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WRITE FOR FULL INFORMATION OF

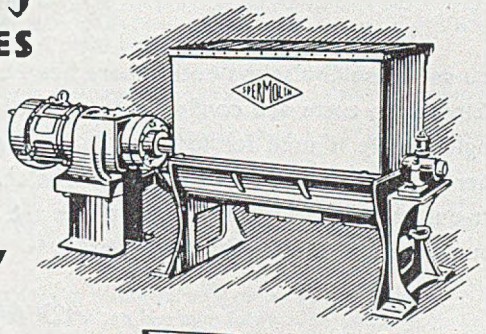
the Spermolin range

OF FOUNDRY SPECIALITIES

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

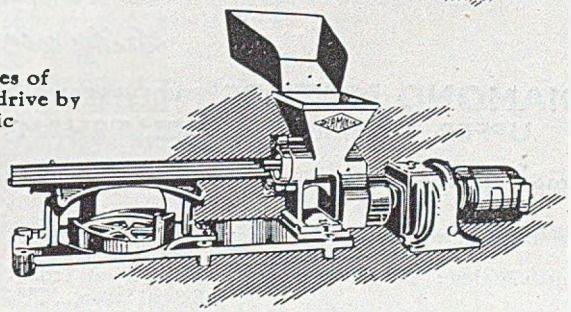
CORE OILS & BINDERS FOR EVERY TYPE OF CASTING

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



SAND MIXING MACHINES

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



ROTARY CORE MACHINES

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

WRITE TO SPERMOLIN LIMITED, HALIFAX, ENGLAND

Telephone: Halifax 4197 Telegrams: Spermolin, Halifax

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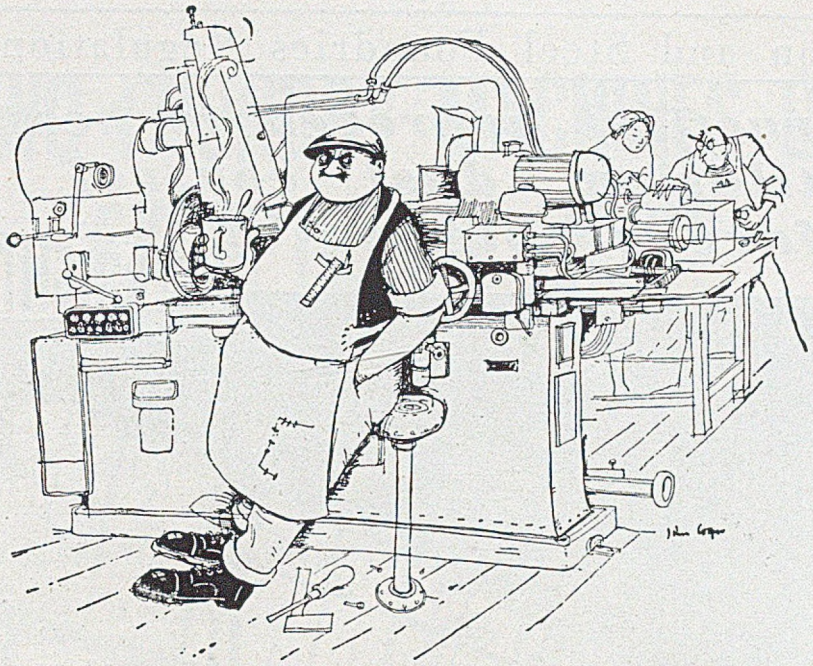

Try them on Alf!

Go on, you've got nothing to lose—except maybe Alf. Approach him from down wind while he's having a cuppa, and take him by surprise ;—we'd love to hear the conversation . . . . . .

"Morning Alf—"

"What d'you want now you perishin' little time waster?"

"I've got a sample of a new kind of grinding wheel for you to . . . "

"For me nuthin'. You can have it—I dont want anything to do with it. Been wastin' yer time reading them adverts again, I suppose . . ."

"But this really is different Alf. It's a new kind of bond Norton have developed which holds the grains firmly until they've done their most effective cutting, then lets them go to make room for new grains with fresh, sharp cutting edges..."

"Dear oh dear oh dear! And a bloomin' little fairy tells the poor worn out grains when they can run away and play, eh? Why don't you run away and play!"

"Well, it's worth trying, Alf. Perhaps these new wheels *do* last longer, perhaps they *do* cut with a nice continuous spark stream that could only come from a uniform cutting action, and with the nice steady swish-h-h of free and easy cutting."

"Co'r luvus! what ever next? Alright, give it here. I wouldn't do it for no-one else but you, and remember I've got my job to do and I 'aven't got time to muck about just to please you office fellows . . . etcetera, etcetera, etcetera."

It will be the acid test of course, but Alf knows his job and we're confident he'll see and admit, very reluctantly of course, that Norton's new 'G' Vitrified Bond really is a big step forward in grinding wheel development—the greatest advance in precision grinding wheels for 45 years.

NORTON the greatest name in ABRASIVES

'G' Vitrified Bond Wheels are available for **CYLINDRICAL & CENTRELESS GRINDING, GEAR, FORM AND THREAD GRINDING**

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ALFRED HERBERT LIMITED COVENTRY

NORTON ABRASIVES

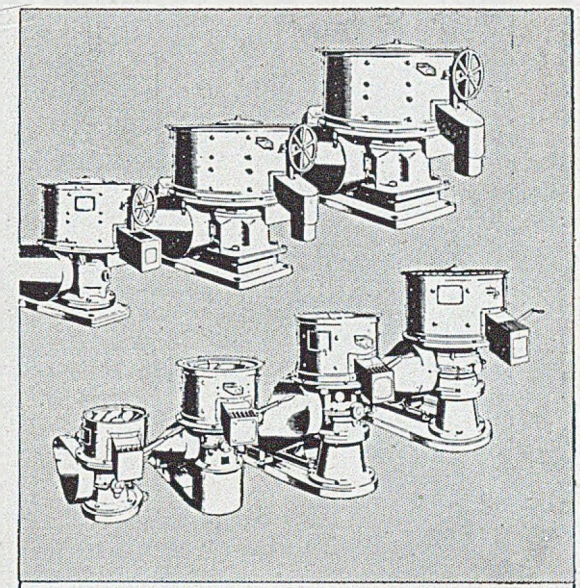
The Iron and Steel Foundries Regulations 1953

TWO FOUNDRY MACHINES OF EXCEPTIONAL MERIT

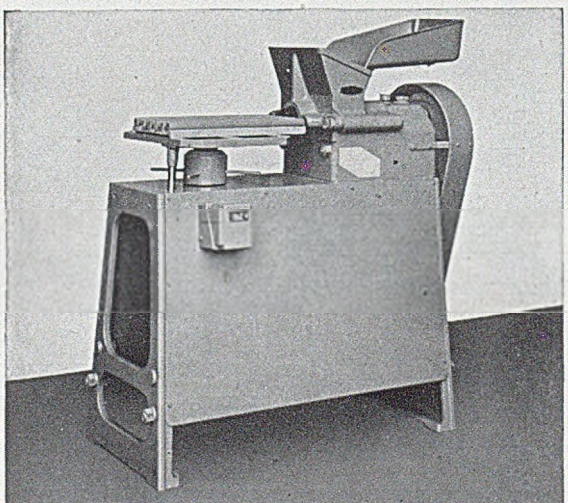
Sand/Binder Mixing without crushing

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.

Arrange to see these machines at work

Full details from :

THE FORDATH ENGINEERING CO. LTD.

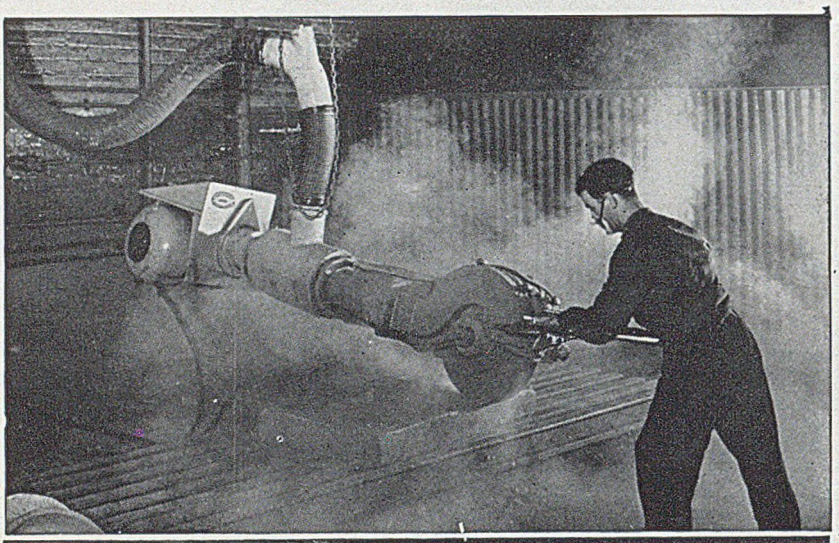
HAMBLET WORKS, WEST BROMWICH, STAFFS.

