflection test and (ii) the relationship of test-bar to actual casting thickness."

The sub-committee has carried out a very considerable programme of investigation and, in the course of its study of the transverse test, an

apparatus has been devised which it is considered enables the plastic part of the deflection to be differentiated easily from the elastic. If a simple procedure acceptable to everyone can be devised, this work may result in recommendations being made to secure improvements in the transverse test. With regard to the tensile test, the specification and testing of thinner sections up to those represented by the 1.2 in. dia. bar are regarded by the sub-committee as reasonably satisfactory. Over this, very few castings are tested correctly, as the 2.1 in. dia. bar is used very rarely on account of the lack of suitable testing machines. If work in progress confirms a provisional view which has been formed, it is likely that the committee will propose that 1.2-in. bars be universally used (providing the composition is such that they are grey) and that a conversion factor to represent heavier sections be adopted.

T.S.38—Copper-base Alloy Castings (chairman—Mr. F. C. Evans, F.I.M.).

This sub-committee has completed one part of its work and an interim report was presented for discussion at the annual conference at Blackpool in June, 1953.

T.S.39—Mould Drying (chairman—Mr. W. J. Colton).

This sub-committee was formed in March, 1951, with the following terms of reference:

"To review the factors involved in the drying and skin-drying of moulds, with special reference to the rate of removal of moisture from the mould surface."

During the year, the sub-committee has carried out a very extensive series of tests and at one stage in the work the opinion of the sub-committee was divided on the likelihood of the investigation having a useful outcome, due to the difficulty of evaluating the results and of securing a reasonable assessment of temperatures. As a result of recent work carried out by the members of the sub-committee, however, what is regarded as a satisfactory means for the assessment of drying has been established, as well as a method of obtaining a definite temperature control point which should result in more fundamental information becoming available. Work is now in progress on tests which combine both sand-face temperature and mould drying.

T.S.40—Atlas of Non-ferrous Microstructures (chairman—Mr. A. Logan, F.I.M.).

In 1951 the Technical Council decided to proceed with a project, which had been under consideration for some time, to publish an atlas of microstructures covering all cast metals. To implement this decision, three new sub-committees were formed, of which the first (T.S.40) has met on a number of occasions during the past year. As a result, the work of assembling the photomicrographs for this, the non-ferrous section of the Atlas, is now approaching completion.

T.S.41—Atlas of Typical Steel Microstructures (chairman—Mr. C. H. Kain, A.M.I.Mech.E., F.I.M.).

This sub-committee, which is charged with preparing the steel section of the Atlas, has completed its work, which will shortly be submitted to the Technical Council.

T.S.42—Atlas of Typical Cast-iron Microstructures (chairman—Dr. Brynmor Jones).

This sub-committee has compiled the cast-iron section of the Atlas and the results of its work are also almost ready for submission to the Technical Council.

T.S.43—Cupola Development (chairman—Mr. E. S. Renshaw, F.I.M.).

Arising from the report of sub-committee T.S.36, the Technical Council in December, 1951, appointed this sub-committee with the following terms of reference:

"To investigate the hot-blast system, carburization, desulphurization, water-cooling and combinations of these."

As a first step in one of the aspects of the sub-committee's work, a questionnaire was issued to firms operating, or expected in the near future to operate, hot-blast cupolas, with the object of securing information for the foundry industry on the chemistry and operation of this type of plant. It will be some time before all the information expected is available. Other subjects which the sub-committee is studying include carbon pick-up, the effect of calcium-carbide additions to the cupola, refractory linings and water-cooling. In some of these matters the sub-committee is conducting practical experiments.

T.S.44—Receivers (chairman—Mr. S. J. Sargood).

The appointment of this sub-committee, which was formed in December, 1951, also arose from the report of sub-committee T.S.36. Its terms of reference are:—

"To review the value and effect of receivers, including tapping systems and slag-handling and disposal methods."

This sub-committee had made considerable progress when, due to promotion to another appointment which demanded his full-time attention, the chairman, Mr. C. S. Johnson, found it necessary to resign. At this stage, from the point of view of construction and operation, most types of receiver, the Freier-Grunder spout, the syphon brick, and some methods of wet slag collection had been critically considered and the merits and disadvantages of the various items had been assessed. From this review a number of practical points of value had emerged. The sub-committee had also outlined a programme of further work to complete its study of the subject, but circumstances have only recently permitted the appointment of a new chairman in the person of Mr. S. J. Sargood, with the prospect of an early resumption of the work.

T.S.45—Non-ferrous Quality Test (chairman—Mr. A. Logan, F.I.M.).

As a result of suggestions made at the Buxton and Sheffield conference, this sub-committee was formed in September, 1952, with the following terms of reference:—

Technical Council Report

"To investigate the possibility of developing a suitable fracture test or other quick routine test for assessing melt quality of copper-base and aluminium-base alloys."

The sub-committee has made a careful survey of the literature of the subject and some practical work on fracture tests is now in progress.

T.S.46—Mould Materials (chairman—Mr. J. Hird).

Arising from the report of sub-committee T.S.33, this new sub-committee was formed in September, 1952, its terms of reference being:—

"To investigate the effect of mould materials on the cooling rate in the solidification range of cast metals, with particular reference to cast iron."

Preliminary tests have been carried out at Birmingham University to establish a method of obtaining constant ramming densities and initial tests are already completed in a study of the variation of solidification time and ramming density and different plate thicknesses with hard and soft ramming. Further tests are now in progress with synthetic and natural sands, using ramming density as the main variable.

Election of Chairman and Vice-chairman, 1953-54

At the March meeting of the Technical Council, Mr. A. E. Peace and Dr. A. B. Everest were unanimously nominated for re-election as chairman and vice-chairman respectively of the Institute's Technical Council for the year 1953-54. These nominations were unanimously approved and adopted at the meeting of the Council of the Institute held on April 18.

The Report is signed by Mr. A. E. Peace, chairman.

Fines for Buying Scrap at Excess Price

At Tipton Magistrates' Court, recently, Mrs. Livia Doris Pearson, trading as Henry Pearson, of Critchlow House, Dudley Port, Tipton, appeared on 18 summonses for selling scrap metal in excess of the controlled maximum price. The New Garter Foundry, (1926), Limited, of Groveland Road, Tipton, faced 18 summonses for buying scrap metal from Mrs. Pearson at excess prices. In all cases there were pleas of guilty.

Mr. S. W. Smith, defending, said Mrs. Pearson was not familiar with the prices. Her son, who dealt with those matters was in the Army. As regards the New Garter Foundry, said Mr. Smith, more than 60 men might have been thrown out of employment if the metal had not been obtained. Mrs. Pearson was fined a total of £61 with £5 5s. 0d. costs and the New Garter Foundry (1926), Limited, were fined a total of £100 with £10 10s. 0d. costs.

ON JUNE 20, Rolls-Royce, Limited, Derby, held their 38th annual children's field day and sports; about 20,000 people attended the Welfare Sports Ground, near Osmaston Park Road, Derby.

EUROPEAN FOUNDRYMEN will be pleased to learn that the tornadoes which recently struck Cleveland, Ohio, have done but little damage to the local foundries or injury to their personnel.

Birmingham Safety and Efficiency Exhibition

Organized by the Birmingham Industrial Safety Group, with an exhibition committee under the chairmanship of Mr. R. Bramley Harker, H.M. Superintendent Inspector of Factories, and with Mr. A. G. Cogswell (Dunlop Rubber Company) as hon. secretary, the 1953 Safety and Factory Efficiency Exhibition was opened at Bingley Hall, Birmingham, on June 19, by the Lord Mayor of Birmingham (Ald. G. H. W. Griffith) and remained open for one week.

Believed to be the largest display of its kind in the world, the exhibition followed the pattern of a successful one held in 1951 which attracted more than 10,000 visitors in four days. The scope of this year's show was extended to cover all aspects of safety, efficiency and health in industry. Some 50 manufacturers of safety and industrial health equipment demonstrated their products, and in addition 30 stands were occupied by member firms of the Birmingham Industrial Safety Group, illustrating the practical application of safety measures in their respective factories.

A wide range of industrial accident-prevention products included many exhibits of special interest to foundrymen. W. Canning & Company, Limited, exhibited an interesting polishing motor with safety sleeves and dust-extracting unit, and also a chrome plating vat with exhaust fan, and ducting, showing the method of withdrawing fumes away from the operator.

Exhibiting features of the safety measures adopted within their organization, Joseph Lucas, Limited, included a display of mechanical-handling equipment. The "Beanstalk" and the "Giraffe" mobile hydraulic working platforms shown by William Moss & Sons, Limited, were claimed to provide the answers to many "access" problems.

In addition to safety devices on machines, the exhibition included protective clothing and appliances and surgical and medical aids. Glasses, and goggles, mitts, aprons, footwear, and so on, were shown. Of interest to foundrymen were gauntlet gloves and the special helmets. In addition there were hand creams and anti-dermatitis unguents useful in employee welfare and a large number of exhibits covering such subjects as factory-roof painting, glass cleaning, scaffolding, containers for acids, and non-slip covers for ladders.

The exhibition coincided with a special week-end congress on safety and factory efficiency. Lord Llewellin gave the presidential address and later speakers included Sir Charles Bartlett, chairman, Vauxhall Motors, Limited; Sir George Barnett, H.M. Chief Inspector of Factories; while Mr. W. G. Tucker, president, Birmingham Metallurgical Society, Inc., took the chair at a session when Mr. S. G. Broom, personnel manager, Sir W. G. Armstrong Whitworth (Aircraft), Limited, spoke on "The Supervisor." Some 4,000 young people at school and about to enter industry visited the exhibition, and various associated bodies arranged lectures, meetings, film shows dealing with the aspects of safety. Competitions were organized for apprentices, young workers and students and the educational aspect of safety was the keynote of the entire exhibition.

MR. JUSTICE SHEIL, in the Northern Ireland High Court last week, approved a settlement giving £2,350 damages to John Wallace, foreman moulder, of Belfast, in an action arising out of an accident at work in which Wallace had his left arm severely injured when he slipped and caught it in machinery. The defendants were James Mackie & Sons, Limited, foundry proprietors, Belfast.

Council of Ironfoundry Associations

ANNUAL REPORT

[*Abstract*]

The following has been culled from the annual report of the Council of Ironfoundry Associations which has recently been issued:—

The year 1952, although it has again been marked by a record output of iron castings, has been a difficult period for many ironfounders owing to the acute shortage of raw materials in the early part of the year, and the sharp decline in important sections in the later months.

Iron and Steel Bill

Throughout the year the executive committee and council, in consultation with the constituent associations, have given earnest consideration to the Government's plans for the iron and steel industry. These proposals included the repeal of the Socialist Government's Iron and Steel Act and the creation of a statutory Board similar to that which had existed in 1946-48 under the chairmanship of Sir Archibald Forbes. The Minister of Supply stated in Parliament in November, 1951, that such a Board could embrace the whole industry, and he promised to consult the organizations concerned. The president of the Joint Iron Council—in which body the Council of Ironfoundry Associations and the Council of Iron Producers are equal partners—was shortly afterwards asked by the Minister for the Joint Iron Council's views on specific questions. In the preparation of the replies to these questions, the chairman and the C.F.A. representatives serving on the Joint Iron Council executive took a full part. The chairman and other members of the C.F.A. executive committee accompanied the president of the Joint Iron Council in subsequent interviews with the Minister.

The policy adopted by the Joint Iron Council was based on the following considerations:—

(1) To support the Government in its attempt to free the whole iron and steel industry (including 23 per cent. of iron-castings production and virtually the whole of the foundry pig-iron production) from State ownership.

(2) To support the Government in its efforts to produce a solution which would remove the whole industry permanently from the field of party politics and which would gain the support of public opinion generally.

(3) To safeguard the raw-material requirements of the ironfounders and so far as possible to ensure that their interests would not be subordinate to those of the steel industry.

(4) Within the framework of the Government's proposals to ensure that the freedom and initiative of the industry were properly safeguarded.

(5) To preserve the essential unity of the industry in the partnership between the ironfounders and iron producers which was proving so benecifial to the ironfounders in their struggle for raw materials at that time, and in meeting the common problems which would inevitably arise under the new regime.

The early discussions between the C.F.A. representatives and the Minister were necessarily conducted within bounds of confidence imposed by the Minister, and while it was not possible therefore to acquaint all member-firms fully with the details of these discussions, the Council members received reports at all the material stages and were almost unanimously in support of the action taken; and in accordance with the C.F.A.'s constitution, each association was free to decide the manner in which the essential features of the negotiations were communicated to its own executive body or members generally.

The broad considerations which had emerged up to the date of the publication of the Government's White Paper on the Iron and Steel Industry (Command 8619) were as follows:—

(1) The Government's intention to include iron castings among the activities to be "supervised."

(2) The Government's wish to meet so far as possible the industry's desire for adequate representation on the Board.

(3) The Government's expectation that the Board would not be likely in view of past experience to attempt to bring iron castings generally under price control.

(4) The Government's expectations that only very few, if any, ironfounding development schemes would qualify for review by the Board.

(5) That the powers of the Board would stop at iron castings and not extend into the field of engineering.

Immediately on its publication in August, copies of the White Paper were sent to the Council members and the secretaries of the C.F.A. associations, and a summary was printed in General Bulletin No. 70 and sent to all member-firms. It will be recalled that the main feature of the White Paper as affecting iron foundries was the setting up of an Iron and Steel Board with statutory duties and powers, and that the Board would supervise all of the main processes, including "the casting of iron and steel by any process." The Council met in September to discuss the White Paper and then agreed not to oppose the inclusion of iron castings as such but to make appropriate representations as to the specific provisions of the Bill when these became known. The whole subject was discussed at the annual convention of the Joint Iron Council on October 9 when almost 200 representatives of individual firms were present. As unanimity of view was not reached the matter was referred back to the Council; after full consideration by constituent associations a special meeting of the Council took

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place on October 30, at which by a substantial majority vote the C.F.A. policy was endorsed and the Minister was informed accordingly. At the same time representations were made to him for:—

(*a*) Exclusion of iron castings from price control by the Board, and (*b*) inclusion on the Board of a member with ironfounding experience.

Subsequently, further discussions with the Minister took place and additional representations were made with reference to clause 6 (a more precise definition of the class of development proposals for which the Board's consent would be required, it being assumed from his statement in the House of Commons that few foundry development schemes would come into that category); clause 31 (definition of production facilities to exclude if possible, plant or machinery), and clause 13 (drastic amendment of the proposed powers of the Board to obtain information). The member associations were invited to notify the C.F.A. of any further suggested amendments to the Bill.

The debate on the Second Reading of the Bill was held on November 25 and 27, and the Second Reading was carried by 36 votes.

On December 8, a statement on the proposed amendments to the Bill received from associations was submitted to Council and on January 2 the chairman of the C.F.A. notified all member-firms of the Minister's agreement to the following amendments to the Bill:—

(1) *Prices:* The Board's power to determine the prices of iron castings not to go beyond those which were subject to control when the White Paper was published in July 1952. These powers not to be extended without Parliamentary sanction.

(2) *Development Schemes:* The power of the Board to call for the submission of development schemes and withhold consent not to apply to ironfoundries.

(3) *Information:* Clause 13 to be completely revised on the following lines:—

(*a*) The Board to have power to call for information on such matters as production, capacity and raw materials consumption. For price-control purposes only, the Board to be empowered to ask for information relating to costs and call for an auditor's certificate if required.

(*b*) The Board to have no power of entry or inspection except that the Minister may at the Board's request, for the enforcement of price control and development provisions only, authorize an examination of books and records.