PHONE: West Bromwich 0549, 0540, 1692

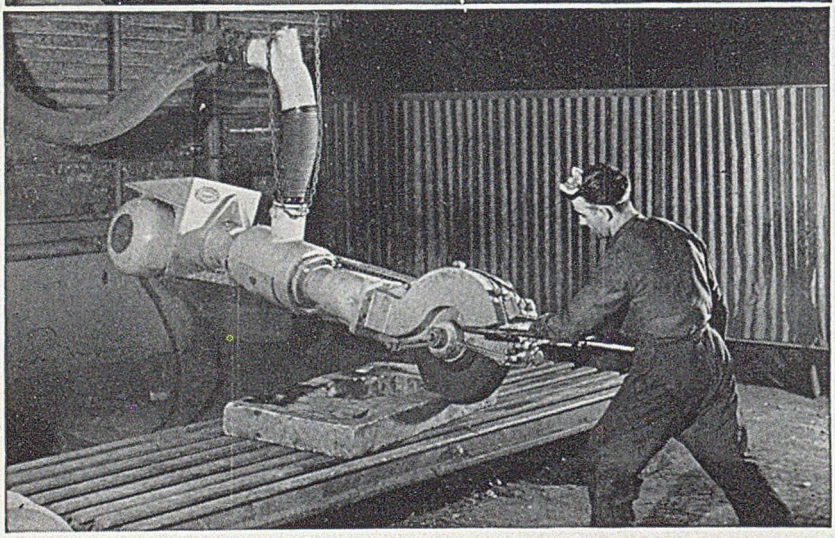
GRAMS: Metallical, West Bromwich

A NEW 20" SWING FRAME GRINDER

which completely solves one of the worst problems in the foundry



GRINDING WOOD WITH EXHAUST **OFF**



GRINDING WOOD WITH EXHAUST **ON**

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

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

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

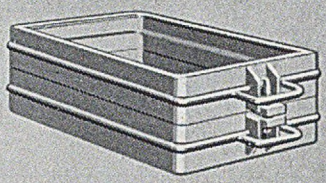
EXHAUSTIVE TESTS WHICH HAVE BEEN FILMED PROVE THAT THIS MACHINE COMPLETELY SOLVES ONE OF THE WORST PROBLEMS IN THE CAMPAIGN AGAINST PNEUMOCONIOSIS.

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

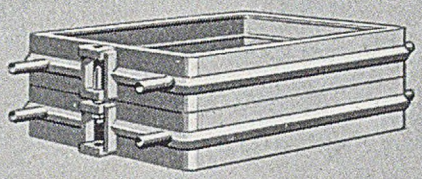
LUKE & SPENCER LTD.

Viaduct Works, Broadheath, Altrincham, Cheshire

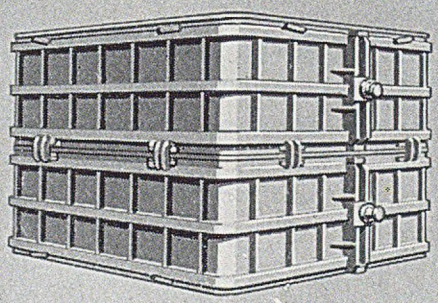
Phone: Altrincham 3281 Grams "Emery, Altrincham"



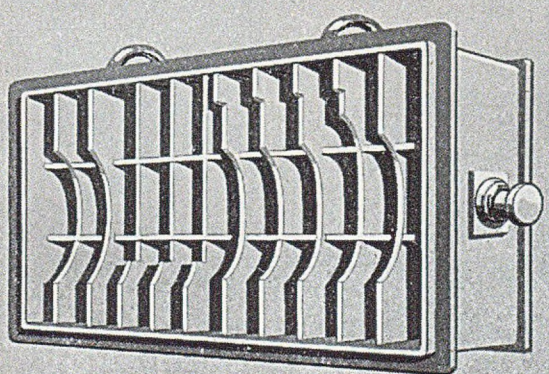
LIGHT WORK - 1 MAN LIFT



MEDIUM WORK - 2 MEN LIFT



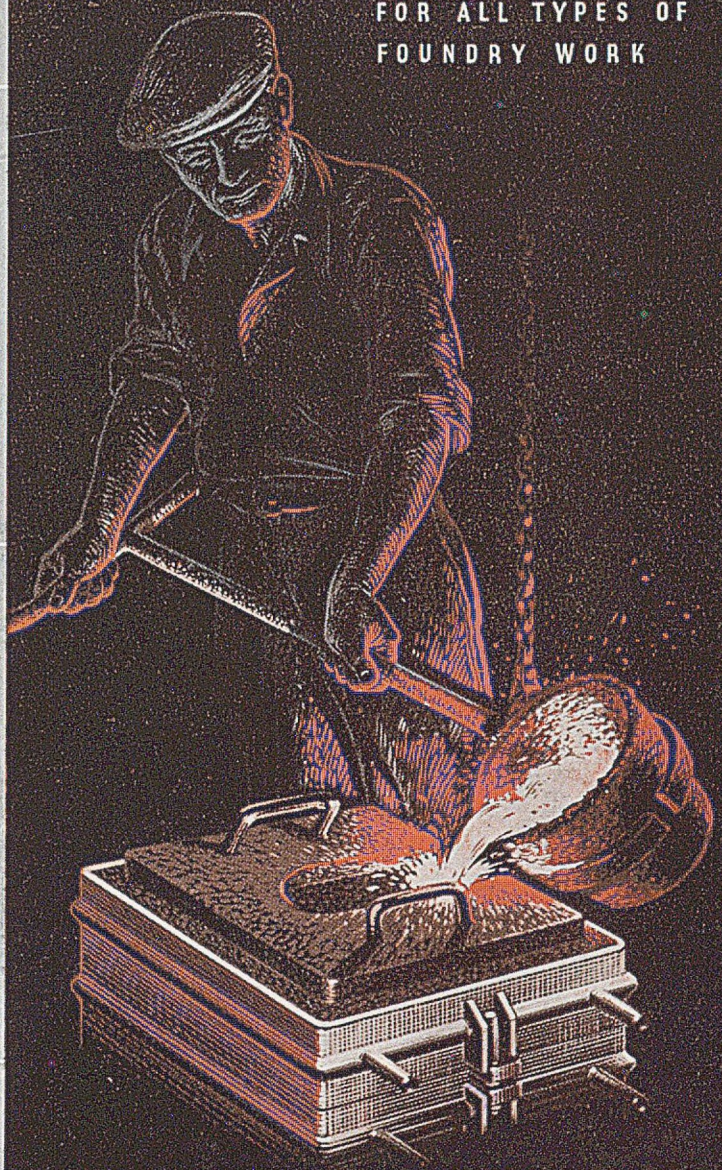
MEDIUM WORK - CRANE LIFT



HEAVY WORK

Sterling

MOULDING BOXES FOR ALL TYPES OF FOUNDRY WORK



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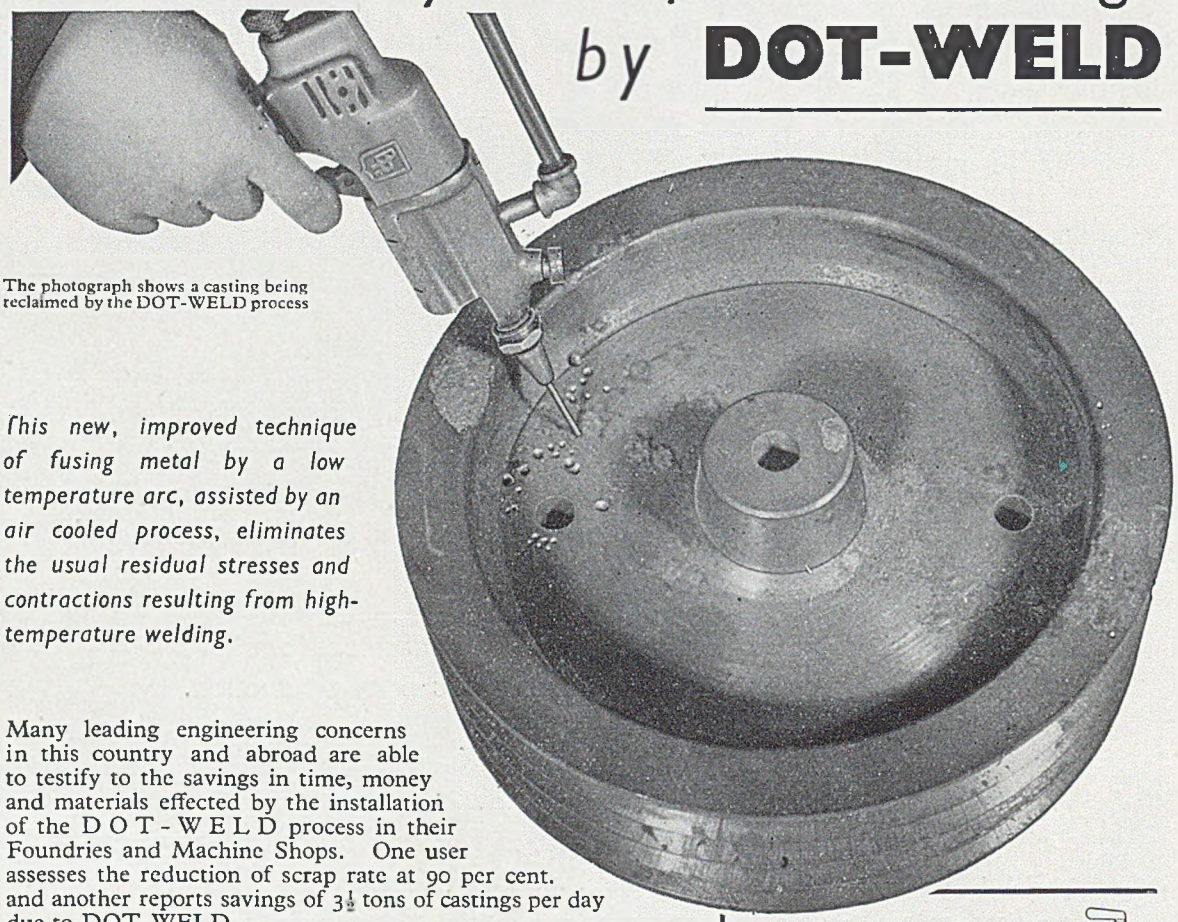
RECLAIM your defective castings by DOT-WELD



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

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

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

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

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

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

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

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"G.R." PRODUCTS	'43' GRADE	'87' GRADE	'12' GRADE	No. 1 BLOCK	No. 2 BLOCK	No. 3 BLOCK	No. 4 BLOCK
DENSITY—(lb. per cu. ft.)	43	34	44	25	18	12	13
RECOMMENDED SERVICE TEMP °F (back-up only)	1652	1652	2200	1832	1625	625	1000
AFTER-CONTRACTION AT MAX SERVICE TEMP.	Less than 1% for all grades						
THERMAL CONDUCTIVITY B.T.U./sq. ft./hr./in./°F. at mean temp. of:-							
300 °F	0.97	0.84	—	—	0.525	0.49	0.49
400	1.04	0.94	1.53	—	0.56	0.535	0.54
600	1.18	1·085	1.75	—	0.66		0.655
900	1.38	1.20	2.03	1.09	0.92		
1000	1.46	1.22	2.11	1.225			
1200	1.57	1.24	2.24	1.48			

Technical advice and assistance in the selection and application of refractories and insulating materials are always available on request.

"HOT FACE" BRICK INSULATION

"G.R." PRODUCTS	LW-20	GR-20	GR-21	GR-22	GR-23	GR-26
DENSITY—(lb. per cu. ft.)	29	40	48	30	47	48
COLD CRUSHING STRENGTH- (lb. per sq. inch)	130	200	270	175	270	350
RECOMMENDED SERVICE TEMP. °F Hot face	2000	2000	2100	2200	2300	2600
AFTER-CONTRACTION AT MAX. SERVICE TEMPERATURE	Less than 1% for all grades					
THERMAL CONDUCTIVITY B.T.U./sq. ft./hr./in./°F. at mean temp. of:-						
932 °F	1.41	1.95	2.01	1.36	2.04	2.26
1292	1.67	2.17	2.46	1.58	2.27	2.46

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

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

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

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

BRITISH CAST IRON RESEARCH ASSOCIATION

Alvechurch, Birmingham. 'Phone and 'Grams : Redditch 71.

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

J.J.M. Hx.

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Simplification of Productivity Organization

To increase the productivity of the foundry industry, teams have been sent to America; conferences have been held; general regional organizations have been formed, and internationally, based on Paris, a Technical Assistance Mission No. 122, being a part of the Organization for European Economic Co-operation, has been formed. This body has held two seminars (both in Paris), one in November, 1952, and the second during the period of the International Foundry Congress last September. It has now issued a 268-page report under the title of "European Foundries and Productivity —Some Recent Experiments and Achievements." There were seven contributions from this country, but little new knowledge is to be had from their perusal, though in one case diagrams showing the results consequent upon mechanical handling are intelligently set out. The contributions from other nationals do, here and there, show new facets on old problems.

All these worthy endeavours—local, national and international—need simplification and so far as the British are concerned, we postulate the following scheme as essentially meeting all requirements for the organization for increased productivity in our industry. (The proposals are based on the premise that the best foundries in the United States and in this country are roughly on a par, but the average in America is distinctly better than here):— (1) Visits by teams to America, say, every seven or ten years; (2) intense development by our industry of the work of operational research teams; (3) the full utilization of existing organizations such as the international foundry congresses and the Institute of British Foundrymen, properly supported by the employers' and research associations. Within this framework there is ample scope for the collection and dissemination of knowledge on the subject. Activities outside these bodies, though here and there they have shown themselves to be useful, are bound to result in much duplication of effort. Canalization of all endeavours into the traditional organizations would reduce the calls on the time of busy executives to reasonable proportions.

A fresh effort which falls into our list of rational requirements is that being made by the Association of Bronze and Brass Founders under the "Conditional Aid" scheme. This is a clear case where production technology is to be removed from the conference hall to the shop floor and we commend the enterprise as being of the greatest use to every copper-base founder in the country. The brass and bronze founders are perhaps not so well organized as those making steel and iron castings, but the scheme now launched does much to place them in a strong position, for there is being put at their disposal (and especially does this refer to the smaller establishments) a high-grade technical service which concentrates on more efficient methods of working. Shyness is no excuse for non-participation; there is much worth-while information available and the opportunity is now presented to get this at shop-floor level.

F

Dinner

BRITISH STEEL FOUNDERS' ASSOCIATION

Mr. T. H. Summerson, J.P., presided over a dinner held at Claridge's on Wednesday of last week. With him at the high table were the Rt. Hon. W. C. Elliot, C.H., M.C., D.SC., F.R.S., P.C., M.P.; Admiral of the Fleet Lord Fraser of North Cape, G.C.B., K.B.E.; Mr. F. Pickworth; Lt.-Col. Lord Dudley Gordon, D.S.O.; the Viscount Davidson, P.C., G.C.V.O., C.H., C.B.; Mr. H. Yates; General Sir Brian Robertson, Bart., G.B.E., K.C.M.G., K.C.V.O., C.B., D.S.O., M.C., A.D.C.; Mr. F. N. Lloyd; Mr. Cyril M. Cohen; Sir Harry Pilkington; Sir Archibald Forbes; Mr. L. Chapman; Mr. G. M. Menzies; Sir Percy Mills, Bt., K.B.E.; the Ven. the Hon. Archdeacon Stephen H. Phillimore, M.C.; Dr. Hugh S. Stannus; Mr. Frank Rowe; Mr. C. H. Kain; Mr. James Carson, O.B.E.; and Sir George Barnett.

Morgan "Floats"

Any step that can be taken to reduce the radiated heat from bale-out furnaces and thereby obviously improving the thermal efficiency of the plant is to be welcomed. The solution offered by the Morgan & Crucible Company, Limited, of Battersea Church Road, London, S.W.11, is alike simple, and we should imagine relatively inexpensive. It is known as the "Morgan Float," and is subject to patent application.

These floats are marketed in sets of four segments, each segment being made from M.I.22 insulating concrete. This concrete is a product of the Company's Refractory Group at Neston, Wirral, Cheshire, and is treated with a "Salamander" plumbago coating to act as a protection against wetting by molten aluminium. The four sections float on the surface of the molten metal, as shown in Fig. 1, and by preventing heat radiation, result in a substantial saving in fuel and a considerable improvement in working conditions. The presence of the floats does not impede handling in any way, as can be seen by Fig. 2. When the ladle is dipped in the metal the segments are easily displaced, but immediately the ladle is removed the segments float back again into position.

In addition to the advantages mentioned, there is

(*Continued at foot of col.* 2)

"At Home"

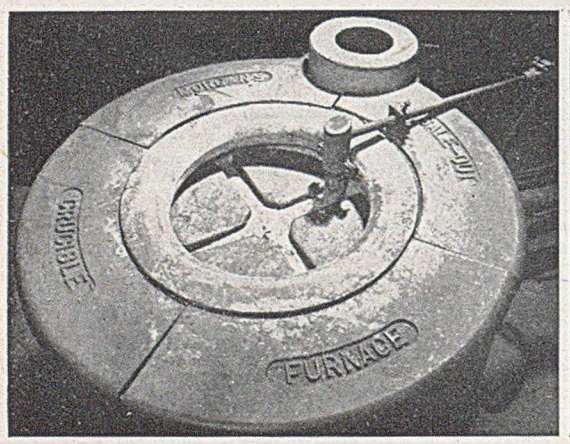
ALLIED IRONFOUNDERS' SHROPSHIRE GROUP

On Monday of this week, the Shropshire group of foundries of Allied Ironfounders, Limited, were "at home" to about 200 representatives of the county and district housing authorities, as well as members of the Press. Visits were arranged in parties to two foundries of the group. In the first—Sinclair Iron Company, Limited—interest centred on plants for sand- and centrifugally-cast rainwater and soil pipes and on the new die-casting process for cast-iron gutters. At Aga Heat, Limited, the visitors followed the whole production of the firm's range of cookers and heating boilers from metal melting to assembly and dispatch.

The *piéce de resistance* of the programme was the showing to the whole party of "The Stockton Test". This film, which has been referred to several times in these volumes, revealed to the civic authorities how three terraced houses, normally considered below standard, had been converted at quite a moderate outlay to incorporate modern stoves, hot-water systems and baths—thus making a notable contribution to solving the housing problem. The audience, consisting of mayors, councillors, architects, surveyors, and other housing dignitaries, showed themselves to be much impressed by the scheme in a discussion which followed. The whole idea was carried through at the personal instigation and day to day directive of Mr. W. T. Wren, assistant managing director of Allied, who addressed the gathering. Light castings founders as a whole should indeed be grateful to Mr. Wren for such worthwhile national propaganda efforts, which cannot but have industry-wide repercussions. At the close of the film show, the company were entertained at a cocktail party to which they were welcomed by Mr. T. O. Lander and Mr. G. Saville Stevens, both directors of the parent concern.