(*c*) The penalty of imprisonment to be removed, and the monetary penalties to follow those in the Statistics of Trade Act.

A number of employers' associations in the engineering and allied trades were opposed to the Government's policy to include iron foundries within the scope of the Bill and continued negotiations with the Minister under the ægis of the Federation of British Industries. Eventually a meeting took place between the Minister and the representatives of 18 employers' associations, which resulted in the unanimous conclusion that, short of excluding the iron and steel foundries from the Bill, the Government's revised proposals would remove, as far as possible, existing anxieties and objections. The text of this statement was published in the Press on January 14, 1953.

Government amendments covering the various undertakings given by the Minister have been introduced at the Committee Stage and adopted at the Report Stage of the Bill. The various stages have been completed according to an agreed timetable, and it seems likely that the remaining stages will be completed by June, 1953.

Member-firms have been advised of developments through the Bulletins or by letter, according to circumstances. The executive committees of both the C.F.A. and the Joint Iron Council have met at frequent intervals for consultation throughout the period of negotiation.

Joint Iron Council

The eighth annual report of the Joint Iron Council's executive committee was distributed to the members of all C.F.A. Associations in October. In the second half of the year, the executive committee was largely occupied first with the Government's White Paper on the iron and steel industry and then with the Iron and Steel Bill which was published in November. It also continued its work in connection with the supply of raw materials both to the blast furnaces producing foundry pig-iron and to the iron foundries.

The steering committee has continued to assist member-firms to obtain building licences for the extension or modernization of iron foundries, and its work is reviewed in a later section of this report.

Development work undertaken by the C.F.A. for the industry as a whole has been supported by grants from the Joint Iron Council. A substantial grant has been made to launch the C.F.A.'s advertising campaign to increase the use of iron castings. The report ("Training for Ironfounding") on the C.F.A. "Recruitment, Training and Education" Conference held at Ashorne Hill in March, 1952, was financed by the Joint Iron Council. Financial support has been given to the British Cast Iron Research Association and to the Institute of British Foundrymen, which are both affiliated to the C.F.A. The National Foundry Craft Training Centre and the National Foundry College have also received considerable assistance.

Annual Banquet

The annual dinner was held by invitation of the Lord Mayor of London (Sir Leslie Boyce, K.B.E., himself an ironfounder) in the Guildhall; 630 members and their guests, the latter including many eminent public figures, attended, and the historic pageantry in the noble surroundings of the Guildhall provided a memorable occasion. The principal speakers were the Lord Mayor and the Minister of Labour and National Service (Sir Walter Monckton).

Modernization of Iron Foundries

The steering committee of the Joint Iron Council has continued its work of advising member-firms

on schemes of foundry modernization or extension and of recommending them to the Iron and Steel Division of the Ministry of Supply—the Government department responsible for the issue of building licences. At the beginning of 1952, there was a Government ban on new industrial building other than for matters of urgent national importance, and this restriction continued for a few months; even when the ban was officially removed there was still considerable difficulty in getting official support for some schemes in their entirety. The restrictions on capital expenditure unfortunately applied to some of the amenities schemes proposed by larger foundries, who were asked either to postpone or to reduce the cost of their licence applications.

The restrictions have been considerably relaxed since the end of 1952; but the fact that there have been official obstacles in the way of ironfounders wishing to improve their amenities and working conditions has been a considerable irritant to employers at a time when the physical conditions in the industry were being criticized and when, indeed, a Bill was before Parliament which would require the drastic reconstruction of many existing iron foundries. The pronounced shortages of raw materials in the earlier months of the year had a bearing on the issue of building licences, and the Ministry of Supply scrutinized closely all applications which appeared to require larger supplies of raw materials; and although building licences were issued in some cases, successful applicants were warned that additional supplies could not be guaranteed.

Since the end of 1952, with the prospect that pig-iron might be taken off licence and with the likelihood that the building licensing position would also improve, members of the steering committee have considered whether their routine work could be discontinued. The committee's advice has been available to all member-firms, and most of them have found that support given has helped considerably to obtain authorization for their building plans. How long this procedure can continue to offer any advantages to member-firms is uncertain, but they can be sure that this voluntary advisory work will be relinquished as soon as possible without disadvantage to members.

In 1952, the Ministry of Supply sponsored 382 applications from iron foundries for building licences, with an estimated expenditure of £2,678,559; of this expenditure, amenities were expected to account for £119,592. From October, 1946, (the date when the old Iron and Steel Board began the investigation of ironfounding schemes) up to December 31, 1952, the authorized expenditure of the ironfounding industry on licensed modernization and amenities schemes is estimated to be £17,606,929.

Working Conditions

The expenditure on modernization schemes and amenities reported in the previous paragraphs is one measure of the considerable progress which has been made in the industry to improve working conditions, along the lines which were recommended in the "Garrett Report" in 1947. The Minister of Labour and National Service, Sir Walter Monckton, when formally opening new ironfoundry baths at Thorncliffe, Sheffield, in April, praised the efforts of the industry in providing good amenities. The statement by H.M. Chief Inspector of Factories in his annual report published in February that there are grounds for satisfaction in the overall picture of improvements achieved so far in ironfounding conditions is well merited in the case of member-firms. Nevertheless, there has been sustained pressure from several quarters, since the "Garrett Report," that greater improvements would be accomplished more quickly under the compulsion of Government Regulations. The accident rate in iron foundries was advanced as evidence of the need for additional measures to protect the safety and welfare of all those occupied in the industry. This subject was several times mentioned in Parliamentary questions, and in December a Private Member's Bill entitled "Foundry Workers (Health and Safety) Bill," presented by Miss Herbison and eleven other members, was given its Second Reading.

The Bill, which had been hastily drafted and which was based substantially on various recommendations in the "Garrett Report," was opposed in detail by the constituent associations of the C.F.A., because some of its clauses were considered to be either unnecessary, or premature, since they would be incapable of enforcement. The latter objection applied particularly to the clause dealing with the suppression of dust and fumes. The C.F.A. urged upon the Minister of Labour that a measure of this kind ought not to be pushed through Parliament without reference to the industry itself, and the Parliamentary Secretary offered to consider the making of Regulations if the sponsors of the Bill would withdraw it. This offer was refused by the sponsors during the second reading and the Bill was due to come before a Standing Committee of the House of Commons in January, 1953. As a matter of urgency, the constituent associations of the C.F.A. were asked to appoint representatives to an *ad hoc* committee which would examine the Bill in detail with a view to submitting drastic amendments, and steps were taken to bring the matter to the urgent attention of Members of Parliament.

Member-firms will be aware that almost immediately before the Committee Stage, Miss Herbison did agree to the withdrawal of the Bill on an undertaking from the Ministry that "Draft Regulations" would immediately be published for the consideration of both sides of the industry, in accordance with the procedure laid down in the Factories Act, 1937. The Draft Iron and Steel Foundries Regulations, 1953 (the steel foundries had now been brought into the scope of the Regulations) were published on January 30, 1953, and the C.F.A. and other foundry employers' organizations were asked to submit their comments to the Minister by March 31, 1953. The *ad hoc* committee has worked hard for the amendment of the Draft Regulations, in close collaboration with the constituent associations and with other interested organizations such as the Engineering and Allied

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Employers' National Federation, the National Light Castings Ironfounders' Federation and the British Steel Founders' Association. The committee considered that two of the Draft Regulations (that dealing with the suppression of fumes and dust, particularly in the knock-out; fettling and dressing operations; and the one dealing with the installation of baths) should, at the least, not be brought into effect until a date considerably later than January 1, 1954, which is the commencing date proposed for the bringing into force of those Regulations. The Council will consider the *ad hoc* committee's recommendations at the annual meeting in March, 1953. Every member-firm will be provided with a copy of the C.F.A.'s amendments before they are sent to the Minister.

The Council has received a request from the Joint Standing Committee on Conditions in Ironfoundries that ironfounding employers should be encouraged to set up works safety committees with the object of reducing the rate of accidents in foundries. The Council is in sympathy with this proposal and it agreed to appoint a small safety sub-committee to advise the Council on this subject. However, the pressure of work arising from the Iron and Steel Bill and the Foundry Workers (Health and Safety) Bill—both of which measures covered safety and welfare—has delayed the appointment of this committee. The Management Bulletins frequently print information on accident prevention organizations and accidents in industry.

Joint Standing Committee on Conditions in Ironfoundries

The Joint Standing Committee on Conditions in Ironfoundries which was set up in 1947 to advise H.M. Chief Inspector of Factories, and on which the C.F.A. has two representatives, has met regularly to discuss matters concerned with safety, health and welfare, and is collaborating with the foundry atmospheres committee of the British Cast Iron Research Association, to which reference is made later in this Report.

The Joint Standing Committee is considering the application of local exhaust ventilation to various processes in ironfounding and has investigated in detail the stand-grinder; results of work completed on a new type of ventilation for a 14-in. dia. wheel were published in a paper, illustrated by a film, presented by Mr. W. H. White and Mr. W. B. Lawrie to the Institute of British Foundrymen (London branch) in September. Problems of dust control at the knock-out, and the general ventilation of foundries, are being studied, and the Building Research Station is assisting in some of the experimental work, which will include a survey of atmospheric conditions in a foundry which has installed a Swedish type of roof. Attention has been given to the presence of carbon monoxide in foundries, particularly in the vicinity of cupolas and arising from mould dryers; fumes from core-binders; and possible health hazards resulting from the use of pitch. The committee has considered various types of foundry accidents, especially those occurring to eyes and feet and burning generally, and has invited the Council to consider how works safety committees could best be set up in order to promote accident-prevention work in the industry.

Development

The necessity has not lessened for the ironfounding industry, as one of the nation's basic manufacturing industries, to develop and apply all possible measures to increase its efficiency. The Government, through the National Production Advisory Council on Industry and through Ministerial pronouncements, has reiterated the need for increased exports, and the growth of competition in markets overseas emphasizes the factors of quality and lower costs. Voluntary collective action within the industry itself is undoubtedly the surest and quickest means of continuing the progress which has marked the industry in the post-war years, and although in recent months the Development Panel has been concerned mainly with consolidation of its work, fresh activities have been considered and the Panel has reviewed the whole of its terms of reference.

The British Productivity Council, formed in November, 1952, to carry on the work of the Anglo-American Council on Productivity, has been working out ways and means to continue the national campaign to increase industrial efficiency and has expressed its intention of collaborating with existing organizations. The Board of Trade has recently announced the allocation of "counterpart funds" from the Mutual Security Agency's Economic Aid scheme, to assist schemes associated with efforts to increase productivity, and the official statement on this matter suggests that professional management and other academic bodies will be asked to carry out research into factors affecting the efficiency of the national economy.

The Development Panel has continued its meetings with constituent associations, and has extended its encouragement to ironfounders to form small costing groups. In September the Panel issued for the Council several thousands of copies of a leaflet on the economical use of pig-iron and coke, intended for study by foremen and shop-floor workers. The widespread publication of information in this way undoubtedly helps to eliminate wastage. The chairman of the Panel presided over the "Recruitment, Training and Education" Conference held in March and the Panel has given special consideration to problems of training for management. In August, the Anglo-American Council on Productivity issued a Press statement (which was extensively quoted) describing the results of the industry's efforts to implement the recommendations of the Productivity Team.

At the request of the operational research team committee of the British Cast Iron Research Association, the Council was able, through the Development Panel, to assist in the preparation of a pamphlet advocating the wider use of the team's services. The document is designed to explain in greater detail than has hitherto been available the aid to be obtained from this source. It is intended for distribution to all iron foundries. Subject to the

approval of the final text by the team committee and the Council of the British Cast Iron Research Association, publication will take place in May or June, 1953.

Output in 1952

The output of iron castings in 1952 again set up a record for the industry. In the 53 weeks of the year it was 3,830,737 tons. The equivalent for 52 weeks is 3,758,146 tons. The increase over the previous year (which was 3.75 million tons) is the smallest since the end of the war. The position in comparison with the steel industry has been the reverse of 1951. Iron castings production rose by 7.6 per cent. from 1950/51, while steel ingot and castings production fell by 4.0 per cent. Comparing 52-weeks periods, from 1951/52 iron castings production rose by only 0.15 per cent., compared with 3.0 per cent. for steel.

Apart from normal seasonal fluctuations, the general trend of output, which had moved steadily upward in 1951, reached a peak in the first half of 1952 and then fell sharply. In the last quarter there was a partial recovery, with production running almost 4.0 per cent. below the level of the first half of the year. Although raw-materials shortages were pronounced in the earlier part of the year, the lower level of production in the second half resulted from a fall in demand for various types of castings, so that some sections of the industry have felt the recession more sharply than others.

Table I shows that pipes and ingot moulds have not shared in the demand difficulties, in contrast to the declines for the other categories. The share of output for automobile castings fell in the second and third quarters, but there were signs of a recovery in the last quarter. Similarly, building and domestic castings, which had declined in relative importance through the year, showed a recovery in the last quarter. The main drop in the engineering and jobbing foundries' share of output only came in the last quarter, and railway-equipment castings showed a further decline then. Thus, although some sections have continued to expand and some others show signs of recovery, it seems that the industry's post-war expansion, in which all sections shared fairly evenly, has come to a halt. Particulars of output of iron castings according to product and destination are given in Tables II and III.

Raw Materials

In the early months of the year, many iron foundries were handicapped by shortages of raw materials, notably of particular grades of pig-iron,

TABLE I.—*Composition of Iron Castings Production (Percentages).*

—	1st half, 1952.	2nd half, 1952.
Automobile	7.83	7.29
Building and domestic	14.35	14.14
Pipes	15.59	17.13
Engineering and jobbing	45.08	43.46
Ingot moulds	7.88	8.98
Railway equipment	9.27	9.00
Total	100.000	100.00
Of which malleable	3.85	3.94

TABLE II.—*Output of Grey-iron and Malleable-iron Castings in 1952 (53 weeks) according to Product.*

Product.		Grey cast iron.	Malleable cast iron.
		tons.	tons.
(A) *Automobile*—			
Motor and cycle industry castings: Cars and commercial vehicles (including engines)	1	217,619	60,745
Cycles and motor cycles	2	6,933	3,872
(B) *Building and domestic*—			
Stoves, grates, ranges and cooking apparatus (gas)	3	37,409	27
Stoves, grates, ranges and cooking apparatus (electric)	4	8,484	3
Stoves, grates, ranges and cooking apparatus (solid-fuel fired)	5	121,481	50
Castings for other domestic appliances, *i.e.*, refrigerators, irons, etc., including electric and gas	6	12,663	210
Hot-water boilers, radiators and radiator fittings	7	71,834	328
Baths, sanitary cisterns, and other sanitary goods	8	77,583	67
Builders' ironmongery not elsewhere specified, and hollow-ware	9	10,931	1,311
Bedsteads and furniture trades' castings, and piano frames	10	8,209	49
Municipal castings—manhole covers, gratings, paving and floor plates, etc.	11	78,981	370
Rainwater, hot-water and soil pipes and gutters	12	114,761	1
(C) *Cast-iron pipes*—			
Cast-iron pipes and fittings, and malleable cast-iron fittings	13	611,027	16,427
(D) *Engineering and jobbing*—			
Marine castings for turbines and parts	14	8,932	363
Other marine engines and parts	15	68,212	295
Deck and hull auxiliary machinery, propellers, etc.	16	30,794	450
Dockyard plant and harbour machinery	17	4,318	106
Prime movers for land :—Turbines and parts	18	22,163	29
Gas, oil and steam engines and parts	19	84,133	349
Boiler fittings, firebars, boiler-house plant and auxiliaries	20	75,713	306
Colliery castings	21	40,205	1,498
Electrical-industry castings, *i.e.*, generators, switchgear, motors, fans, etc. (excluding castings in lines 4, 6 and 23)	22	78,041	8,772
Cases for small switch and fuse boxes, meter cases and similar castings	23	18,577	1,712
Gas-producer and gasworks' castings	24	35,059	336
Chemical plant	25	26,325	289
Agricultural implement and machinery castings	26	157,373	14,311
Food machinery—sugar, flour, biscuits, etc.	27	22,215	273
Textile-machinery castings	28	142,639	1,902
Sewing machines—industrial and domestic	29	18,732	153
Printing machinery, paper-making, etc.	30	28,045	86
Clayworking, cement-making and quarry plant and machinery	31	24,797	446
Pumping machinery—compressors, etc.	32	37,885	367
Valves, valve bodies and covers	33	49,332	1,073
Transmission machinery and equipment	34	25,666	359
Machine-tool castings, including jigs, tools and dies	35	213,559	4,096
Cranes, lifting and conveying appliances	36	36,071	4,215
Iron and steel works plant	37	84,600	1,711
Rolls for mills	38	51,047	27
Other iron castings not elsewhere specified	39	247,374	20,840
(E) *Ingot moulds*—			
Ingot moulds and ingot bottoms for steel and non-ferrous industries	40	322,689	—
(F) *Railway equipment*—			
Locomotive castings	41	50,225	196
Tunnel segments	42	17,104	1
Chairs, sleepers, spikes, plates, etc.	43	190,557	27
Carriage and wagon castings	44	82,869	785
Sundry railway equipment	45	7,873	265
Total	46	3,681,639	149,008

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and the Council received a large number of appeals for assistance. The pressure of demand slackened somewhat towards the middle of the year, and in the latter half, it is probably true to say, there were adequate supplies in most grades of materials to meet the needs of all members.