(*Continued from col.* 1)

obviously a considerable saving in fuel which can be of the order of 15 per cent. and as the cover is in intimate contact with the molten metal it reduces disturbance on the surface and prevents continual oxidation. At present these floats are being made in one size only, this being suitable for the 200-, 300- and 400-lb. aluminium capacity furnaces.



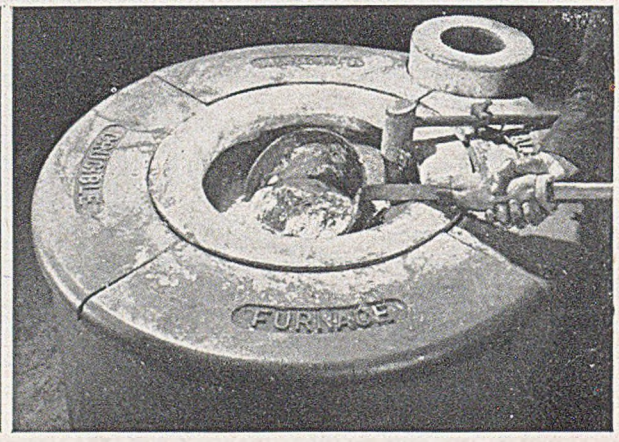


FIG. 1.—*Morgan "Floats" on the Surface of the Metal in a Bale-out Furnace;* FIG. 2.—*The Floats displaced during the Baling Operation.*

Seen through the Students' Eyes

Extra-mural Activities of the National Foundry College

Each year, one of the most valued of the extra-mural activities of the National Foundry College is a series of works visits to foundries in a selected area of the country. This year, London and S.E. England was chosen and seven large foundries were visited. This account describes the tour, and some outstanding features of the establishments which received the party. Initially, a brief résumé is given of the nature of the College set-up and its curriculum.

The National Foundry College provides a two-year diploma course designed to equip suitable candidates for executive posts in the foundry industry. A wide range of entrance qualifications is acceptable, provided that the applicant has completed a specified minimum period of training in the foundry industry. In many cases, candidates from the British foundry industry may not be required to pay the course fees, if their employers are members of appropriate trade associations such as the Council of Ironfoundry Associations, the British Steel Founders' Association, the Light Metal Founders' Association, or the Association of Bronze and Brass Founders, which contribute to the funds of the College. Such "sponsored students," as they are known, are in effect seconded by their employers for training at the College. Many British students, and also candidates from India, South Africa, Switzerland, Ceylon, Norway, China and Egypt, have already been trained. The diploma course is unique in the Commonwealth and covers the whole foundry field. Mould and casting production methods, management problems and foundry metallurgy, rank with estimating and costing as main subjects. In addition, a panel of visiting specialists from the industry give lectures upon subjects of major interest. New College premises, completely equipped for the study of all foundry problems, are almost completed adjacent to the Wolverhampton and Staffordshire Technical College.

Another valuable feature is a series of approximately 70 visits to actual foundries. Throughout the diploma course, one foundry is visited each week and, towards the end of the course, a complete week is spent in touring a number of foundries in a chosen district. The maximum benefit is derived from these works visits, since all information obtained by individuals is pooled and thoroughly discussed afterwards. No aspect of the foundry industry is neglected, jobbing plants, mechanized plants, those which are devoted to ferrous castings, and those specializing in non-ferrous, all are considered.

Since 1948, foundries on the North East coast, Manchester, and on Clydeside have been visited in these tours, in addition to a large number of plants in the Midlands. Last summer a number of foundries in the London area and in East Anglia received a party of students from the 1952-53 Diploma Course. These foundries were representative of the whole field of castings production, and of outstanding interest to the students. The following account deals with the salient features of each, variously illustrated in Figs. 1-11, the captions of which are self-explanatory.

HIGH DUTY ALLOYS, LIMITED

On Monday morning, the Foundry College party visited the works of High Duty Alloys, Limited, Slough. Here, the foundry division consists of shops devoted to the production of aluminium and magnesium alloy castings. Two sand foundries are in operation covering a total area of 40,000 sq. ft., and are devoted to the production of castings weighing from a few ounces up to 3,000 lb. in

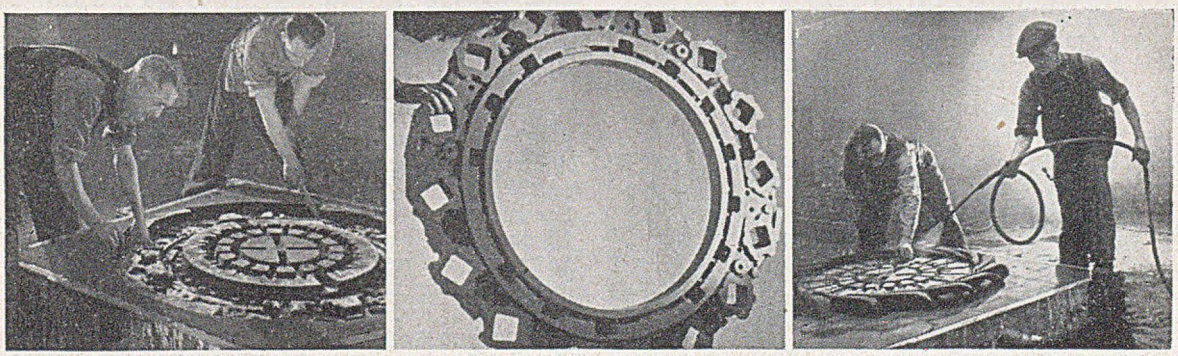


FIG. 1.—*Producing Diffuser-ring Castings weighing* 108 *lb. in Magnuminium Alloy at High Duty Alloys, Limited;* (a) *Finishing off a Mould for the Rear Part,* (b) *Finished Ring (Rear) and* (c) *Coring-up and Drying a Part Mould.*

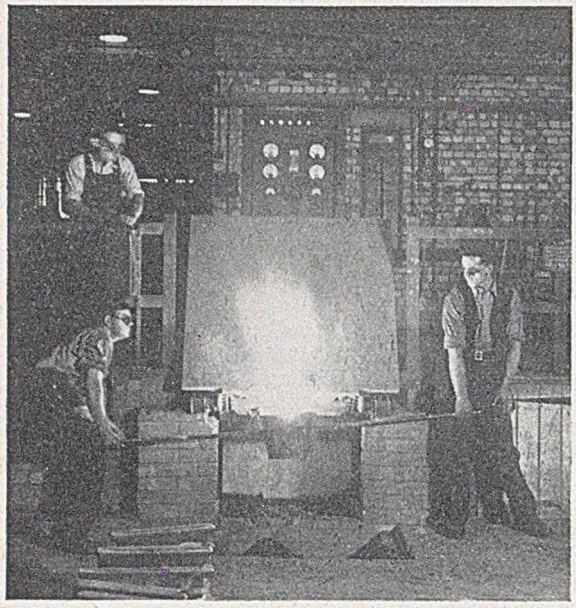


FIG. 2.—*Tapping the High-frequency Melting Furnace at Langley Alloys, Limited.*

weight. Impeller-type ramming machines are used for the large, floor-moulded work and smaller castings are produced on moulding machines. The latter vary in size, the largest taking a moulding box up to 48 by 36 in. A sand supply and reconditioning plant is installed centrally. The castings produced on the moulding machines are intended for use in the textile, building and motor industries and aircraft castings form a substantial proportion of the products of the firm. A wide range of oil-fired melting furnaces is installed, and these are grouped from bale-out furnaces of 250 lb. capacity, for use in the machine-moulding section, to larger units capable of supplying up to 1,200 lb. each for the floor-moulding section. The castings are knocked-out on gratings built into the floor, and belt conveyors below ground level transport the sand back to the processing plant. A large patternshop provides the necessary wooden and metal equipment for coreshops and foundries.

A large coreshop is equipped with a considerable amount of mechanical equipment. Large cores are baked in gas-fired horizontal ovens, while those of medium and smaller size are processed in vertical coke-fired stoves of the continuous type.

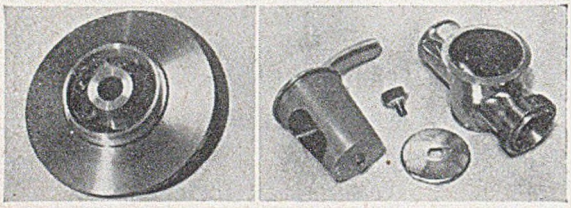


FIG. 3.—*Examples from Langley Alloys' Production: (left) Impeller in Aluminium Bronze and (right) Milk Cock Castings in Nickel-base Alloy.*

Die-casting Foundries

A considerable amount of die-casting is carried out in two buildings equipped for gravity and pressure work. The gravity die-casting section provides an excellent example of modern design in order to afford the maximum light and optimum working conditions. All of the services—electricity, air, water, etc.—are placed in trenches in the floor covered with steel chequerplate in order to afford easy access for maintenance. A series of bale-out furnaces provide the metal for die-casting, and are fed in turn from two large Ashton semi-rotary bulk-melting furnaces. Temperature control is provided on all furnaces, and good melting conditions are facilitated by various items of control equipment. A fettling shop is provided nearby for the trimming of gravity die-castings. The pressure die-casting foundry has been completely rebuilt during the past 18 months, and now has a floor area of 7,600 sq. ft. Electrically-operated cranes are installed which enable dies to be conveyed to the casting machine, or to be transferred to any part of the shop. The pressure-die-casting machines installed are of the cold-chamber, Polak type and some smaller Edgwick machines are also used. The range of castings produced varies from a few ounces up to 30 lb. Two large Ashton semi-rotary furnaces supply molten metal as required to the small holding furnaces. The individual fume extraction system provided for the machines is excellent, and the general air conditioning and lighting arrangements in the shop are very efficient.

The majority of the sand and gravity die-cast components are subjected to heat-treatment. For this, three pit-type electric furnaces, each 5 ft. dia., are installed, and special atmosphere-control arrangements are available when required. Low-temperature units are also used. Elaborate inspection facilities are provided, and non-destructive testing methods are widely used for inspection and control.

The die foundry tool-room is extremely well equipped, and rapid production of dies is ensured by the use of the most modern machine-tools. The close technical control essential in the production of light-alloy castings is maintained by a very comprehensive chemical and metallurgical laboratory.

LANGLEY ALLOYS, LIMITED

After luncheon, the same day, the party proceeded to Langley Alloys, Limited, and spent the remainder of the day there. These works embody modern trends in factory design and layout. Although younger than 20 years, the company has been able to establish a reputation for high-grade sand castings in a wide range of copper-base alloys, nickel-base alloys, and austenitic stainless steels. Light- and medium-weight castings are made for use in the chemical-engineering and food-processing industries.

The foundry is equipped to produce both machine-moulded and hand-moulded castings. A variety of moulding machines are installed in the west bay of

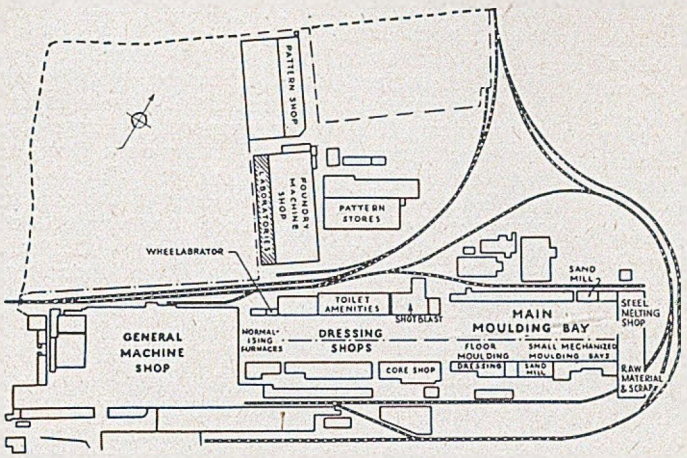


FIG. 4.—*Layout of the 65-acre Works of K. & L. Steelfounders & Engineers, Limited, Letchworth.*

the foundry, and the moulds produced are cored and assembled on gravity roller conveyors for pouring. Knock-out facilities are provided by a long grid extending the length of the moulding-machine bay; a belt conveyor below the grid returns the sand to a compact sand-handling plant nearby. In this section, pipe fittings, gland castings, valve bodies, seats and discs are made.

In the hand-moulding section, aluminium-bronze pump impellers, transformer secondary castings in copper, filter and meter bodies in manganese- and aluminium-bronzes, and various castings in gun-metal and phosphor-bronzes are made. Components up to 1 ton in weight can be made in those alloys. An interesting post-war development in the Langley plant is the production of nickel-base alloy castings and austenitic stainless-steel castings up to 400 lb. in weight. The nickel-base alloy castings used for acid-manufacturing plant are now a speciality of the firm.

A small, though quite adequate, coreshop serves both machine- and hand-moulding sections. Cleaning and fettling operations are carried out in a well-equipped shop, and also in a modern shop, excellent facilities for wood and metal pattern production and maintenance are available.

Metal melting capacity is of a varied character, including oil-fired tilting crucible furnaces, one electric rocking-arc furnace and a high-frequency melting unit. The large variety of alloys processed in the foundry involves the use of strict technical control and close laboratory supervision and inspection is exercised at all stages.

K. & L. STEELFOUNDERS & ENGINEERS, LIMITED

On the second day of the tour, the party visited K. & L. Steelfounders & Engineers, Limited, which was established in 1916 at Letchworth, and was then largely manned by Belgian refugee foundrymen. It became one of the "600" Group of Companies in 1928. Considerable expansion occurred subsequently, and to-day the works cover approximately 65 acres. The layout of the foundry and associated buildings is illustrated in Fig. 4, and comprises a fully-integrated engineering works, including steel and bronze foundries, light and heavy machine-shops and assembly bays. The ancillary departments include welding and fabricating shops, patternshops, research and development laboratories and heat-treatment departments.

The steel foundry is one of the most modern of its kind in this country, and over 200 tons of castings are produced weekly, almost entirely by mechanized methods. Green-sand work accounts for the bulk of the production. A large proportion of the castings produced is for use in steam locomotives and Diesel-electric units. In addition, earth-moving and mechanical-handling equipment produced by the company consumes considerable quantities of steel castings. The types of steel produced include plain carbon ranges and a number of heat-, wear- and corrosion-resisting alloys. The main foundry building covers approximately 88,000 sq. ft. and consists of four main bays, two devoted entirely to machine moulding, one jointly to machine moulding and floor moulding, and the fourth to shot-blasting, dressing, heat-treatment and inspection.

Melting

The melting shop for steel is contiguous to the main foundry, and accommodates all the melting equipment and the raw materials stores. Scrap metal handling is carried out by magnet and grab suspended from 10-ton capacity overhead cranes. Charges are prepared and weighed in drop-bottom hoppers. Melting is carried out in two Birlec arc furnaces of the swivel-roof type, each of 5 tons capacity. These furnaces are both basic lined and are powered by 3,000-kva transformers.

K. & L. Steelfounders were one of the pioneers in Great Britain of steel refining by the oxygen-injection method, and this is now established as routine practice. A complete system of temperature measurement and recording is installed, and the whole lay-out is typical of the best in modern practice. After tapping the ladles of steel are taken to the appropriate section of the foundry on a specially-designed bogie, drawn by a tractor.

The main machine-moulding bay covers 27,000

Seen through the Students' Eyes

sq. ft., and plant includes 750-lb. Pneulec jolt-roll-over machines, and large plain-jolt machines capable of handling boxes up to 6 ft. sq. The sand used in this bay is processed in a plant handling 8 tons per hr. The sands used include those from Leighton Buzzard, King's Lynn and the Erith varieties and bonding materials are of the bentonite type. Sand is supplied to the moulding machines by means of a telpher conveyor which services each hopper as required. Pouring operations are carried out in part on the floor and in other cases on gravity roller conveyors placed at right-angles to the longer axis of the shop. Knocking-out takes place over a number of grids, some of which are stationary and others vibratory, and are all situated over a continuous underground belt running the entire length of the bay. The returned sand is elevated, screened and passed to a Newton-Collins cascade cooler and de-silter, and is then elevated and ploughed off into a storage hopper of 90 tons capacity placed immediately behind the Simpson mill. The latter is equipped with a time switch for the control of milling time, and a water-meter is also provided.

Mechanized Sections

The smaller machine-moulding sections in two bays have recently been mechanized to quite a high degree, each section utilizing a pair of 1,000-lb. jolt-roll-over machines, one of which produces copes and the other drags. Sand is fed into the machine hopper from discharge hoppers above each machine, and an automatic cut-off device controls the amount of sand supplied. Jolting time is controlled by a limit switch and thereafter mould production is automatic. The moulds travel along roller conveyors to a coring station where they are afterwards closed and then transferred to adjacent lines of roller conveyor for casting. This section is served by vibratory shake-outs, and the castings are skip loaded for periodic transfer to the fettling shop. A mould-box return system is formed from pairs of gravity conveyors leading back to the moulding machines.

The coremaking facilities are provided in a highly-mechanized shop operating mainly with female labour. The present installation is capable of producing 100,000 cores per week. Large cores for jobbing work are made in the open shop, but these are relatively few in number. Core-sand is supplied to the benches by means of a pendulum conveyor bearing appropriate containers, core-plates, carriers, etc. Completed cores are transferred by similar means to vertical continuous core-drying stoves.

Fettling Shop

Cleaning is carried out by shot-blasting which takes place in five cabinet-type plants. In addition, a barrel-type unit (a model unique in this country when first installed) impeller-type cleaning plant are provided for the smaller castings. Castings then pass up through the fettling shop for the normal dressing procedures. A notable feature is the good lighting, the fettling shop being illuminated entirely by a system using cold-cathode tubes—a feature described in some detail in the JOURNAL, June 12, 1952. The firm has produced the K.L. fettling bench, booth ventilated on scientific lines, which is a marked advance in layout for fettling operations. This design has passed its early trials, and is now in production so that a test on a larger scale can be made.

Heat-treatment is carried out in a range of furnaces, annealing is carried out in Buell furnaces, fired with pulverized coal, and a number of Birlec 165 kva bogey-hearth units are available for normalizing and tempering. Quenching equipment with controlled water-circulation have recently been added to the electrical heat-treatment facilities.