An inspector of iron foundries was appointed in March, 1952, by the Ministry of Supply to visit foundries to ensure that the raw-materials licensing schemes of the Ministry were correctly understood and operated. It was to be the duty of the inspector to report any serious irregularities to the Ministry, who would prosecute if necessary. No reports have been received of any prosecutions, and some member-firms have, indeed, expressed their appreciation of the advice of the inspector.

Pig-iron

The Ministry of Supply announced early in the year that it was considering a separate licensing scheme for hematite pig-iron to deal with the acute supply shortage. The C.F.A. was consulted by the Ministry and after representations had been made by those sections of the industry mainly affected by the proposals a modified scheme was introduced. This extended the pig-iron licensing period for malleable iron founders to six months in order that the latter could buy reasonable quantities of suitable grades of low-manganese hematite irons as these became available. The Ministry of Supply made an order in September, 1952, to permit the duty-free importation of pig-iron for one year.

According to the Ministry of Supply figures, the total receipts of pig-iron in iron foundries were 2,490,000 tons in 1952 (53 weeks). The equivalent

TABLE III.—*Annual Production of Grey-iron and Malleable-iron Castings, 1948 to 1952, and Details of the Main Fields of Consumption. (Figures for Gross Tonnages of Ingot Steel are Added for Comparison.)*

Year.	1948.	1949.	1950.	1951.	1952.*	Comparison, 1952 with 1951.	
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Per cent.
Total production of grey-iron and malleable-iron castings	3,283,001	3,388,121	3,486,892	3,752,451	3,830,737	+ 78,286	+ 2.1
Malleable cast iron only	125,119	120,447	129,511	142,571	149,098	+ 6,527	+ 4.6
Ingot steel production	14,877,000	15,553,000	16,293,000	15,638,000	16,418,000	+ 780,000	+ 5.0

MAIN FIELDS OF CONSUMPTION.	Tons.	Per cent. of total.	Tons.	Per cent. of total.	Tons.	Per cent. of total.	Tons.	Per cent. of total.	Tons.	Per cent. of total.		
1. Building and municipal (pipes, gutters, manhole covers, baths, sanitary goods)	206,205	6.28	236,275	6.97	255,671	7.33	263,072	7.01	271,763	7.09	+ 8,691	+ 3.3
2. Cooking and heating apparatus, including radiators	207,843	6.33	207,591	6.13	227,829	6.53	247,817	6.60	239,616	6.26	— 8,201	— 3.3
3. Other domestic appliances	15,573	0.47	12,801	0.38	15,822	0.44	16,298	0.43	12,873	0.34	— 3,425	—21.0
4. Pipes and fittings for gas, water, sewage, etc.	491,714	14.97	545,253	16.09	572,197	16.41	589,556	15.71	627,454	16.38	+ 37,898	+ 6.4
5. Coal mining, quarry, clay and cement plant	63,473	1.93	61,962	1.83	56,204	1.61	62,037	1.65	66,946	1.75	+ 4,909	+ 7.9
6. Gas production	33,227	1.01	34,284	1.01	34,587	0.99	34,635	0.92	35,995	0.94	+ 1,360	+ 3.9
7. Electricity generation and distribution	98,015	2.98	100,387	2.96	95,060	2.73	109,912	2.93	107,102	2.80	— 2,810	— 2.6
8. Motor-car and cycle industry	214,523	6.53	215,748	6.37	269,726	7.74	294,157	7.84	289,169	7.55	— 4,988	— 1.7
9. Railway equipment	316,405	9.64	321,799	9.50	277,638	7.96	330,871	8.82	349,902	9.13	+ 19,031	+ 5.8
10. Shipbuilding and docks	120,925	3.68	115,053	3.40	102,878	2.95	109,518	2.92	113,470	2.96	+ 3,952	+ 3.6
11. Prime movers (turbines, engines) for land use, and transmission machinery	92,852	2.83	102,439	3.02	115,540	3.31	131,728	3.51	132,699	3.46	+ 971	+ 0.7
12. Boiler-house plant for industry, etc.	72,880	2.22	74,687	2.20	72,911	2.09	74,709	1.99	76,019	1.98	+ 1,310	+ 1.8
13. Agriculture and food processing	194,805	5.93	178,033	5.25	198,342	5.69	213,833	5.70	194,172	5.07	— 19,661	— 9.2
14. Machine tools	175,575	5.35	170,813	5.31	180,257	5.17	202,711	5.40	217,655	5.68	+ 14,944	+ 7.4
15. Textile machinery	157,890	4.81	146,845	4.33	134,165	3.85	147,012	3.92	144,541	3.77	— 2,471	— 1.7
16. Valves, pumps and compressors	46,391	1.41	60,623	1.79	70,731	2.03	82,045	2.19	88,657	2.31	+ 6,612	+ 8.1
17. Chemical plant	24,502	0.75	26,865	0.79	27,367	0.78	26,314	0.70	26,614	0.69	+ 300	+ 1.1
18. Ingot moulds for steel and non-ferrous metal manufacture	302,580	9.21	318,339	9.40	321,647	9.22	334,360	8.91	322,689	8.42	— 11,671	— 3.5
19. Iron and steel works plant and rolls for mills	134,558	4.10	135,092	3.99	131,584	3.77	132,760	3.54	137,385	3.59	+ 4,625	+ 3.5
20. Cranes and conveyors for industry, transport, etc.	32,587	0.99	34,465	1.02	36,302	1.04	37,440	1.00	40,286	1.05	+ 2,846	+ 7.6
21. Printing and paper machinery	22,074	0.67	23,151	0.68	29,006	0.83	32,004	0.85	28,131	0.73	— 3,873	—12.1
22. Balance (general engineering and jobbing castings)	259,304	7.90	256,616	7.57	261,928	7.51	279,662	7.45	307,599	8.03	+ 27,937	+10.0

* 53 weeks.

total for 52 weeks is 2,444,846 tons, a record, being 2.7 per cent. greater than in 1951 and 1.6 per cent. greater than the previous record in 1950. The total charge of pig-iron in 1952 was 2,433,468 tons. The equivalent for 52 weeks is 2,386,455 tons, 5.3 per cent. less than in 1951, despite the slightly greater output of castings. This resulted from an increase in the proportion of scrap (including own arisings) in the total metal charge, from 52.7 per cent. in 1951 to 55.0 per cent. in 1952. The scrap ratio was at its highest in the early part of 1952, which may be attributed to the severe shortage of some grades of pig-iron at that time. In the last quarter it was still well above the 1951 level despite easier pig-iron supplies. It is probable that many iron founders are now making the maximum use of scrap in order to reduce their costs.

Scrap

The national scrap-recovery campaign included special drives for farm scrap and household scrap, the latter being carried out with the aid of the civic authorities. This campaign had good results and the amount of "home bought" scrap increased in 1952 by 370,000 tons. Scrap imports also showed an encouraging increase.

The Ministry of Supply informed the C.F.A. that it was intended as from January 28, 1952, to limit scrap consumption by iron foundries to the monthly rate of consumption in the last quarter of 1950 and to reduce the permitted level of stocks from five weeks to four weeks. This proposal was strongly resisted by the C.F.A. since it implied the fixing of a level of production for the industry. The Ministry insisted that some restrictions should be applied so as to alleviate the national shortage of scrap. The C.F.A. then urged that the last quarter of 1951 should be used as the yardstick without prejudice to the level of production of the industry. The Ministry accepted this alternative which was more favourable to the industry since the overall rate of scrap consumption in the last quarter of 1951 was higher than the corresponding quarter in 1950.

A number of amendments had been made to the 1950 Iron and Steel Scrap Control Order during 1951, and the Ministry of Supply decided to issue a consolidated Order in 1952. The C.F.A. submitted proposals and was consulted by the Ministry during the process of consolidation. The new Order, which came into effect on September 17, did not make any substantial increases in the price of scrap.

Coke

There was evidence at the beginning of the year that the licensing of foundry coke was handled more strictly by the Ministry of Supply, which had largely taken over this work from the Ministry of Fuel and Power. At the same time, it appeared that the 12 per cent. cut in coke supplies imposed in the Autumn of 1951 was being felt by some iron founders. The national figures showed that there was a sufficiency of hard coke, and it became obvious that such shortages as there were could be attributed to maldistribution. An investigation was carried out by the C.F.A. and all reported cases of inadequate supplies of coke were remedied. The quantity of coke consumed in 1952 was 1,153,500 tons (of which 75 per cent. was "foundry" quality), compared with 1,140,100 tons in 1951.

Ferro-alloys

Consumption of ferro-alloys for ironfounding increased throughout the year and representations were made to the Ministry of Supply regarding future supplies for the industry. In November, 1952, the Ministry announced that from January 1, 1953, the trade in ferro-alloys would be returned to private hands. It was soon apparent that all available supplies of ferro-silicon had been purchased and that the only source of supply was the British Iron and Steel Corporation, Limited, which had for a number of years been the sole importer of ferro-alloys. The short notice given by the Ministry had forced the Corporation to sign contracts in order to ensure supplies of ferro-silicon for the U.K. in 1953.

The Corporation invited all consumers of ferro-silicon to sign an agreement to continue to purchase their requirements through the Corporation. Those iron founders who have signed the agreement can revoke it on December 31, 1953, provided notice is given not later than June 30. The Council has been assured by the Ministry of Supply that licences to import ferro-silicon will be sufficient to cover all reasonable demands and that an adequate currency quota will be available.

Market Development

Work on the long-range, long-term publicity programme described in last year's Report has progressed steadily; but the Market Development Committee decided in the second half of the year that the general trend of trade warranted an early start on a Press advertising campaign to stimulate the demand for grey-iron and malleable-iron castings. The preparation of such a campaign and the negotiations with suitable advertising agents occupied several months, but the first advertisements will appear in March, 1953, in a carefully selected variety of trade journals and other Press organs. To supplement and reinforce the Press advertising scheme, the Market Development Committee recommended to the Council that member-firms should be provided with the opportunity of distributing other publicity material by direct mail and other means. The details of this supplementary plan, with a letter of recommendation from the chairman, were sent to all member-firms early in March, 1953, and the executive committee trusts that there will be a considerable and immediate response from iron founders to the proposals. It is significant that the collective advertising of several constructional materials which compete against grey iron and malleable cast iron has intensified in recent months, and similar publicity is essential if only to defend the industry's traditional markets.

Recruitment, Training and Education

The Minister of Labour, speaking at the Joint Iron Council's annual dinner at the Guildhall, stressed the selection of the right men, and systematic and continuous training at all levels from the bench to the

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manager's office, as being two cardinal points in securing the conditions of efficiency and progress in industry on which the prosperity of the country would depend.

One of the actions the Council agreed to take following the publication of the Grey Ironfounders' Productivity Report in the Autumn of 1950 was to review the system of foundry recruitment and education and to submit recommendations. This review took the form of a "Recruitment, Training and Education" Conference at Ashorne Hill, near Leamington, on March 12, 13 and 14, 1952, under the chairmanship of Mr. S. H. Russell, who had been the Leader of the Grey Ironfounders' Productivity Team. Representatives of nearly 100 member-firms attended, and officials of the Ministry of Education, the Ministry of Labour and National Service and other bodies were also invited. The conference provided a considerable amount of information on which to base future action, and the Council has authorized the setting up at an early date of a new committee to deal with these subjects.

Teaching Aids

The C.F.A.'s training films, film strips and wall charts on foundrywork are in widespread use, both among member-firms and in technical schools and colleges. The American training films offered for use in British industry through the Mutual Security Agency have been kept under review, and the C.F.A. has recommended that several films on pattern-making should be acquired for the Central Film Library, from which they can be borrowed by companies at a small fee.

National Foundry College

The National Foundry College opened its sixth session on September 22, 1952, and 17 students enrolled for the Diploma Course, Part I, and 15 for the final year. Of these, four are from overseas, seven are attending with National Foundry College scholarships, one is in receipt of financial aid from the Institute of British Foundrymen and another from his local Education Authority, and the remaining 19 are maintained by their employers. Twenty-two of the students had their previous industrial experience mainly in grey-iron foundries, and two in malleable-iron foundries. About ninety lectures will be delivered to the students during the session by specialists drawn from the foundry industry and its research associations. The students make weekly visits to foundries; the Part I students will probably participate in about 25 such visits, and the number of foundries and allied works visited by the Part II students should reach 45.

The building of the new College premises is progressing satisfactorily, and the schedule of equipment has been considered by the Governors and the officers of the Ministry of Education. It is hoped that the various laboratories, library, drawing office and classrooms will be available for use in the 1952-53 session.

National Foundry Craft Training Centre

In 1952 the National Foundry Craft Training Centre had its most active year since the Centre was opened in October, 1948. In 1949 85 boys attended, and last year the number increased to 107, of whom 93 were resident at the club attached to the Centre. In March, six boys had completed the four courses and qualified and they received certificates. In January, 1953, fourteen boys had completed their four courses and similar presentations were made to them.

The training given by the instructor at the Centre is augmented by visits to foundries in the district and by lecturers who talk on subjects of which they are specialists. The boys who reside at the club speak highly of the care and attention given to them.

Affiliated Technical Organizations

British Cast Iron Research Association

In November, 1952, the retiring president of this Association, Dr. J. E. Hurst, J.P., was succeeded by Mr. F. Scopes, who is also president of the Joint Iron Council. New extensions to the laboratories were officially opened during the year. Much new spectrographic equipment has been acquired through American sources with the aid of the Mutual Security Agency and the Department of Scientific and Industrial Research. A conference on foundry economy was held at Ashorne Hill in October, 1952, and was well attended.