Patternshop and Inspection

The patternshop at the Letchworth works is of very modern design and is a model installation in that many recommended practices have been carried

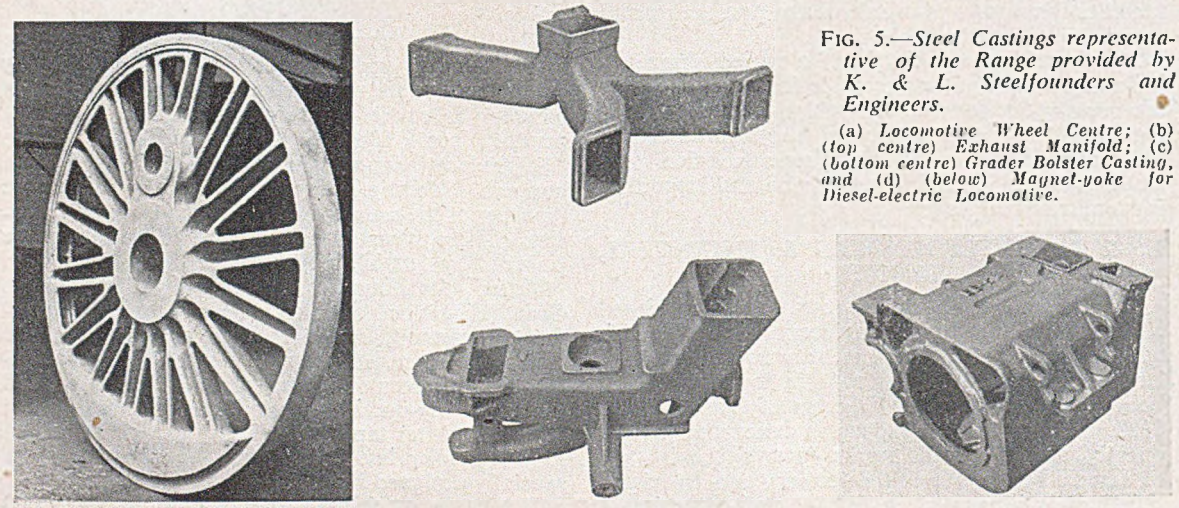


FIG. 5.—*Steel Castings representative of the Range provided by K. & L. Steelfounders and Engineers.*

(a) *Locomotive Wheel Centre;* (b) *(top centre) Exhaust Manifold;* (c) *(bottom centre) Grader Bolster Casting, and* (d) *(below) Magnet-yoke for Diesel-electric Locomotive.*

FIG. 6.—*Pouring Medium-weight Castings on Pendulum Conveyors at the No. 4 Moulding Unit of Ford's, Dagenham.*

out so far as lighting, heating and ventilation are concerned. Each machine is provided with individual drive and sawdust removal ducts underground. The north and east walls are glazed to their full height; radiant panels steam heated are installed in the ceiling and on the west wall. Excellent pattern-storage facilities are available.

The inspection department is under the control of a Chief inspector who is quite independent of production and planning. His staff are distributed amongst the pattern, moulding, core-making and fettling departments. The radiographic section of the metallurgical department, also is at the disposal of the inspection staff whenever this is considered necessary. This section includes a 220 kv. Siemens-Schuckert X-ray set, and equipment for gamma-ray work.

This metallurgical section occupies two floors in a separate building, and is well equipped for chemical and metallurgical control. An interesting feature is the provision of a Lamson tube connected with the steel melting shop in order that samples can be transferred to the laboratory with the minimum delay.

A new block has recently been erected to house the washing and shower bath facilities necessary for the 450 men and 60 women on the staff. Duplicate sets of lockers for clean and working clothes are provided.

FORD MOTOR COMPANY

Continuing the students' "Cook's Tour," the works of the Ford Motor Company, Limited, at Dagenham, were visited on the Wednesday morning. The Ford foundry occupies the north-east corner of the plant at Dagenham, and has an area of approximately 371,000 sq. ft. If the patternshop and maintenance departments be included, approximately three thousand men are employed. All pig-iron used is supplied from the Ford blast furnace, and the considerable amount of coke needed is produced in the coke ovens nearby. The foundry is served by a very modern patternshop which includes a drawing office and a comprehensive range of wood- and metal-working machinery. Foundry machine and maintenance departments are located adjacent to the foundry and a small jobbing foundry is set aside for the production of experimental and prototype castings and components.

Melting Shops

Grey-iron melting is a fully mechanized operation in the Ford plant and charges are transported from the stockyard to the melting furnaces by means of a Telpher system. All are weighed and loaded into skips with the necessary fuel and fluxes before moving to the furnaces. Melting of grey iron is handled in a battery of eight cupolas which range from 36 to 72 in. dia. and are tapped continuously. Molten metal is collected in gas-fired receivers of from 2 to 5 tons capacity, and then poured into ladles for use on the moving conveyors. One hot-blast water-cooled cupola is in operation, and a 36-in. dia. basic-lined cupola is used in the duplexing cycle. The latter unit is capable of producing between 10-12 tons per day. Short-cycle blackheart malleable castings are made by the duplexing process.

A separate melting section is devoted to the processing of special alloys. Two electric-arc furnaces are available for the purpose, of three and seven tons capacity respectively. A 15-ton arc furnace, working in conjunction with a 60-in. dia. cupola, produces metal by the duplexing method.

Seen through the Students' Eyes

Metal from the arc furnaces is poured at approximately three-minute intervals into a tilting receiver, and continuous temperature control is carried out by means of immersion and optical pyrometers. A one-ton electric-arc furnace is used occasionally for the production of melts of alloy steel for valve-seat inserts, etc. Heat-treatment is carried out in two sets of three electric furnaces which operate on the malleable cycle of 16 hrs., and one gas-fired furnace is in use for the normalizing and annealing of cast crankshafts.

Cores and Moulds

Core production is organized in four main departments, capable of producing a total of 84,000 cores daily. Each shop has its own sand-preparation unit and core ovens, and is provided with a wide range of mechanical appliances for core production. A unique feature is the production of cylinder-block barrel cores at the rate of from 100 to 120 per hr. by means of a specially-designed eight-stage rotary coremaking machine.

Moulds are produced on a number of independent moulding units, the moulding machines used being of the jolt-squeeze type, and a notable feature is the use of impellor ramming machines for cylinder-block production. The first of the moulding units produces various high-grade iron castings, while the second is devoted entirely to cylinder-block production. Miscellaneous grey-iron castings are produced on two further units, while yet another is devoted to the production of camshafts and flywheels. Differential carriers, clutch forks, brake hubs, etc., are made on the remaining units lines.

The castings produced are intended solely for use in the automobile and tractor plants of the company on the same site. The output runs at approximately 240 tons of fettled grey-iron castings per day, along with 50 tons of blackheart malleable. A wide range of castings, numbering some 50,000 daily, is produced, up to a maximum of 435 lb. fettled weight.

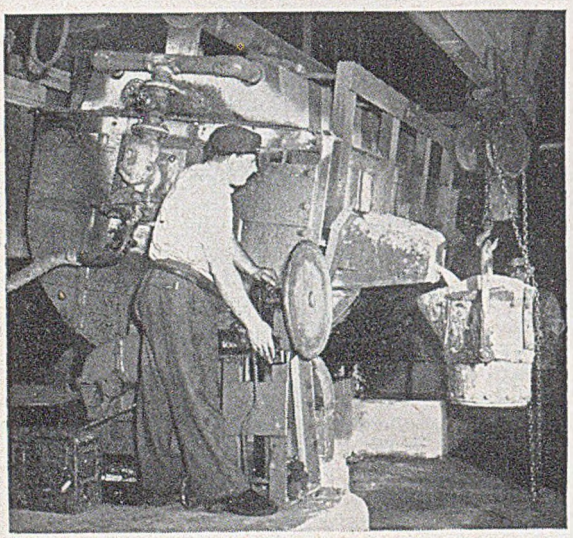


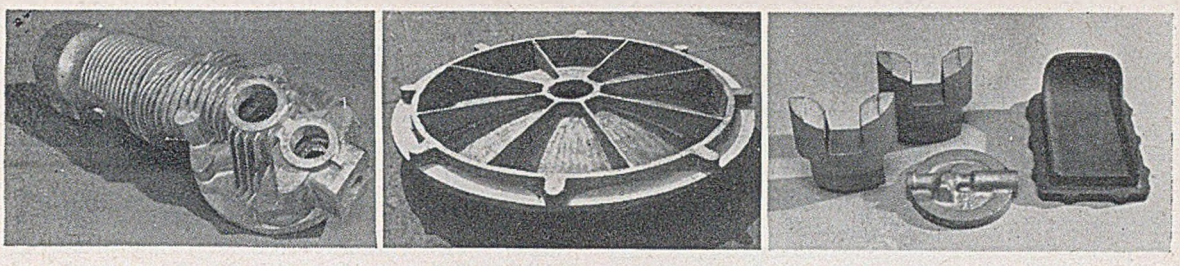
FIG. 7.—*Filling a Pouring Ladle from an Electrically-controlled Gas-fired Receiver of 5-tons capacity at Ford's Dagenham Foundry.*

Pouring is carried out on pendulum-type conveyors which carry the completed moulds to the pouring station concerned and then into the fume tunnel, from which mould gases are extracted by suction fans. The castings next arrive at the shake-out station where they are removed from the moulds and suspended on a cooling conveyor which carries them across the roof of the foundry to a cooling tower situated outside of the building. When cool enough for handling, the castings are moved to the knock-out proper where runners and risers, and core irons are removed. They are subsequently transported from there to the fettling department by monorail. Heavy castings are cleaned in a continuous shot-blast cabinet, others are processed in other impeller-type cleaning plants. Fettling is carried out with the aid of portable electric grinders, power chisels, double-ended grinding wheels, etc. Most of the castings are subjected to a pressure test. Grey-iron fettling is segregated from that of the remaining alloys.