During the year, 167 visits were made to iron foundries by the operational research team. The work done by the Team since its inception in June, 1950, to the end of 1952 is summarized as:—Team visits, 199; special visits by team or individual team members, 61; return visits, 44; special reports, 5. The main purpose of the team is to submit to the managements of iron foundries (who have asked for a visit) a confidential report suggesting changes or improvements that may be put into immediate effect or alternatively may be spread over a longer period. Diagrammatic sketches for discussion purposes are submitted when necessary, with emphasis on simplicity and economy of lay-out. The team deals with technical details as far as time permits, but problems which require closer study are passed on to the Development Department of the Association for further consideration.

Institute of British Foundrymen

The Institute of British Foundrymen has conducted much research and investigation through its Technical Council and its 15 sub-committees. Among the subjects being investigated are internal stress in castings, tests and specifications of cast iron, mould drying, cupola developments, including the hot-blast cupola, and the influence of mould materials on the solidification rate of cast iron. Another successful Foremen's Course was held at Ashorne Hill and the Institute sponsored a student at the National Foundry College. The Institute was enabled to carry out most of the afore-mentioned work with funds provided by the Joint Iron Council.

Costing

As mentioned earlier, the Development Panel has continued to encourage wider interest in sound

(*Continued on page* 29)

Assessing the Cost of Losses in a Vitreous-enamelling Shop*

By C. Lobley

The Author prefaced his remarks by giving a raison d'être *for the choice of subject, viz.:—"A major pre-occupation to-day should be to help to raise the efficiency of the industrial and commercial enterprises of our country in general and individual companies in particular. It is not inferred that British industry is inefficient, but there is always room for improvement, and a personal feeling is that costing has a great part to play in any endeavour to improve efficiency. Developments in cost accounting have been so remarkable in recent years that a wider adoption now of the best practices would, I am sure, have an appreciably beneficial effect."*

What is Meant by Costing

During recent years, the whole conception of the object and purpose of costing has undergone such a radical change that it is not out of place to discuss the aims of costing at the present time as compared with its use in the past. Before the last war, the general outlook on costing in industry was that it was a means of fixing sales prices at such a level that a profit was able to be earned. Costs were usually calculated from past achievements over periods of one, three or twelve months, and very little thought was given to trends in the future. It is now held that this conception of costing does not result in the maximum advantage being taken of information available in the cost department, and a more enlightened view is that the costing system is a "tool of management" and as such a very necessary instrument in the formulating of policy and the prevention of waste and scrap.

Present-day requirements have led to the general acceptance of what is known as "budgetary control and standard costing." This system is based on a plan for future operations of the concern, which is formulated by piecing together information provided by the executives responsible for the various sections. It is a pre-requisite for success that every employee, from the junior executive to the members of the Board, is striving consistently to achieve fulfilment of this plan and so works to attain a common goal. The costing system then records the actual achievement against this plan and the cost accountant is responsible for reporting and explaining any deviations.

Producing the Plan

The following is a brief outline of the plan which falls into five main objectives: —

(*a*) The volume of sales and production to be aimed at. The assessment of this figure is mainly a joint effort on the part of the comptroller, sales manager and works manager, and the basis can be said to be (1) what can be sold; (2) what necessary to carry out the production plan. It is is the capacity of the plant to manufacture, and (3) what material is available.

(*b*) The strength and cost of the labour force very important to consider under this heading the most advantageous combination of male and female labour, the efficiency to be aimed at, *e.g.*, "double-time," and the cheapest way of doing each operation. All this information is summarized in detail on a process-planning layout-sheet for each article or component to be manufactured.

(*c*) The cost of direct material necessary to manufacture the articles in the production budget.

(*d*) The cost of "overhead" charges incurred in running the plant at the levelvisualized in (*a*).

(*e*) The profit to be earned by the company, the plan fitting up to the formula $(a)=(b)+(c)+(d)+(e)$.

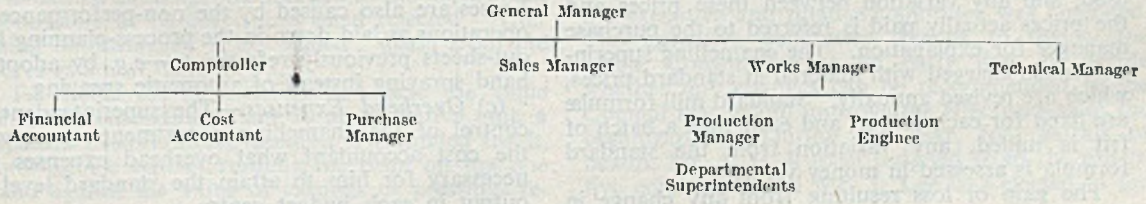
Position of the Cost Accountant

The diagram, Table I, shows the position of the various executives in the company to which the Author belongs.

The cost accountant is responsible for reporting to the comptroller the achievement attained against the budget and the cost of *all* items of excess expenditure. He also reports in detail to the works manager, departmental superintendents, sales manager and technical manager all cases in which their budgets and standards have not been met and obtains from them the reasons if he is not satisfied with the information already in his possession. It is important here to add that the comptroller is, in

* Paper given at the Institute of Vitreous Enamellers' summer school. At the time this Paper was given, the Author was associated with a large gas-stove foundry in the Midlands.

TABLE I.—*Division of Responsibility Among the Firm's Executive.*



turn, responsible for reporting to the general manager, and the Board of directors any variations in operation against the budget to which he considers attention should be drawn.

Areas of Control

It is important that areas of cost control be rigidly defined in order that there shall be no overlapping of responsibility. To give the enamelling-shop lay-out in the Author's factory serves as a good example:—

There is an enamelling superintendent, under the production manager, and under his control are three foremen who look after pickling, sheet-iron enamelling and cast-iron enamelling. The areas of control of these foremen are called "budget centres" and in addition is introduced a fourth to cover de-enamelling, although in practice this is looked after by the foreman for cast-iron (mainly for reasons of geography). It will be appreciated that the firm does not make its own frit.

Each budget centre is then divided into "cost centres" which it may be of interest to describe briefly, although they will be familiar processes to most enamellers:—

(*i*) *Budget centre: pickling.*—This is divided into cost centres: (*a*) for grease burning—done in coal-fired muffle and (*b*) pickling—by hydrochloric acid —the ware is dried by gas.

(*ii*) *Budget centre: sheet enamel.*—The cost centres here are:—(*a*) mill room, which services sheet and cast ware (the transfer of expenditure to the "cast" process is a simple book entry); (*b*) grip-coat swilling and drying (which latter operation is done by gas); (*c*) spraying and brushing, both hand and automatic spraying are used, and (*d*) fusing, here a "Ferro" continuous, gas-fired furnace is employed.

(*iii*) *Budget centre: "cast" enamelling.*—Here the cost centres of (*a*) annealing (gas-fired furnace); (*b*) shotblasting (two Wheelabrator machines); (*c*) spraying, brushing and drying (hand spraying and infra-red tunnel drying), and (*d*) fusing (coal-fired box-type muffles are separated).

(*iv*) *Budget centre de-enamelling.*—This cost centre is comprised of (*a*) de-enamelling (two operators who operate the plant), and (*b*) planishers, that is, the "rectification" gang.

Comparison of Standards and Results

Having given the broad outlines of the system, the main purpose of my paper is to explain how the losses and sources of inefficiency are shown up in the enamelling shop.

(*a*) *Material.*—Considering first the question of material, standard prices are set for all ingredients used, and any variation between these prices and the prices actually paid is referred to the purchase manager for explanation. The enamelling superintendent is charged with material at standard prices, which are revised annually. Standard mill formulæ are fixed for each colour, and each time a batch of frit is milled, any variation from the standard formula is assessed in money value.

The gain or loss resulting from any change in formula is shown against the enamelling superintendent, as he is held responsible for the control of all his material. He has a laboratory assistant of his own, who looks after the issue of material from his sub-stores to the milling process for each batch milled. Standard consumption is set for the use of each colour slurry on an area basis. For each four-week period it is calculated how much of each slurry should have been used for the enamelled area produced and this is compared with the amount actually consumed. Here again, the enamelling superintendent has to explain the reason for any variation. Perhaps the sprayers are laying on enamel too thickly or some operator is not bothering to recover the scrapings.

Recently, it was found that the maintenance men had been too liberal with oil and grease on the spray-booth turntables; a quantity of grease became mixed with the recovered scrapings, and a considerable amount of material was destroyed. This is an example of one of the losses reported under "usage variation" and one that should not have occurred.

(*b*) *Direct Labour.*—In this case, the standards and results are considered separately in each cost centre, in order that variants may be localized. The firm's wages system is a premium bonus scheme, payment being based on so many minutes allowance for each operation. As an example, suppose a job with a time allowance of 3 standard hrs. is actually completed in 2 hrs.; in this case, the operator is paid for 2 hrs. (his actual clock hrs.) at his total day-work rate of (say) 3s. per hr., and 1 hr. (the time saved) at his basic rate of (say) 2s. per hr. Thus the company gets 3 hrs. of work (known as standard hrs.) for 3s. plus 3s. plus 2s., or 2s. 8d. per standard hr. In this case, the operator is said to be working at an efficiency of 150 per cent. or time-and-a-half. It is necessary to set a standard of efficiency for each cost centre, and in this case the firm has adopted double-time for most of the cost centres, a rate of 2s. 6d. per standard hr. in the example quoted.

Working Results

Any excess or reduction in the cost per standard hr., due to under- or over-attainment of double-time, is then shown up each period against each cost centre. It is one of the functions of supervision to ensure that conditions are such that it is possible for operators to attain the efficiency laid down, *e.g.* that there shall be no waiting for work, no plant breakdowns or shortage of material, etc.

Another source of variation in the case of labour is by departure from the standard combination of male and female employment laid down for each cost centre. Here again, the supervisor is held responsible for the maintenance of the standard. Losses are also caused by the non-performance of operations as laid down in the process-planning lay-out-sheets previously referred to—*e.g.* by adopting hand spraying instead of automatic spraying.

(*c*) *Overhead Expenses.*—The superintendent in control of the enamelling department agrees with the cost accountant what overhead expenses are necessary for him to attain the standard level of output in each budget centre.

Taking "cast" enamelling as an example, some of the items are:—Labouring; overtime allowance; shift allowance; scrap; rectification; consumable stores; maintenance; electricity; gas and coal. It will be seen that these are all items which the superintendent can control. He is not charged with depreciation, rent, and other overhead items for which he is not responsible. In the case of variable items of expense, his budget allowance is amended in line with the volume of output.

The actual expenditure is calculated from meter readings, a summary of requisitions, scrap reports, and wages analysis. It is most important that definite persons are authorized to sign requisitions and time sheets, and where possible this authority should be confined to the foreman responsible. There can then be no dispute that expenditure is charged to people who are not in a position to control it.

Duplicate Operations, Rectification and Scrap

Without doubt, the greatest sources of loss in an enamelling shop, that must be rigidly controlled, are due to duplicate operations, rectification and scrap. It is only possible to do this if an efficient system of production control by batches is in operation. Inspection should be carried out after each operation to ensure that any components requiring rectification are not allowed to pass to the next stage. If a component is rejected at any stage it is a function of the inspection department to decide whether it is to be re-processed (*e.g.*, re-swilled or re-sprayed), de-enamelled or scrapped.

(*a*) *Re-processing.*—If re-processing only is necessary, the inspector institutes a special job-ticket for the operations necessary, and this is of a colour distinctive from that of the normal job-ticket. The cost of excess operations is obtained by a weekly summary of these re-operation job-tickets and the cost of additional operations such as stripping and washing off, is dealt with in a similar manner.

It might be useful at this stage to give one example of the cost of re-processing a cooker-door panel rejected after having been degreased, pickled, swilled grip-coat and sprayed cover-coat. It would be necessary for the following additional operations to be carried out to enable a good product to be manufactured:—(*a*) stripping; (*b*) pickling; (*c*) grip-coat swill, and (*d*) cover-coat spray. The cost of these additional operations, which also includes the cost of the enamel, amounts to, say, 1s. 8d., which it will be appreciated is an extra expense to be set against the profit on this particular component.

(*b*) *De-enamelling.*—All enamellers are familiar with this particular process, which has received more attention in recent years, due to the shortage of steel sheet. When a component has to be de-enamelled, it is treated as scrap, and charged to the department responsible at its cost value when rejected. After being de-enamelled it is "issued" again from the stores as a new item.

To enable the management to assess the value of the de-enamelling plant as an operative unit, a separate profit-and-loss account is compiled for it, showing the cost of running the plant on the one hand against the value of castings or pressings recovered on the other.

(*c*) *Scrap.*—It will be appreciated that under this heading is included any item of cast iron or sheet steel which cannot be rectified and made usable. Records are kept of each component showing at what stage it has to be scrapped, the reason (against each item) why it is to be scrapped, and the department responsible for the fault, if any. The enamelling shop superintendent should certify each scrap note made out by the inspection department and these are then in turn forwarded to the cost accountant for summarizing and reporting to the comptroller.

Conclusion

It has been rather difficult within the space allotted to attempt to cover such an important subject as that envisaged, but no one can disagree that the present scarcity and high cost of most manufacturing materials has an increasing effect on the cost of production to-day. It is imperative, therefore, that the full collaboration of *all* employees be enlisted, so that losses, from whatever cause, are reduced to a minimum. A personal view is that standard costing can, without question, be of great assistance in obtaining more efficient production and attaining this goal.

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costing methods. It has helped to arrange meetings between local associations and cost consultants, at which the latter have explained the benefits which could be derived from cost groups. The Panel has in preparation, for distribution to member-firms, a series of short, practical articles on foundry costing. The first of these should be ready in the summer.

Conditions of Sale

The C.F.A. "Conditions of Sale," first issued in 1946, continue to prove extremely valuable to member-firms in their commercial relations with customers, and during the year several thousand copies have been supplied. The staff has advised on a number of problems arising from the use of the "Conditions" which have been submitted by member-firms.

Membership of Associations

The total number of firms recorded as members of the constituent and affiliated associations of the Council was 1,097 at the end of 1952, representing a net increase of 24 over the year.

Constitution

During the year, the Article in the Council's Constitution which deals with the composition of the executive and finance committee was amended. The executive committee intends to review the whole Constitution at an early date to decide whether any changes can be recommended to the Council that would improve the effectiveness of the organization. During the year, for reasons of health, Mr. S. H. Russell resigned from the executive committee, and Mr. T. Lee was elected to the vacancy.

B.I.S.R.A.'s Sheffield Laboratories

The announcement that Lord Dudley Gordon has succeeded Sir Andrew McCance, F.R.S., as president of the British Iron and Steel Research Association was made at the annual general meeting, held at the association's Sheffield laboratories on June 17. The council has elected Capt. H. Leighton Davies (Steel Company of Wales, Limited) to succeed Mr. Richard Mather (Skinningrove Iron Company, Limited) as its chairman.

In his address to the meeting (which was read in his absence by Mr. W. Barr, of Colvilles, Limited), Mr. Mather said that they were now able to see in Sheffield something of the results of a plan formulated in 1947 when the council decided to acquire a site and to build laboratories in that city, which, with the B.I.S.R.A. laboratories elsewhere, would provide its scientists with the facilities for the considerable research programme that the association had ahead of it. The Sheffield laboratories would provide benefits not only for members of the association in the district, but for the industry as a whole, by which the association was so well supported. The new laboratories would soon be finished and would be opened on November 19 next.

Improvements at Battersea

Mr. Mather mentioned that it was not only at Sheffield that their laboratory facilities had enlarged. At Battersea they had recently completed some improvements of the premises acquired in 1951 which had enabled the plant engineering division and the corrosion laboratory and, to a lesser extent, the physics and chemistry departments, to have better and larger working areas. The head of the physics department, Mr. M. W. Thring, would become Professor of Fuel Technology at Sheffield University, when Prof. Sarjant, a member of the B.I.S.R.A. council, retired from the chair next September. Mr. Mather also referred to the appointment of Sir Charles Goodeve, director of B.I.S.R.A. as a member of the Lord President's Advisory Council on Scientific Policy.

It would be generally known, said Mr. Mather, that the United States had, under the Mutual Security Act, allotted dollar funds to the United Kingdom, the sterling counterpart of which would be spent through approved organizations in the U.K. on the extension of research into factors affecting the efficiency or the economy of British industry and advisory technical services. The association had submitted proposals through the D.S.I.R. for projects which it was hoped would qualify for financial support from that source.

The application of research results from the laboratory by industry was a subject of vital and constant attention of the council. The information services provided by the association employed a variety of means of communicating results of research to members, and the success which attended the publication of the B.I.S.R.A. survey in 1952 had prompted the issue of a further survey on similar lines, which was now in the press. These publications stressed the benefits to be had by applying the work done by the association in co-operation with its members, and it was the response by members which accelerated the application of new ideas to industry. An example of how that led to commercial developments was the recently formed group of member companies interested in the continuous casting of special steels. They had combined to finance and operate an experimental plant based on operating principles evolved in the association's laboratories. It was hoped that this would be the forerunner of other collective projects to be financed and developed on similar lines.

Head, Wrightson Order-book

An order-book greater than at any time in the history of the company is recorded by Mr. Richard Miles, chairman and managing director of Head, Wrightson & Company, Limited, in his statement accompanying the annual accounts. Trading profits, despite the inclusion of only nine months' trading by the parent company, were again higher than before, with a contribution from all the subsidiaries. Mr. Miles reports the formation of a new company, Head, Wrightson Australia (Pty.), Limited, designed to supplement the group's operations with its associates in Australia, where economic factors had hampered recovery from last year's recession. The South African company had a successful year and a new branch office had been opened in Canada. Overseas inquiries included a large order from Spain for an ore-handling and blast-furnace plant, which would take three and a half years to complete, and an oil refinery in Belgium was nearing completion.

Although home requirements in the automobile and transport industries had varied occasionally, there had been continued expansion in the needs of the iron and steel, coal, oil, and heavy industries for capital equipment. The largest blast furnace outside the United States, built for John Summers & Sons, Limited, had been successfully started in February, and a duplicate plant was now being built. Business in aluminium alloy structures had improved, and outputs of steel castings and drop forgings were the highest recorded, despite inadequate supplies of raw materials.

Iron-ore Imports

Iron-ore imports in May and the total for the five months of the year to date, with comparative figures for 1952, are shown below.

Country of origin.	Month ended May 31.		Five months ended May 31.	
	1952.	1953.	1952.	1953.
	Tons.	Tons.	Tons.	Tons.
Sierra Leone	44,680	52,950	322,148	315,231
Canada	94,550	111,945	126,655	245,629
Other Commonwealth countries and the Irish Republic ..	3,457	37,730	10,937	53,993
Sweden	314,072	344,059	1,454,187	1,382,525
Netherlands	4,546	2,349	6,940	5,545
France	44,720	33,017	186,743	202,821
Spain	82,283	38,198	307,336	201,079
Algeria	163,355	177,089	750,863	715,276
Tunis	67,903	43,812	223,041	198,385
Spanish ports in North Africa	24,200	—	150,952	—
Brazil	8,472	60,229	37,013	129,200
Other foreign countries	34,175	121,340	226,279	546,413
TOTAL	886,413	1,022,718	3,803,094	3,996,097

Savings Trophy Gift

Glenfield & Kennedy Limited, Kilmarnock, have presented a silver cup to the Scottish Savings Committee for competition among savings groups in local authorities throughout Scotland. At a luncheon in Kilmarnock last Friday, Mr. Hugh Cowan-Douglas, chairman of Glenfield & Kennedy, Limited, formally handed over the trophy to Sir John Maxwell Erskine, chairman of the Scottish Savings Committee. Mr. James A. Scott, Kilmarnock, secretary of the North Ayrshire Local Central Savings Committee, has been appointed chairman of a Scottish committee set up to administer the competition.

As Others See Us . . .

An American Foundryman Reports on European Research Activities

Mr. C. O. Burgess, technical director of the Gray Iron Founders' Society of America, who recently visited this country to study co-operative foundry research activities, has issued an interim report to his members, from which the following has been abstracted. Mr. Burgess spent 3½ weeks, altogether, in studying conditions in Britain, France, and Switzerland. Members of the Gray Iron Founders' Society represent about 70 per cent. of the United States' production tonnage of iron castings. Overall, he reported that most basic research work in the cast-iron field was being done to-day by the British Cast Iron Research Association, supported by both the government and industry.

Mr. Burgess said his visit had the effect of forming close co-operation in technical development being carried on between U.S.A. and Britain, and arranged for exchange of samples so the results of work of the British Association could be more readily applied to American practice.

The British Cast Iron Research Association, associated with the Council of Ironfoundry Associations in well-co-ordinated, effective action for production and marketing of castings, had recently developed a service to ironfoundry members which enabled British foundries to use the results of research work directly in their everyday operations. This was remarkable, he said, because the difficulty generally had been that research often was so far ahead of operations that it could be used to advantage.

There was need for someone who had both the scientific and commercial viewpoint to act as liaison. The British had advanced further in that direction than anyone else.

British Set-up

Continuing his account, Mr. Burgess said that, as at present constituted, the Association consists of four main branches, the "research department," the "development or industrial contact department," "operational research," and "intelligence, library and publications department." In addition to these formal departments, facilities are available at the B.C.I.R.A. for routine chemical and physical tests in special cases, where this type of work is necessary to put a member on the right track or standardize his testing procedure.

Two of these departments, those of operational research and of development, are devoted primarily to direct service to members. These departments both recognize the great importance of research as a stimulating and fertilizing influence in any service activity. The operational research department, for example, sends a team into any foundry requesting service. The team surveys the possibilities of more efficient movement of materials, improved general layout of the foundry, and, at the same time, notes any technical problems that may require solution. The development department is then available to aid the foundry in correcting specific metallurgical problems, sand problems, etc., and this latter department, in turn, directs the foundry's attention to information developed by the research department. The great benefit of this three-pronged approach to each member's foundry problems is obvious. For best operation, however, a highly co-operative spirit must animate the men heading each department, and this desired combination of personalities has been very successfully obtained.

Effort is so divided that it is possible for the men in the research department to devote approximately 15 per cent. of their time to outside service to members, thereby maintaining ability to relate research to direct industrial problems. Similarly, the development team devotes approximately 15 per cent. of its total time to research activities in order to keep aware of the fact that research is an essential part of any service furnished to an industrial concern. The intelligence department disseminates available literature on the subject of grey iron and related subjects, and informs all the other departments as to new developments or existing research work along any particular line. This department also organizes special meetings and papers on phases of foundry operations.

The Department of Scientific and Industrial Research of the British Government encouraged research in all fields, primarily metallurgical and chemical, Mr. Burgess reported, saying that it was staffed by famed technical men, and the U.S. had nothing comparable. The D.S.I.R. matched industry contributions with donations from government funds to carry on basic research in the cast-iron field. Industry was permitted to conduct research without constant supervision and interference; only an annual inspection was made to ascertain the money was spent in a useful manner. He was of the opinion that fundamental work in metallurgy and moulding sand technology in the British laboratories was revolutionary in character and would influence future practices in the U.S. and Britain. British researchers, he said, found that quantities and types of nitrogen gases that are absorbed in cast iron can drastically alter the properties of the casting. The use of additives in moulding sand should enable the industry to produce castings to closer dimensional accuracy and with fewer defects.

Mr. Burgess accompanied teams from the British research group on service missions to various foundries. The field workers showed foundrymen how to improve technical work and use research development and even how to lay out their foundries more efficiently.

Other Activities Surveyed

A somewhat similar organization to B.C.I.R.A. had been formed in France under the title of the *Centre Technique des Industries de la Fonderie*, Mr

As Others See Us

Burgess continued. It was still in its formative stage, but was designed to furnish French foundries with virtually the same service as the B.C.I.R.A. Support was, however, under much more rigid government regulation than in the case of the B.C.I.R.A. It was considered that this organization would develop so as to occupy eventually as essential a part of the French foundry industry as the B.C.I.R.A. did in British industry.

Finally, Mr. Burgess was privileged to observe the efficient conversion of research findings into operation within the confines of a large foundry organization, namely, George Fischer, Limited, of Switzerland. Their activities, of course, contrasted development on an overall industrial scale, such as typified by the associations discussed earlier. As might be expected, individual personalities had a great influence on the remarkable technical developments in this company.

Mr. Burgess closed his report by expressing his own appreciation and that of all their members for the courtesies shown during his tour. Co-operation of all the organizations and individuals had made it possible, he said, to obtain information which would be of material aid in formulating research and service activities for the members of the Society.

Meaning of Higher Productivity

Talk of higher productivity often emanates from official circles. Mention of the word " productivity " alone is sometimes sufficient to arouse fears and suspicions in the minds of both management and workers. It is pleasing, therefore, to note that the meaning of " higher productivity " was defined by the Minister of Labour and National Service, Sir Walter Monckton, when he addressed the 36th annual session of the International Labour Conference in Geneva. Higher productivity, said Sir Walter, did not necessarily mean the expenditure of greater physical effort or an increase in the intensity of work, but it did mean the employment of better methods, better thinking, and the greater diligence of all concerned, so that there was an increase in the effectiveness of a given quantity of resources. It was comparatively easy, he continued, to convince a worker or an employer that higher productivity was desirable for the economy as a whole. It was not so easy to explain to him why he himself might have to change his present job or reorganize his own business.

Great importance was attached in the United Kingdom to the practice of joint consultation between workers and employers and to regarding the worker as an intelligent and responsible person with his own individual contribution to make to the success of the enterprise as a whole. Unless human relations were good, it was very difficult to introduce changes in working methods. One of the chief obstacles to the rapid introduction of new and more efficient processes to-day lay in the fact that there were many employers who refused to consider a reorganization of their undertakings because they were afraid of the resistance which it would arose among their workpeople.

THE UNIVERSITY OF LEEDS has acknowledged a donation of £300 for the purposes of scholarships from the Yorkshire Copper Works, Limited, Leeds.

Damages for Injured Fettler

A 38-year-old fettler, William Henry Blount, of Derby, was awarded £395 damages against his employers, Qualcast, Limited, at the Derby Assizes on Thursday last, for injuries received to his eye while he was using a portable grindstone on June 23, 1951.

Mr. A. J. Flint, for Blount, said that the defendants were large ironfounders, who made among other things parts for stoves, from heavy chrome iron. Blount was grinding this iron, wearing goggles, when a chip flew up, breaking the goggles. As a result, Blount suffered a a detachment of the retina and had to undergo an operation. The operation was successful, but there might be a recurrence.

Blount told the court that chips often came out of the grinding wheel, sometimes breaking it altogether. On this occasion a piece of " flash " flew up and hit him on the bridge of the nose. The next thing he knew was the goggles hanging down with the nose piece broken. He felt a bump on his face, but nothing in his eye. The next day, however, his sight became blurred and misty.

Mr. Harry Frank Good, a consulting engineer of Sheffield, said that, while this type of goggles was safe for ordinary work, for the kind of work the plaintiff was doing at the time of the accident, when large pieces of metal and stone might be thrown out at high velocity, they were very weak over the bridge of the nose. " I think employers ought to anticipate the danger of considerable-sized pieces being thrown off by this type of grindstone." Witness said he would prefer a close-fitting shield made of a clear plastic, and showed an example of this type.

Mr. Ernest McKie, a consulting engineer, called for the defence, said that he had never heard of a similar accident before, but there was always the possibility of such an accident however much care was taken. Mr. F. Sunderland, also for Qualcast, commented that, because the goggles did not stop everything, that did not mean they were not suitable for the job.

The relevant section of the Factory Act, which covered the provision of safety goggles, was not, Mr. Sunderland said, intended to cover an injury of the kind suffered by plaintiff. It was meant to prevent fragments of metal entering the eye. Even if the plaintiff came within the schedule of the Statutory Act, his injury was one which the legislative had not intended that employers should guard against.

Mr. Justice Cassels commented that for a risky job like this, it was important that the most adequate protection should be provided for the workmen.

Use of Solid Fuel in the Home

A happy combination of business sessions and social events has been arranged for the convention which the Coal Utilisation Council is to hold at Harrogate on October 14 and 15. The aim of the convention is to foster the co-operation between the coal trade and the appliance industries which already exists through their membership of the C.U.C. and to serve as a platform from which to give public expression to the work (both accomplished and projected) of the coal and appliance interests in their joint efforts to serve the public. Theme of the convention will be " The Use of Solid Fuel in the Home."

A NEW HEALTH CENTRE for 5,000 workers has been opened at the Darlaston works of Rubery, Owen & Company, Limited, structural and manufacturing engineers, at a cost of £10,000.

Reasons for High Productivity

An analysis of the main factors responsible for the high level of productivity in the United States, selected by the British Productivity Council from the findings of the productivity teams, has been made by Mr. S. H. Russell for the Development Panel of the Council of Ironfoundry Associations and is reproduced in Table I.

TABLE I.—*Factors recorded by Teams as being Responsible for High Productivity in the United States.*

—	Team reports surveyed. (58)		Heavy-industry teams. (17)		Light-industry teams. (24)		Specialist teams. (17)	
		Per cent.		Per cent.		Per cent.		Per cent.
TECHNICAL FACTORS—								
Extensive use of mechanical aids	43	74	16	94	18	75	9	53
Economical handling of materials	32	55	14	82	11	46	7	41
Good layout of factories, offices and stores	30	52	13	76	12	50	5	29
Extent of mechanization	26	45	11	65	10	42	5	29
MANAGEMENT TECHNIQUES—								
Modern methods of costing	36	62	12	71	18	75	6	35
Production, planning and control	36	62	13	76	16	67	7	41
Training at all grades	28	48	10	59	9	37	9	53
Wide dissemination of company information to employees of all grades	20	34	11	65	4	17	5	29
HUMAN FACTORS (general)—								
Cost-consciousness of all grades	22	38	11	65	4	17	7	41
Management:								
Progressive attitude of management	30	52	9	53	11	46	10	59
Effectiveness of management	21	36	9	53	7	29	5	29
High standard of foremanship	12	21	8	47	3	12	1	6
Labour:								
Appreciation by workpeople of the need for higher productivity	43	74	16	94	19	79	8	47
Flexibility of rules governing apprenticeship	11	19	5	29	4	17	2	12

Vitreous-enamelled Aluminium

According to an article in *Modern Metals*, after more than ten years' experimental work, E. I. du Pont de Nemours, Inc., U.S.A., have developed a process for applying vitreous enamel to aluminium. The enamels have excellent impact and flex-resistance with high resistance to thermal shock; their ability to withstand acids, alkalis and sulphides is comparable with that of commercial enamels, and they add to rigidity. The rigidity of 0.0051 in. aluminium sheet is increased by more than 50 per cent., and maximum weight saving is obtained by using the minimum metal thickness and taking full advantage of the enamel strength. Commercially-pure aluminium alloys 2S and 3S (U.S. spec.) need no pretreatment other than cleaning, while the pretreatment for 53S, 61S and casting alloy No. 43 is an alkaline chromate bath. Enamelled aluminium alloys can be heat-treated by conventional methods to restore properties which may have been affected by the firing. Frits are supplied in the course form to be milled by the enameller. Standard ground-coats are preferred, except when a white or pastel cover coat is used over white ground. The composition of the cover-coat depends on the colour desired and the metal used. It is extremely important that a reliable grade of titanium oxide be used for both ground- and cover-coats. Details of application are set out in the article. The Kawneer Company, of Niles, Mich., have, it is stated, produced thousands of feet of "Zourite" enamelled-aluminium panels for interior and exterior use. There should be a promising field for roofing and siding, appliance parts and countless shipboard applications.