J. STONE & COMPANY, LIMITED

After luncheon the students travelled, on the same day, to Charlton and visited the plant of J. Stone & Company, Limited, which constitutes a large group of foundries in the London area. In the scope of the work carried out, this non-ferrous foundry may well be one of the largest installations in existence. The foundries originated in Deptford during the reign of King William IV, when the original brass foundry formed an important section of the comparatively small works of the time, though the engineering activities of the company subsequently expanded considerably. Some 35 years ago, some of the foundries of the company were transferred to the Charlton area, and shortly after the recent war all foundry activities were transferred from Deptford to Charlton, where some 1,200 people are now employed. In the Charlton foundry group, a wide range of cast and finished products is produced. Aluminium, magnesium and copper-base alloy castings are made in sand-moulded and gravity-die-cast form. In addition, a substantial tonnage of bronze ingots and white-metal-bearing alloys is produced for sale. The company operates an iron foundry in the Gravesend area, and in conjunction with Fry's Metal Foundries, Limited, at Merton Abbey, operates a magnesium-alloy pressure-die-casting plant. The latter, however, were not inspected by the National Foundry College party.

In the Charlton works, production is divided into eight sections: the propeller foundry; the general bronze foundry; an ingot and billet foundry; the bronze die-casting section; white metal section; aluminium and magnesium gravity-die-casting; a magnesium sand-casting foundry, and an aluminium sand-casting foundry.



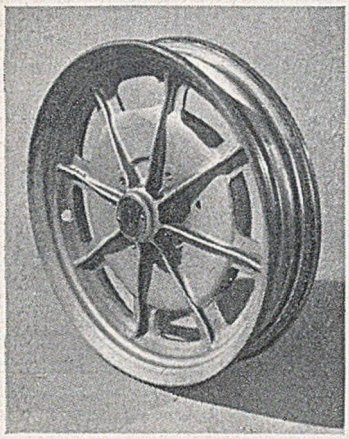


FIG. 8.—*Selection of Castings produced by J. Stone & Company, Limited:* (a) *Starter Body for a Gas-turbine Aero-engine, Gravity Die-cast in Aluminium Alloy;* (b) *Sand Cast Aluminium Reflector Centre, 5 ft. dia., weighing 2¼ cwt.;* (c) *Bronze Form Castings (left) and Gravity-die-castings in Magnesium Alloy (right) for the Aircraft Industry, and* (d) *Machine-moulded Magnesium-alloy Road Wheel for "Cooper" Racing Car.*

Propeller Foundry

The propeller foundry is one of the largest units in the world designed for the production of marine propellers. Cement-sand moulding technique is used and all propellers are fettled and machined at Charlton. An impressive list can be prepared showing the destinations of propellers made by this company. The Queen Mary and Queen Elizabeth are well-known examples of ships fitted with J. Stone & Company's propellers, though the majority of the liners in the world, for that matter, have at one time or another used propellers made in the Charlton works. It is interesting to note that the largest propellers formerly made for modern liners are now exceeded in size, though not in weight, by propellers intended for large oil-tankers, many of which have been made since the end of the recent war. A large proportion of the propellers produced in the Charlton works has been destined for the Royal Navy. No fewer than 22,000 were made between 1939 and 1945, and this total included propellers for nine battleships, 29 aircraft carriers, 80 cruisers, 424 destroyers, 275 submarines, and 396 sloops, corvettes and frigates, besides thousands of smaller craft. The marine activities of the company are also well represented by water-tight bulkhead doors which have been made for many years. The liner Queen Elizabeth, for example, has a complete installation of 47 power-controlled water-tight doors. Electrically- or pneumatically-operated systems may be incorporated for these doors and, in addition, a hand-operated hydraulic system is available. The company have derived considerable satisfaction from a recent order for a seven-door electrically-operated system intended for Her Majesty's new yacht Britannia, recently launched on Clydeside.

A highly successful new venture by the marine department of Stone's is the manufacture of the Stone-Marepa gravity davit for launching ships' lifeboats. The orders for this product constitute a valuable addition to British export trade.

Bronze Sand Foundry

In the general bronze foundry a range of small- and medium-weight castings in a wide variety of copper-base alloys is produced. A number of moulding machines are installed, and adequate facilities for sand treatment and handling are available. In addition, floor moulding is carried out on a considerable scale. A single coreshop is designed to serve the needs of both sections.

In the bronze sand-casting section, the tendency is to concentrate upon the production of high-grade components in which good surface finish and close dimensional limits are required. Railway bearings and high-conductivity copper castings (over 97 per cent. I.A.C.S.) are well-known products.

In the ingot and billet foundry, a large tonnage of various bronzes is produced. A battery of remotely-controlled hydraulic lip-axis tilting crucible furnaces of 10 cwt.-capacity is used for the production of large ingots for use in the propeller-foundry melting furnaces. All types of non-ferrous melting equipment can be seen in the Charlton works, ranging from oil-fired pit-type crucible furnaces to large-capacity reverberatory units. Electric melting units are not used. A number of Durville casting machines are installed, and used in the production of small and large billets for forging. Substantial quantities of chill-cast bronze sticks are also made. The various cleaning and fettling departments in the plant are of a most comprehensive nature, and can handle both small and large castings in substantial numbers.

Light-alloy and Bronze Die-casting

The light-alloy die-casting shop is a large and well-equipped installation for the production of gravity die-castings in aluminium- and magnesium-base alloys, the majority being of aluminium. No pressure-die casting is carried out. A notable

feature is the excellent working conditions which prevail in this department. The problem of shop ventilation in die-casting production has always been acute, and the light alloy die-casting department at Charlton is an excellent example of modern practice in this field.

The department concerned mainly with the production of gravity-die-castings in aluminium-bronze alloys, is quite small, yet, nevertheless, is producing a large number of castings of a relatively complicated character for use in the automobile and general engineering trades.

Aluminium and Magnesium Sand Castings

Aluminium sand castings occupies a large department devoted entirely to production by hand- and machine-moulding methods. Aircraft work has always been a speciality of the Charlton works, and this type of work is well represented in the current production. Melting is carried out in large-capacity oil-fired crucible furnaces, and the mechanized section is well equipped with Stone-Wallwork machines. Adequate sand-handling and processing facilities are available. Fettling follows orthodox practice in this field, and is carried out mainly on bandsaws.

Sand casting of magnesium alloys forms an important part of the company's activities, and the large output here is mainly intended for the aircraft industry. All castings are made under Magnesium Elektron Company licence, and the techniques used are typical of modern trends in the field. The recently-developed high-strength magnesium alloys, containing cerium and zirconium are now well established and castings in such alloys are now produced in large numbers.

A large and well-equipped heat-treatment department is installed and serves the needs of both foundries producing light-alloy castings. In addition, very modern and completely equipped chemical and metallurgical laboratories allow a very close control to be exercised over all stages of production. X- and gamma-ray methods of inspection are available wherever necessary at all stages in the production, the X-ray department being one of the largest in the country.

LAKE & ELLIOT, LIMITED

Early on Thursday morning, the National Foundry College party travelled to Braintree, Essex, and spent the remainder of the day in the works of Lake & Elliot, Limited. These are concerned with the production of both steel and grey-iron castings. Three foundries are in operation, the first a modern steel foundry capable of producing an extensive range of castings for the automobile, electrical, agricultural and petroleum industries, with pressure-tight castings a speciality. In the main, the steel castings produced are in the light- and medium-weight range. Mould production is mainly from machines, the series including the jolt-squeeze, turn-over and the jolt-squeeze, box-lift types. Two impeller-type ramming machines are in use, each serving four tables. No dry-sand work is carried out in the steel foundry; a limited amount of skin drying is practised, but green-sand moulds are mainly used. Steel is melted in two electric-arc furnaces, one of which is basic lined and has 3 tons capacity, while a smaller acid-lined unit of 1½ tons capacity is also in use; a 5-cwt. capacity high-frequency electric furnace is installed. Many different types of steel are melted, particularly the carbon-molybdenum and chromium-molybdenum steels. Some 18-8 stainless steel is also made.