SWEDISH PRODUCTION of pig-iron in the first quarter of this year was 240,400 metric tons, and of steel ingots and castings 446,100 metric tons.

Institute of Vitreous Enamellers

W. S. Grainger Award

In accordance with the terms of the W. S. Grainger Award of the Institute of Vitreous Enamellers, all papers submitted, whether at a principal conference or at a section meeting, are eligible for consideration by the panel of assessors. For this year's award all papers presented between July 1, 1952, and June 30, 1953, will be considered, subject to their having been either published in one or other official organ, or submitted in typescript to the secretaries. In this connection it is strongly urged that all authors presenting papers at meetings should prepare a manuscript of their paper with illustrations and submit a duplicate copy to the secretaries within one month of the date of the meeting, regardless of whether the paper is scheduled for subsequent publication or not. In future years only papers of which manuscripts have been submitted in this way will be considered. The award takes the form of a gold medal, given annually, or less frequently, to the author of the paper which, in the opinion of the panel, is the best technical contribution to the proceedings of the Institute during the preceding twelve months. Only members of the Institute are eligible.

THE BRITISH ALUMINIUM COMPANY, LIMITED, announce that, simultaneously with the reduction in the price of virgin aluminium ingot to £150 a ton, reductions are being made in the prices for rolled and extruded products.

THE PRELIMINARY FIGURES of Allied Ironfounders, Limited, show a group trading profit of £1,215,850 for the year ended March 31, 1953, compared with £1,827,994 for the previous year, a decrease of £612,144. After taxation of £731,523, against £1,078,618, the balance available declined from £722,759 to £632,972.

News in Brief

THE BRITISH CAST IRON RESEARCH ASSOCIATION, of Alvechurch, near Birmingham, is organizing a visit to German foundries next Spring.

AN ILLUSTRATED DESCRIPTION of the foundry exhibits at the 1953 Hanover Fair is printed in the June 25 issue of *Giesserei*—the German foundry magazine.

RUSTON & HORNSBY, LIMITED, of Lincoln, have made as a Coronation commemoration a flower garden situated in front of the sports pavilion, and also a children's play corner.

THE FEDERATION OF SECONDARY LIGHT METAL SMELTERS, of 16, Coleman Street, London, E.C.2, have changed their name to the Federation of Light Metal Smelters, as from July 1.

JOHN H. RUNDLE, engineers and ironfounders, of New Bolingbroke, Boston, Lincs, showed a moulder at work in a foundry in a tableau arranged for the local agricultural Coronation procession.

T.I. ALUMINIUM, LIMITED, announce reductions in prices of aluminium and aluminium-alloy products, as from July 1, 1953, consequent upon a further cut in the price of virgin aluminium.

"FUEL RESEARCH, 1952," a report of the Fuel Research Board, together with the report of the Director of Fuel Research, has now been issued by H.M. Stationery Office, price 2s. 6d. (by post 2s. 7½d.).

A CONVEYOR BELT weighing 11½ tons is about to be shipped to India from Dunlop's general rubber goods factory in Cambridge Street, Manchester. The belt will convey hot quenched coke in an iron and steel works. It is 1,192 ft. long.

MR. BERTRAM MORRIS MOORE, chairman and joint managing director of W. H. Moore & Sons, Limited, non-ferrous metals manufacturers, Bordesley, left £57,117 (£53,704 net). He left £50 to the Royal Metal Trades Pensions and Benevolent Society.

LAST WEDNESDAY, British Railways opened a new booking and information office at the corner of Lower Regent Street and Carlton Street (just off Piccadilly Circus), to be known as the "British Railways Travel Centre." This is located at Rex House.

MIDDLESBROUGH HIGHWAYS COMMITTEE has authorized the borough engineer to discuss with the Ministry of Transport and British Railways the position arising from the restriction of maximum loads from 100 tons to 25 tons on the only railway crossing for heavy goods to the docks. Better road facilities are urged to avoid the loss of trade to other ports.

MORE THAN 200 EMPLOYEES at the Triplex Foundry, Limited, Tipton, Staffordshire, are looking forward to their two-weeks' holiday with pay, plus a substantial bonus, the firm having announced a staff bonus of 2½ per cent. of their yearly wages. This means an average of about £10 for each employee. The staff will be paid the money a week before their annual holiday in August.

STANTON IRONWORKS COMPANY, LIMITED, Stanton-by-Dale, Derbyshire, have recruited the first batch of 50 workers from Ireland, and no doubt in the near future more labour will be obtained from this source. Owing to a large expansion in production, 250 extra workers are needed and, when this need is met, it is hoped to increase production of spun-iron pipes, and further double shifts will be worked.

YESTERDAY, on the television programme, the Stockton experiment of modernizing sub-standard, rent-controlled cottage property undertaken by Allied Ironfounders, Limited, was shown. It recorded what has been done to four houses in Stockton-on-Tees at a cost of £349 17s. 3d. per home. The query left by the showing of this film is whether the obvious advantages are to be strangled at birth by the rent-restrictions Act.

W. LEE & SONS, manufacturers of malleable-iron castings for agricultural and other machinery, of Dronfield, near Sheffield, notified their 200 employees on June 29 that a four-day week would be worked until further notice. A spokesman of the firm said that the short time was the result of a trade recession, not only local but national. He could see no prospect of returning to a full week until trade conditions improved.

EMPLOYEES OF W. & T. Avery, Limited, Soho Foundry, Birmingham, held their annual sports on Saturday last on their well-equipped ground at Sandon Road. Before a company of well over 2,000 people, a full programme of events was run through, all functions passing off very smoothly. After the sports were concluded, Mrs. Palmer Lewis, wife of one of the directors, distributed a wide assortment of prizes to the successful competitors.

NATIONAL RESEARCH CORPORATION, of Massachusetts, U.S.A., have announced the acquisition of approximately 25 per cent. interest in the outstanding stock of Leybold-Hochvakuum-Anlagen G.M.B.H., Köln, Germany. This company was founded in 1952 by E. Leybold's Nachfolger, 150-year-old European producer of high-vacuum apparatus and equipment. A minority interest in the company is held by Sachtleben A.G., a jointly-owned subsidiary of I. G. Farben and Metallgesellschaft.

JOSHUA HINDLE & SONS, LIMITED, of Hindle House, Neville Street, Leeds, 1, announce that following a visit to California by Mr. W. Gomersall, the managing director, an agreement with the Hamer Oil Tool Company, of Long Beach, California, has been made for the manufacture of Hamer Line Blind Valves under licence in this country. The agreement gives the Leeds company exclusive rights on Hamer patents throughout the United Kingdom, British Commonwealth and the whole of the sterling area. Line blind valves are used in oil refineries, chemical process plants, and the like.

THE BIRMINGHAM METALLURGICAL SOCIETY'S GOLDEN JUBILEE will be celebrated on Wednesday, October 21, 1953, at the Grand Hotel, Birmingham, when four papers are to be presented. They are:—"Fifty Years of Progress in the Non-ferrous Industries," by Dr. Maurice Cook; "Fifty Years of Progress in the Ferrous Industries," by Dr. J. W. Jenkin; "Fifty Years of Progress in Metallurgical Education," by Dr. T. Wright, and "Fifty Years of Progress in Our Understanding of Metals," by Dr. N. P. Allen. The programme will be broken by a luncheon interval, at which the Lord Mayor of Birmingham will be present.

AT A Midlands court last week, for seven offences of buying scrap at a price above the maximum, a Stourbridge foundry were fined £5 in each case, with £5 5s. costs for the prosecution. Mr. Dale, prosecuting, said the firm bought five lots of scrap from an Oldbury firm and two from a Hill & Cakemore firm. The company, added Mr. Dale, was one of the highest repute, and they had co-operated with the Ministry in supplying all the information possible. Mr. L. Sunderland, who defended, submitted that only a technical offence had been committed, his clients had merely paid the suppliers an extra amount for breaking up large scrap instead of having to engage another firm to do the work for them.

Raw Material Markets

Iron and Steel

Only a slight recovery would suffice to absorb any surplus output of common foundry pig-iron, and for all other grades there is a vigorous demand which cannot invariably be fully satisfied. Nearly 75 per cent. of the aggregate production consists of basic iron and the steelmakers are still asking for more, while hematite supplies barely equal current requirements. Later in the year more blast furnaces are expected to come into production, but in the meantime substantial tonnages of foreign iron are still being imported. South Wales claims the biggest share of this material, but smaller tonnages of foreign iron are also reaching Scottish and North-east Coast ports.

The increase in the deliveries of home-produced steel semis is welcome for more than one reason. It has eased the difficulties of sheetmakers and re-rollers who have encountered occasional embarrassments through shortage of material, and it also tends to reduce the financial burden imposed on the steel industry by the purchase of expensive foreign supplies. Billets are not very plentiful, but it is announced that "good progress" has been made with the installation of a continuous billet mill at Consett, and when this comes into production dependence on Continental supplies will be substantially reduced.

In the report of the British Iron and Steel Corporation for 1952 it is stated that "at the present time the industry has more than sufficient rolling-mill capacity to handle the ingots which can be produced from the steelmaking furnaces." And as there is still a large unsatisfied demand for most rolled steel products the mills are assured of full employment for the third quarter. The export trade remains sluggish, chiefly owing to political unrest and exchange difficulties, but there is a free flow of specifications from the principal home industries, and the steel development programme also absorbs considerable tonnages of finished steel. Heaviest pressure is for plates, but there is also an extensive demand for railway equipment.

Non-ferrous Metals

The Copper Institute's figures for May show that usage of copper in the United States continues at a very high level. Production of crude copper in the United States was 92,700 short tons and of refined copper 118,000 tons. Deliveries to U.S. domestic consumers were 146,800 tons, which shows a sizeable advance on the April figure. It should be noted that this total does not include anything delivered to the stockpile. This tonnage, however, is not believed to be high. Stocks of refined copper in producers' hands at May 31 were 52,760 tons, which is an advance of 4,380 tons on the figure at April 30. Outside the United States output of crude copper was 120,100 tons and of refined grades 97,300 tons, while deliveries to consumers were only 61,000 tons or about half of the mine production.

For the first five months of this year the output of crude copper was 612,500 tons, while deliveries amounted to about 342,000 tons. In total, however, it will be found that apparent world consumption was not much below the total of production. So far as the United Kingdom is concerned, usage of copper is certainly on a poor scale.

Early last week the Government announced that on July 1 aluminium would be freed and the price brought down by £6 to £155. It was agreed, before the announcement of the reversion to private trading was made, that the Aluminium Union, which is the international trading company in the U.K. of Aluminium, Limited, the Canadian company, would charge no more than the Ministry would have charged to U.K. consumers. On Monday of this week, the Aluminium Union announced that the price of Canadian aluminium in the U.K. would be reduced from £161 to £150 per ton as from July 1. The Canadian producers have thus agreed to what is, in effect, a ceiling price of £155. The actual reduction of £11 to £150 means that the Aluminium Union is able to quote a price below this ceiling.

The following official tin quotations were recorded:—

Cash—June 25, £665 to £667 10s.; June 26, £655 to £657 10s.; June 29, £655 to £657 10s.; June 30, £660 to £662 10s.; July 1, £661 to £662 10s.

Three Months—June 25, £665 to £667 10s.; June 26, £650 to £652 10s.; June 29, £650 to £655; June 30, £657 10s. to £660; July 1, £655 to £657 10s.

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

June—June 25, £91 to £91 10s.; June 26, £89 to £89 10s.; June 29, £89 15s. to £90. *July*—June 30, £89 5s. to £90; July 1, £91 to £92.

September—June 25, £87 to £87 5s.; June 26, £84 15s. to £85; June 29, £84 15s. to £85 10s. *October*—June 30, £86 15s. to £87 5s.; July 1, £88 15s. to £89.

Official zinc quotations:—

June—June 25, £71 17s. 6d. to £72; June 26, £71 to £71 5s.; June 29, £71 to £71 5s. *July*—June 30, £71 15s. to £71 17s. 6d.; July 1, £72 10s. to £72 15s.

September—June 25, £71 15s. to £71 17s. 6d.; June 26, £70 15s. to £71; June 29, £71 to £71 5s. *October*—June 30, £71 12s. 6d. to £71 15s.; July 1, £72 5s. to £72 7s. 6d.

Short Periods of Unemployment or Sickness

The Minister of National Insurance, Mr. Osbert Peake, has asked the National Insurance Advisory Committee (Chairman, Sir Will Spens): "To consider whether the provisions governing the payment of National Insurance benefits for very short spells of unemployment or sickness are the most appropriate, particularly in those cases where a claimant is also receiving payments from an employer, and, if not, to make any recommendations which do not increase the liability of the fund for those two benefits." The Committee will also consider representations on the question referred to them which are sent, before September 26, 1953, to the secretary, National Insurance Advisory Committee, 10, John Adam Street, London, W.C.2.

Prison Next Time

A warning of prison sentences for future factory thieves as the only solution to stop so much pilfering was given by Mr. H. J. Barlow, presiding at Darlaston Magistrates' Court on Wednesday of last week. Six men employed by Bradley and Foster Limited, were charged with stealing various materials from the factory. "All such cases should be dealt with by prison sentences. Fines seem to be useless. Too many workpeople imagine they have a perfect right to take and steal everything they see. Other people will have to be dealt with in a far more drastic manner," said Mr. Barlow. Fines ranging from £3 to £21 were imposed.

Lead and Zinc Prices

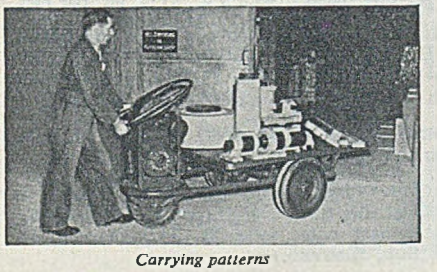
The prices of lead and zinc quoted on the Price List in our issues dated June 10, 17, and 24 were inadvertently transposed, the correct prices being those given in each case in the articles dealing with non-ferrous metals in the Raw Material Markets feature.

We apologize to our readers for any inconvenience that might have been occasioned by these transpositions.

We've proved it pays!

Loading scrap metal for cupola

Sand from stock-pile to mixer



Carrying patterns

THE Winget POWER BARROW

does a wonderful job for the famous Winget Meehanite Foundry.

We use the "Mechanical Moke" through all stages of production—carrying coke and scrap to cupola; patterns from pattern shop; sand to mixers and thence to Moulding floor; castings to Fettling Shop; and finished castings to Machine Shop. In fact, we use the "Moke" *everywhere* in Winget Works. It pays us handsomely, and we are sure it will pay *you*.

Apart from tyre and fuel checks, needs practically no attention.

Consider these features of the "Mechanical Moke":

Instantly interchangeable skip and platform.
Tilt the wheel—it starts. Release—it stops.
Nothing to go wrong—perfectly safe—unskilled labour can operate.
Rotates completely in a 6-ft. roadway.
Eight hours running on 1¼ gallons of petrol.
One control only for throttle, clutch, brake and steering.

Registered Trade Mark

Winget

CONTRACTORS' PLANT SPECIALISTS

WINGET LTD ROCHESTER
KENT ENGLAND

Tel: Strood 7276 (3 lines) Telegrams: Wingetium Rochester

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

(Delivered unless otherwise stated)

July 1, 1953

PIG-IRON

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

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

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

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

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

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

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

FERRO-ALLOYS

(Per ton unless otherwise stated, delivered).

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

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

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

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

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

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

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

Cobalt.—98/99 per cent., 20s. per lb.

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

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

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

SEMI-FINISHED STEEL

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

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

Sheet and Tinplate Bars.—£25 11s. 6d.

FINISHED STEEL

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

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

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

Tinplates.—57s. 9d. per basis box.

NON-FERROUS METALS

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

Tin.—Cash, £661 to £662 10s. three months, £655 to £657 10s.; settlement, £662 10s.

Zinc.—July, £72 10s. to £72 15s.; October, £72 5s. to £72 7s. 6d.

Refined Pig-lead—July, £91 to £92; October, £88 15s. to £89.

Zinc Sheets, etc.—Sheets, 15 g. and thicker, all English destinations, £99 15s.; rolled zinc (boiler plates), all English destinations, £97 10s.; zinc oxide (Red Seal), d/d buyers' premises, £90.

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

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

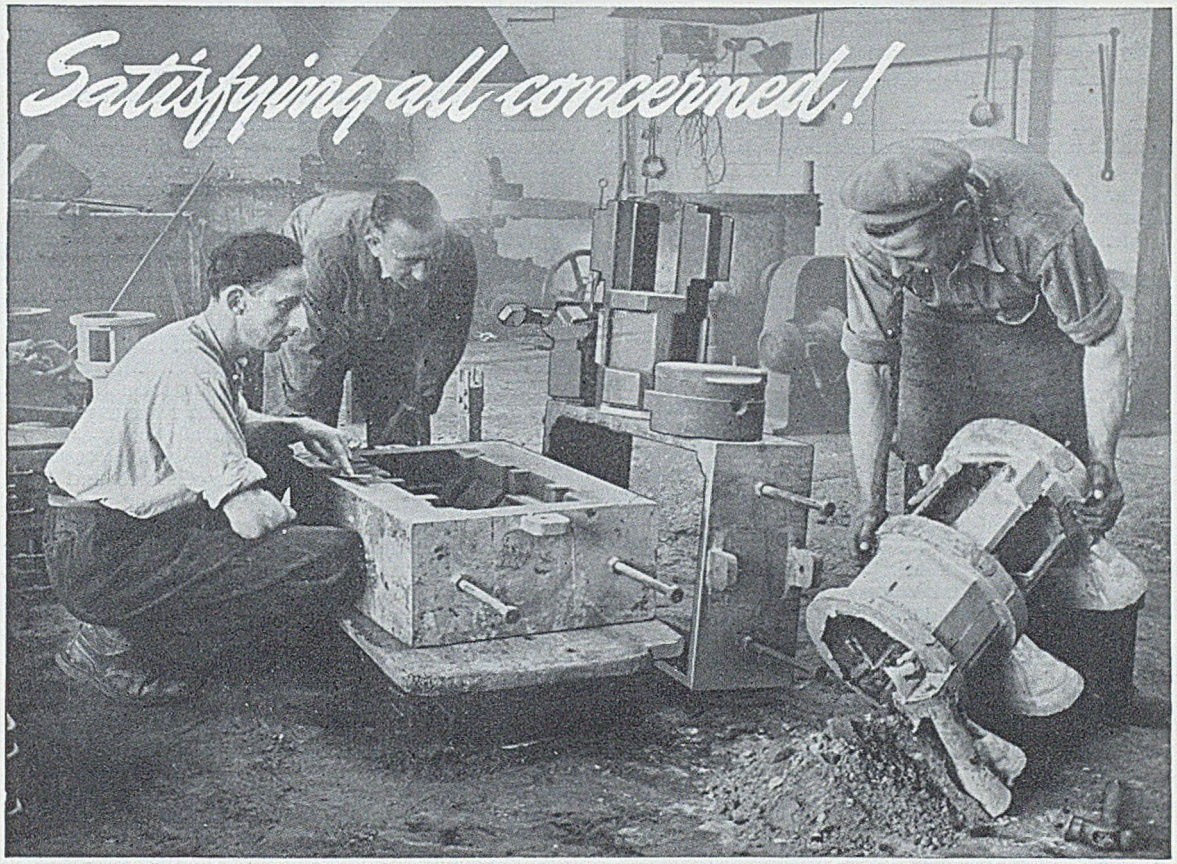
Copper Tubes, etc.—Solid-drawn tubes, 28⅞d. per lb.; wire, 282s. 9d. per cwt. basis; 20 s.w.g., 311s. 9d. per cwt.

Gunmetal.—Ingots to BS. 1400—LG2—1 (85/5/5/5), £160 to £170; BS. 1400—LG3—1 (86/7/5/2), £172 to £190; BS. 1400—G1—1 (88/10/2), £254 to £275; Admiralty GM (88/10/2), virgin quality, £252 to £300 per ton, delivered.

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

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

Nickel Silver, etc.—Ingots for raising, 2s. 5¾d. per lb. (7 per cent.) to 3s. 8¾d. (30 per cent.); rolled metal, 3 in. to 9 in. wide × .056, 2s. 11¾d. (7 per cent.) to 4s. 2¾d. (30 per cent.); to 12 in. wide × .056, 3s. to 4s. 3d.; to 25 in. wide × .056, 3s. 2d. to 4s. 5d. Spoon and fork metal, unsheared, 2s. 8¾d. to 3s. 11¾d. Wire, 10 g., in coils, 3s. 6½d. (10 per cent.) to 4s. 8¾d. (30 per cent.). Special quality turning rod, 10 per cent., 3s. 5½d.: 15 per cent., 3s. 11½d.; 18 per cent., 4s. 4d. All prices are net.



SUPINEX "R" IN USE—

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

SUPINEX "R"
CORE BINDER

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**

FOUNDRY & METALLURGICAL F.A.M.S.L.

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.

Personal

MR. C. SLATER has been appointed secretary of Meters, Limited, gas-meter manufacturers, etc., of Manchester.

COL. J. G. T. ECCLES, the present vice-chairman, has been appointed chairman of the British Slag Federation for the coming year.

MR. K. C. T. MARSHALL has been appointed managing director of Lightalloys as from June 30, in succession to Mr. W. S. Knight, who has resigned from the board owing to continued ill-health.

MR. F. N. LLOYD has joined the Board of W. Hingley & Sons, Limited, of Dudley. Mr. Lloyd is chairman and managing director of F. H. Lloyd & Company, Limited, steelfounders, of Wednesbury.

MR. P. W. HOWARD, managing director of the British Tyre & Rubber Company, Limited, has been elected president of the Federation of British Rubber Manufacturers' Associations for 1953-54.

Eighty students and industrialists attended a dinner at Sheffield University on June 19 to honour PROF. R. J. SARJANT, Professor of Fuel Technology and head of the University Fuel Society, who is retiring this year.

MR. W. B. PALMER has been appointed temporary lecturer in mechanical engineering, and MR. W. R. BENNY has been appointed honorary lecturer in the Department of Coal Gas and Fuel Industries, at the University of Leeds.

MR. T. S. JORDAN, who is retiring from the Parkinson Stove Company, Stechford, after 55 years' service, in the gas-meter and gas-stove industry, was entertained by colleagues at a reception at the Midland Hotel, Birmingham, on June 24.

FOLLOWING his appointment as vice-chairman of the Iron and Steel Board, SIR LINCOLN EVANS has been succeeded as general secretary of the Iron and Steel Trades Confederation by MR. HARRY DOUGLASS, who has been assistant general secretary since 1945.

MR. C. F. BISHOP, road materials and quarry technician with the Thos. W. Ward group of companies, Sheffield, retired on June 29 from the firm's board after 16 years as director. Mr. Bishop, who joined the firm in 1896, will continue to serve the company.

MR. O. W. HUMPHREYS and MR. A. L. G. LINDLEY have been appointed directors of the General Electric Company. Mr. Humphreys is director of the company's research laboratories and Mr. Lindley is general manager of the Fraser & Chalmers engineering works of G.E.C.

MR. ARTHUR KEATS, chairman and managing director of Fisher & Ludlow, Limited, metal pressing manufacturers, etc., of Birmingham, has been elected the first vice-president of the Engineering Industries Association. He has been chairman of the Midlands region of the association since its inception.

MR. STEPHEN BAKER, whose appointment as service manager of the Davy & United Engineering Company, Limited, is announced, received his engineering training at Cambridge University. On his return from service with the Royal Navy, he was maintenance engineer with John Baker & Bessemer, Limited, before joining Davy & United in 1951. Mr. Baker's main responsibility in his new post will be to develop the organization for spares sales and service.

TO MARK the retirement of MR. G. F. YORKE, joint managing director of the Midland Motor Cylinder Company, Limited—one of the Birmid combine—workpeople are to present him with a model of a greenhouse which they have purchased and installed at his home. The presentation will take place in the works canteen, Smethwick, on July 2. "Freddie" Yorke, as he is affectionately known to everyone, has been with the company for 35 years and is a foundryman of distinction.

MR. W. G. TURNBULL has retired from his position as chief electrical engineer of the Staveley Iron & Chemical Company, Limited, Hollingwood, Chesterfield, but his services are being retained in an advisory capacity by the group of companies owned by the Staveley Coal & Iron Company, Limited. He was appointed to the board of works directors in 1944. Mr. Turnbull is succeeded by MR. C. A. WOOD, who has been electrical engineer to the Devonshire Works for over 20 years.

THE STEEL, PEECH & TOZER branch of the United Steel Companies, Limited, announces that MR. HERBERT MCWHINNIE, J.P., retired from the position of general sales manager on June 30, 1953, but remains with the company for a period in order to advise on sales development. He will also continue to be the company's representative on certain trade associations and committees. With effect from July 1, 1953, the position of general sales manager at this branch was discontinued and all departments responsible to the commercial director (Mr. W. T. Vizer-Harmer) were co-ordinated through, and supervised by, the assistant commercial manager, MR. J. MACKENZIE-MAIR.

MR. W. H. PURDIE, a director and general manager of W. Doxford & Sons, Limited, Sunderland, is to retire by his own desire from the position of general manager in November. Mr. Purdie, who has been connected with the company for 40 years, will continue his association with the company in a consultative capacity and will retain his seat on the board. MR. ARTHUR STOREY, a director of the North Eastern Marine Engineering Company, Limited, will join Wm. Doxford in July as a director and as deputy general manager of the engineering department. On the retirement of Mr. Purdie he will succeed to the general managership. Mr. Storey has been with the North Eastern Marine Engineering Company for more than 32 years.

THE NEW CHAIRMAN of the Scientific Advisory Council to the Minister of Fuel and Power is SIR GEORGE PAGET THOMSON. He succeeds SIR ALFRED EGERTON, who retires at the end of this month on the expiry of his term of office. The appointment is also announced of a new member to the council, MR. KENNETH GORDON, who at present is Director-General of Ordnance Factories, Ministry of Supply. Previously, he was deputy managing director of Head, Wrightson Processes, Limited, and was specially released to take the Ministry of Supply post in July, 1952. Formerly he was joint managing director of the Billingham division of Imperial Chemical Industries, Limited, for 12 years.

MR. B. R. LEAPINGWELL, a director of Aiton & Company, Limited, pipe engineers, Stores Road, Derby, has recently retired and, to mark the occasion, a luncheon was given at the Grandstand Hotel, Derby, on June 27, by the directors. A presentation was made to Mr. Leapingwell of a Queen Anne silver tankard, on behalf of the outside erection staff. The presentation was made by Mr. D. D. McIntyre, who will succeed Mr. Leapingwell, as outside erection manager. Mr. J. Chamberlain, chief engineer, also presented Mr. Leapingwell with a cheque from the staff of the Derby works. Wing-Commander J. M. Aiton, chairman of the directors, presided. Over 3,000 people attended the annual gala of the company, held at the firm's sports ground, Raynesway, Derby, last week. Mrs. Leapingwell presented the prizes to those successful in the sports events.

Obituary

MR. WALTER KELLETT, of 228, Abbey Lane, Sheffield, founder of W. Kellett & Company, Limited engineers, Sheffield, died on June 29, at the age of 71.

MR. ARTHUR FRANCIS, late Birmingham manager of the Metropolitan-Vickers Electrical Company, Limited, died on June 21 at his home at Sutton Coldfield.

The death has occurred of MR. ROBERT BLACKETT CHARLTON, owner of the firm of R. Blackett Charlton & Company, Limited, brass and non-ferrous founders, etc., of Newcastle-upon-Tyne. He was 101 and retired from active business 30 years ago.

MR. A. F. BOCK, who retired last September from the post of Birmingham manager to the Metropolitan-Vickers Electrical Company, Limited, died on June 21. He had been manager in Birmingham since 1925 and had been wth the company for over 40 yrs. He was a member of the committee of the Midlands Electrical Engineers' Association.

THE POSSIBILITY of organizing factory visits for American airmen stationed in Britain, who often "live isolated lives in their camps," was explored in a report which the General Purposes Committee of the Birmingham Chamber of Commerce presented to the Chamber's Council on June 22. The report recalls that last year the Secretary of State for Air, Lord de L'Isle and Dudley, invited the president of the Association of British Chambers of Commerce to discuss with him problems created by the presence of American airmen in Britain. He and the Foreign Secretary, Mr. Eden, felt that the Americans should " generally come more into our lives."

A CONVEYOR BELT weighing 11½ tons is about to be shipped to India from Dunlop's general rubber goods factory in Cambridge Street, Manchester. The belt will convey hot quenched coke in an iron and steel works. It is 1,192 ft. long.

MORE THAN 2,000 PEOPLE attended the Qualcast Sports and Gala, which was held at the company's sports ground near Haslam's Lane, Derby, on June 27. The children arrived in twenty decorated lorries. The grey-iron foundry staff were the winners in the decorated-vehicle competition; theirs represented a Coronation coach. A third prize was awarded the lorry of the grey-iron patternshop for a representation of Everest, with Hillary and Tensing on the summit.

FOR THE FIRST TIME since the business was converted into a public company in 1947, Hill Top Foundry Company reports a lower level of earnings. Trading profits for the year ended March 31 amount to £59,896, compared with £69,603 for the previous year. Owing to smaller charges, however, net revenue is about £1,300 higher on the year, at £15,713. For the fourth year in succession, a dividend of 25 per cent. on the ordinary capital is to be paid.

CHAMBERLAIN INDUSTRIES, LIMITED, of Staffa Road, Leyton, London, E.10, have introduced a portable hand-operated hydraulic tool for general works use, and of special interest to maintenance fitters. The basic unit consists of a small hand-operated pump, coupled to a 5-ton hydraulic ram by a flexible high-pressure hose, 7 ft. long. By means of specially-designed tools for attachment to the ram, it is claimed that functions such as pushing, pulling, pressing, lifting, bending, clamping or spreading can be performed, but with 200 times more thrust than with the human hands.

CLASSIFIED ADVERTISEMENTS

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

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

SITUATIONS WANTED

FOREMAN FETTLER, energetic (45), practical man, 30 years' experience iron and steel castings, all weights, desires change. Sheffield area.—Box 3590, FOUNDRY TRADE JOURNAL.

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

METALLURGIST, 28, Full Control, Mechanised and Jobbing High Duty Irons and Alloy Steels, seeks permanent progressive position with small Midlands Foundry.—Box 3579, FOUNDRY TRADE JOURNAL.

FOUNDRY MANAGER, A.M.I.B.F., desires change; 30 years' experience in all classes of foundry practice; mechanisation casting for the machine-tool trade up to 6 tons; costing oxt.; used to being in complete charge.—Box 3564, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT

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

TWO Cast Iron FETTLERS required by Sundry Equipment Manufacturers, Pitsea Street, Stepney, E.1.

LABOURER required by Sundry Equipment Manufacturers, Pitsea Street, Stepney, E.1.

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

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

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

SITUATIONS VACANT—*Contd.*

ESTIMATOR required for Mechanised Foundry situated in South-West London. Applicant must have first-class knowledge of all aspects of estimating for Shell Moulded Castings together with Sales Office procedure. State age, experience and salary required.—Box 3561, FOUNDRY TRADE JOURNAL.

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

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

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

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

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

METALLURGIST required by West London light engineering company for modern mechanised non-ferrous foundry continuously developing new processes and techniques. Position offers excellent prospects probably leading to senior management position in Foundry, to young man with executive potential and sound knowledge of physics or metallurgy preferred in relation to Foundry Processes. Degree in Physics or degree, or HNC in Metallurgy desirable. Good starting salary.—Write Box N.B.4341, A. K. ADVERTISING, 212a, Shaftesbury Avenue, London, W.C.2.

SITUATIONS VACANT—*Contd.*

ESTIMATOR RATEFIXER wanted. Must be fully capable of estimating weights and fixing initial rates direct from drawings for High Duty and Grey Iron castings manufactured in semi-mechanised plant and plate moulding. Position is a permanent one, with opportunity to join the Company's Pension Scheme, and offers scope for the right man with drive and initiative. Assistance will be given with housing.—Write, giving full particulars of experience, and salary, to SYKES & HARRISON, LTD., Port Penrhyn, Bangor, North Wales.

FOUNDRY MANAGER required immediately for foundry in provincial town in North Wales. Experienced applicant capable of controlling production of heavy and light castings by modern methods will receive substantial four-figure remuneration.—Apply Box 3578, FOUNDRY TRADE JOURNAL.

FOREMAN MOULDER required for Grey Iron Foundry. Experience of intricate jobbing work; knowledge of mechanised production an advantage; first-class working conditions; pension scheme; canteen and recreational facilities. House will be provided after satisfactory probationary period.—Apply Labour Manager, MARSHALL, SONS & CO., LTD., Britannia Works, Gainsborough.

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 3577, FOUNDRY TRADE JOURNAL.

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

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

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

SITUATIONS VACANT—*Contd.*

REPRESENTATIVES required for sale, on commission, of foundry equipment and sundries. Established trade. (1) Leicestershire, Nottinghamshire, Derbyshire, Staffordshire; (2) Lancashire, Cheshire, North Wales; (3) South Wales. Applications would also be considered for: (*a*) Northamptonshire, Bedfordshire and eastern counties; (*b*) London and south-eastern counties. Applicants should state particulars of foundry experience and present activities.—Box 3545, FOUNDRY TRADE JOURNAL.

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

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

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REPRESENTATIVE required by well-known bronze foundry, manufacturing all types sand castings, maximum 2 tons. For area London including Home Counties. Salary and commission. Great opportunity for experienced man with live connections among buyers of sand and chill castings. Existing accounts will be handed over and the appointment carries remuneration at present worth four figures per annum. — Write in confidence: Managing Director, CHARLES CARR, LTD., Grove Lane, Smethwick, 40, Staffordshire.

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SITUATIONS VACANT—*Contd.*

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

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ENGINEERING Firm, interested in complete purchase or controlling interest Small Modern Iron Foundry, within 15 miles Marble Arch.—Box 3572, FOUNDRY TRADE JOURNAL.

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THE proprietor of British Patent No. 601968, entitled "Improvements in the extraction of alumina from its ores," offers same for licence or otherwise to ensure practical working in Great Britain. —Inquiries to SINGER, STERN & CARLBERG, 14, East Jackson Boulevard, Chicago 4, Illinois, U.S.A.

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WANTED.—Small Sand or Baker's Mixer for 20-50 lbs. sand batches.—Details to Box 3589, FOUNDRY TRADE JOURNAL.

MACHINERY WANTED—*Contd.*

WANTED TO PURCHASE.—Beardsley and Piper Speed Slinger (stationary model); Titan Core Blower; Jolt Rollover Core Machine (MacNab or Tabor). State model, condition, location, and price. Enclose illustration for identification.—Box 3529, FOUNDRY TRADE JOURNAL.

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WANTED.—Titan Cupolette, with or without motor.—Box 3586, FOUNDRY TRADE JOURNAL.

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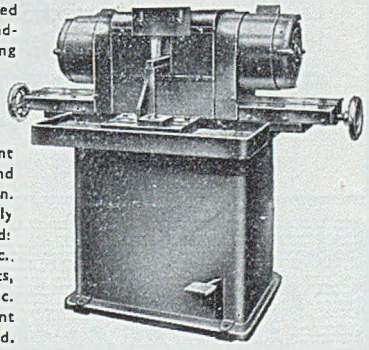

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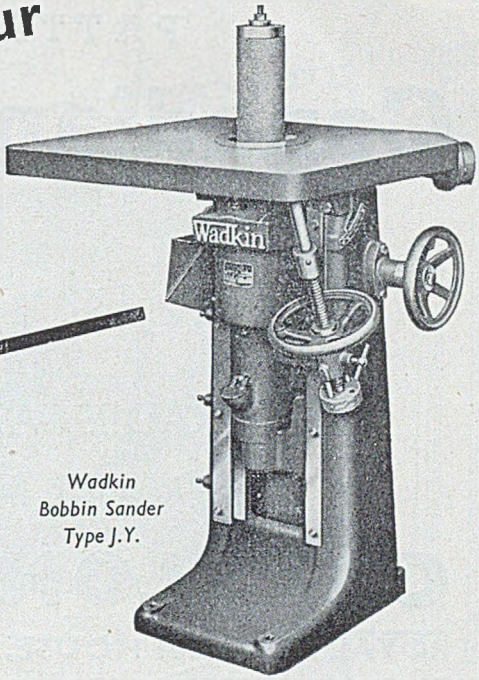

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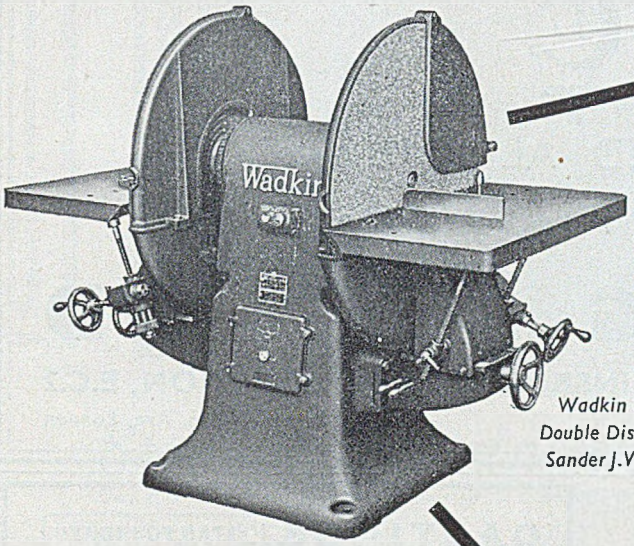

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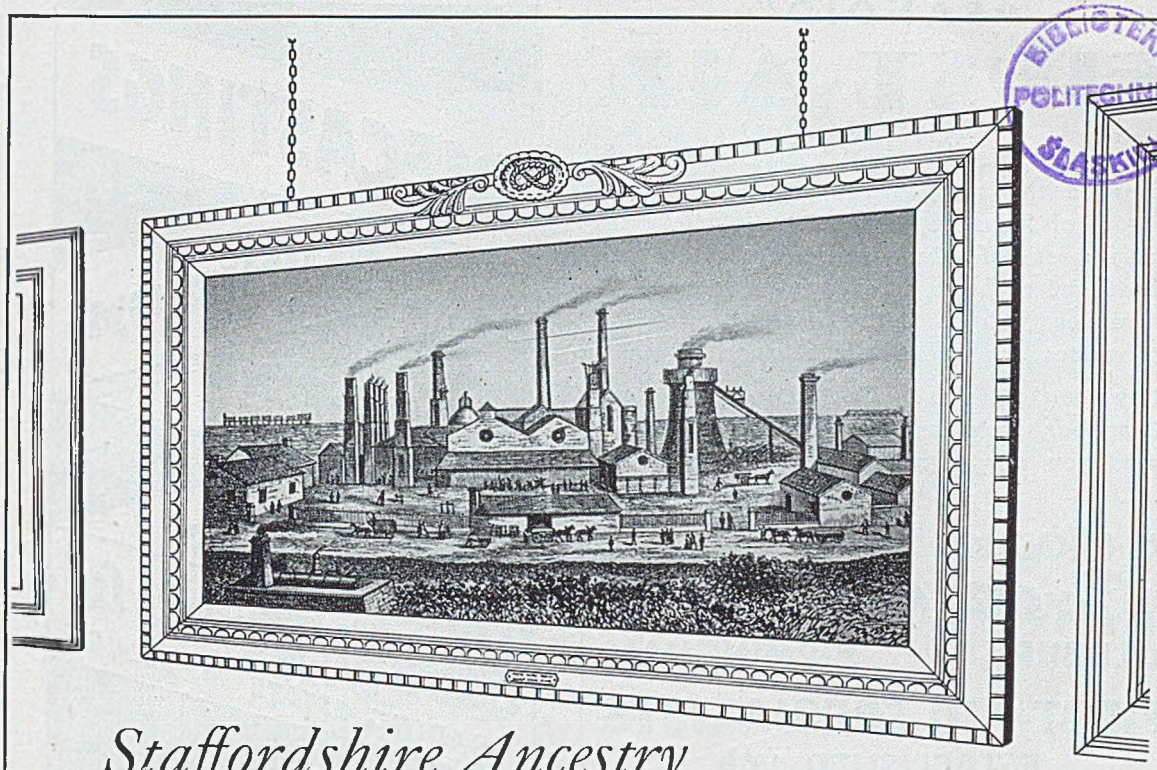

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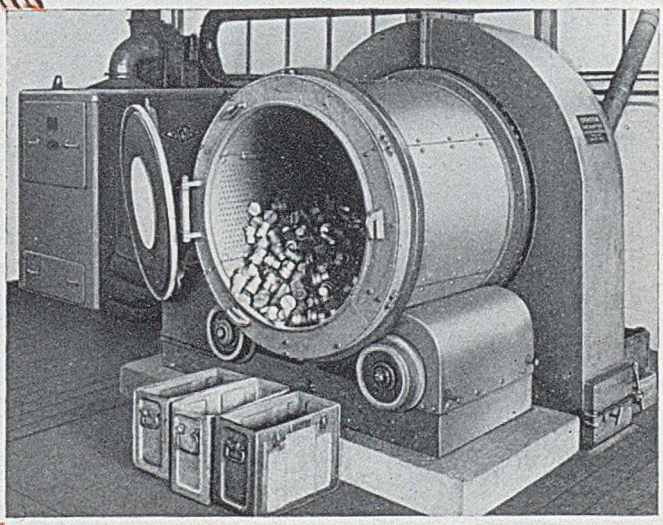

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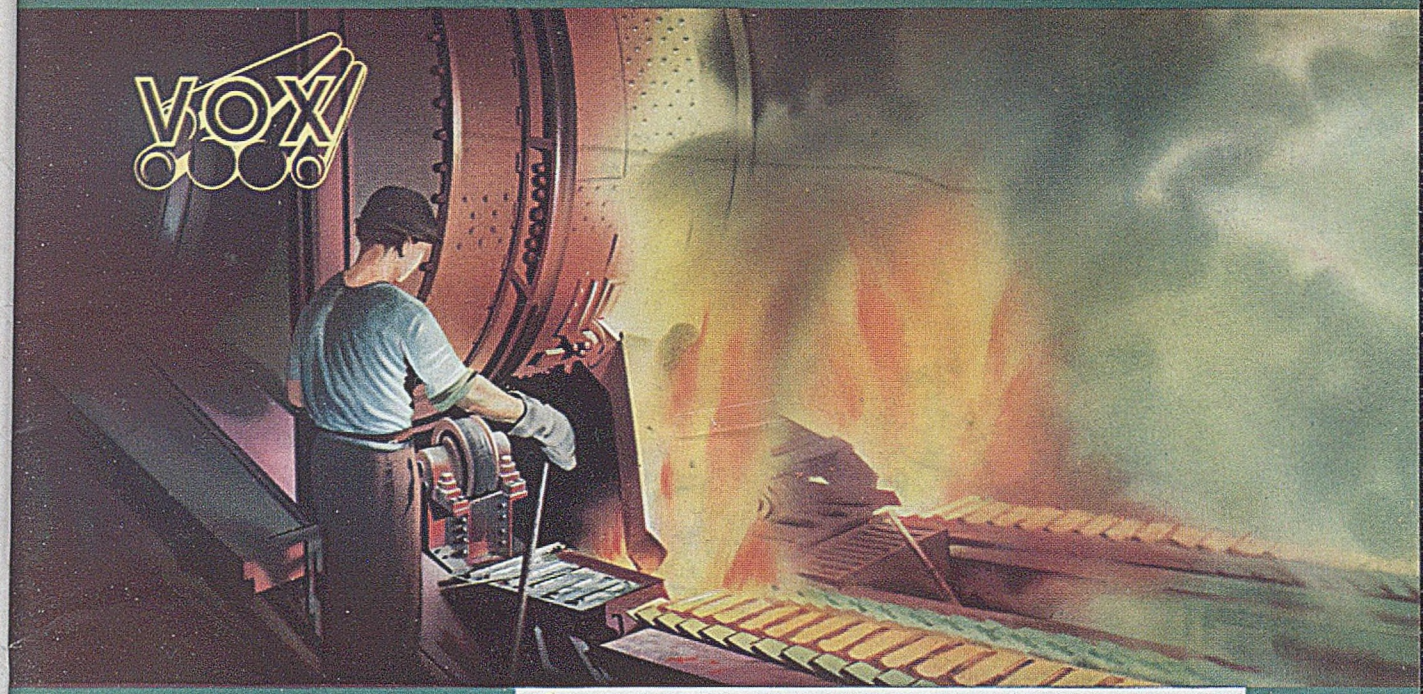

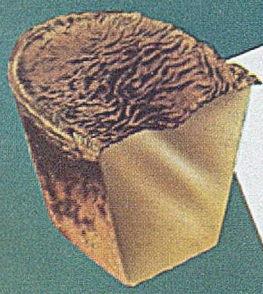

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SPECIFICATION

BSS	1400	B1-1
BSS	1400	B2-1
BSS	1400	B3-1
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BSS	1400	B5-1

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SPECIFICATION

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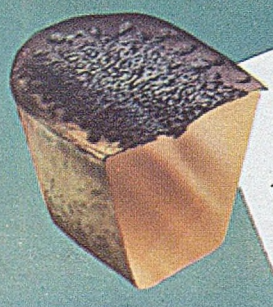
or	DTD	174A
BSS	1400	AB2-1
or	DTD	412



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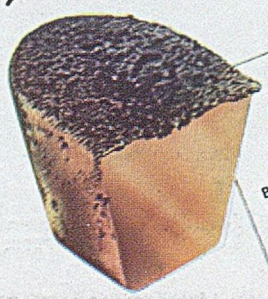

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