Iron Foundry

A large iron foundry at these works is devoted to the production of various castings for the auto-

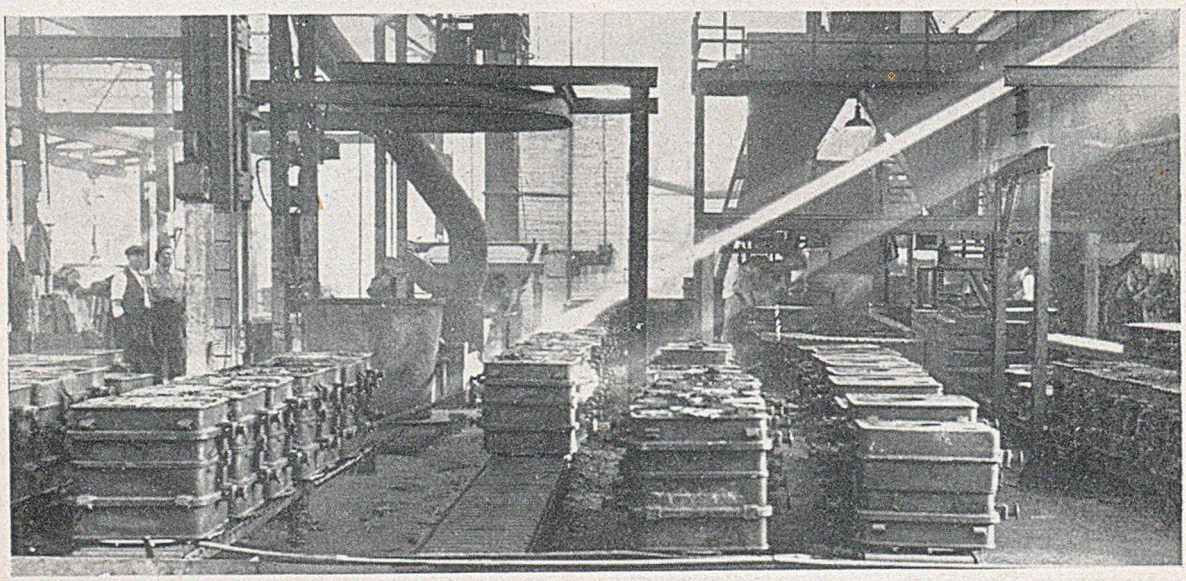


FIG. 9.—*Section of the Mechanized Unit at the Steel Foundry of Lake & Elliot, Limited, Braintree.*

mobile trade. Brake drums of several sizes and weights are produced in large numbers, and a portion of the plant is partially mechanized for this purpose. Synthetic sand is used. High-duty iron is melted in two cupolas of 27-in. dia., operating on alternate days. The coreshop is staffed mainly by female labour, and a number of core-making machines are installed, including bench-type cartridge blowers, and some power machines and stripping units. One Demmler machines of 250-lb. capacity is in use, and was the largest core-blowing unit yet inspected by the visitors.

The fettling shop embodies the usual equipment, and was of special interest in that it is entirely exhausted by the wet-type of dust-collection system. Casting cleaning was carried out in airless and cabinet-type shot-blasting units.

A notable feature of the steel foundry is the electric heat-treatment facilities, which consist of two 240-kw. muffle-type furnaces, charged by a fork-lift arrangement. A mechanically-operated quenching tank is also provided, and other electric muffle-type furnaces are available for heat-treatment of a specialized character.

A separate building accommodates an essentially simple yet effective mechanized plant for the production of small grey iron castings, the latter being intended mainly for the hydraulic jacks which have for many years been produced in large numbers in the machine-shops nearby.

CRANE, LIMITED

For the final day of the tour, the Foundry College party travelled to Ipswich, and spent the whole time in the works of Crane, Limited. These works, occupying a site of approximately 40 acres on the eastern side of Ipswich, consist of four main integrated units, producing a large variety of finished products—including valves and fittings used for the control of liquids and gases in almost all industries. Three modern foundries produce malleable-iron pipe-fittings, cast-iron radiators, domestic and central-heating boilers. A wide variety of cast-iron and bronze valves, including components in nickel alloy, is also produced. Attached to each foundry is a modern well-equipped machine-shop, complete with test and assembly departments.

The malleable foundry is a large fully-mechanized installation for the production of pipe-fittings. It is an excellent example of the application of modern foundry practice to this sort of work. For mould making a snap-flask technique is used. Sand is distributed by overhead conveyors to hoppers above the moulding machines. The latter are of Crane design and are either fully or semi-automatic, both types giving a high production rate.

Rotary System

Two methods of carrying the moulds to the pouring stations are used. In one section of the foundry the finished moulds are transferred to turntables, the moulds jacketed and weighted, and the turntable slowly rotated to bring the moulds under the pouring track. This type of layout, though little used in the British foundry industry, has considerable merit, and apparently affords an excellent method of unit mechanization involving little floor space. Obviously, it can be of major value wherever the metallurgical characteristics of the metal being produced permit of early knock-out after casting. Castings and sand are removed continuously from the pouring area by means of an apron conveyor built into the floor.

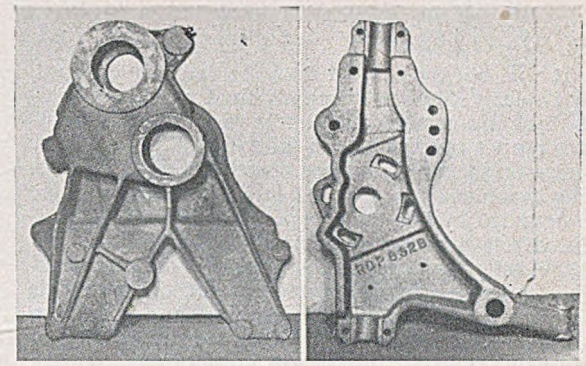


FIG. 10.—*Typical Lake & Elliot Steel Castings: (left) Road-spring Bracket for "Constructor" Vehicle and (right) Main Frame for a Plough.*

The second, and more modern, section of the foundry consists of a batch of moulding machines installed back to back, the moulds being conveyed to the pouring stations by a double-loop pallet conveyor. The pallet conveyors are hooded, and fitted with fume-extraction plant between the pouring stations and the knock-out station. Knocking-out is automatic and dust-extraction plant is fitted over these areas, also. An excellent sand-cooling plant is also provided. Castings from both sections are removed overhead on cooling conveyors and taken to the cleaning department, where sprues and gates are removed, the castings are shot-blasted, weighed, and then fed on to an inspection belt. Afterwards the castings are sorted and packed into annealing cans.

A high proportion of the malleable pipe-fittings made in the plant are galvanized. This department contains a modern automatic plant and elaborate inspection facilities. The fittings here are carried by a conveyor continuously through a flux tank, drying chamber, galvanizing bath and cooling-spray chamber. Equipment having automatic temperature control is installed.

Grey-iron Foundry

The grey-iron foundry is situated adjacent to the malleable foundry and both are serviced by the same stockyard. The way of using this stockyard is extremely efficient. Ground-level loading of the charge bins is practised, the supplies of new materials being drawn from hoppers and chutes. All raw materials in each cupola charge are simultaneously deposited in the cupola. The grey-iron foundry is divided into two sections, one producing radiator castings, the other boiler and valve castings.

Seen through the Students' Eyes

It will be appreciated that the radiator castings, particularly, require extremely fluid iron, and fluidity tests are carried out hourly to check and maintain proper conditions. In the radiator section, very interesting techniques were observed by the visitors. The machines are grouped in pairs; each machine is operated by two men, copes and drags being produced on adjacent machines. These mouldings machines are of special design and operate remarkably well. An interesting feature of the system is the use of a combined weighing and clamping arrangement, which is manipulated by means of an air hoist from box to box as required.

In the boiler and valve section, the moulds are made on large, medium and small roll-over machines, the moulds from the machines being stored and poured on gravity roller conveyors. A batch of jolt-squeeze machines is provided for the smaller jobs. These smaller castings are poured on turntables and the medium-size moulds on wheeled bogies. Two shake-outs of Crane design are in use, and these prove very effective for the removal of cores. The radiator castings are traversed through a two stage automatic cleaning process; after passing through the first stage, the castings are manually reversed and are carried through the second stage where the reverse side of the casting is cleaned.

A well-equipped vitreous-enamelling department is in operation, where the "wet" process is practised. The company make their own enamelling frits, and quite a miscellany of cast-iron and sheet-steel components is treated. These are for use in the boiler-assembly sections.

Bronze Foundry

The bronze foundry in the Crane plant was completely reorganized three years ago, and is now one of the few wholly-mechanized plants in this country devoted to the mass production of small castings. In this foundry was seen the application of modern practices in all sections. Melting is carried out in a battery of Morgan, lip-axis tilting crucible furnaces. In addition a Morgan rotating crucible furnace for swarf melting is in operation. Snapflask moulding techniques are used, and here, also, the moulding machines are fully-automatic machines of Crane design. These are extremely fast in operation and of relatively simple pattern.

Assembled moulds are transferred to wheeled bogies which run in train formation on a two-level track. Each moulding machine serves two tracks and the moulds, after pouring, are knocked out by an ingenious arrangement. The continuous removal of sand and castings from the pouring station, by means of a conveyor at floor level, improves working conditions considerably. The castings produced in this foundry show a surface finish equal if not superior to any such castings inspected by the students of the National Foundry College.

Acknowledgment

The National Foundry College is indebted to the many firms and individuals who have provided facilities for works visits. These facilities are invaluable for implementing the work during the diploma course, and demonstrate effectively the interest and goodwill shown the College by the whole industry. Permission to publish this account and to make use of illustrations provided is also acknowledged.

FIG. 11.—*Pouring in the Bronze Foundry (left) and the Malleable Foundry (right) at Crane, Limited, Ipswich. In the former, Moulds are carried on Wheeled Bogies and in the latter on a Pallet Conveyor.*

Vitreous Enamelling in Sweden, Denmark and Finland*

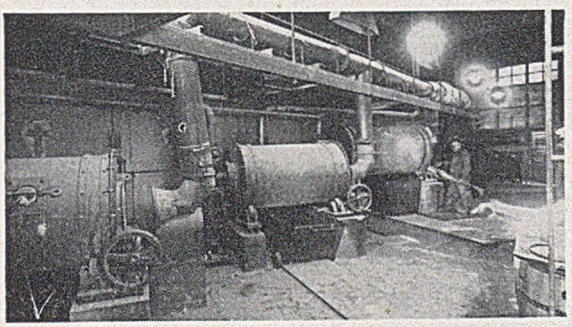
By J. H. Gray, A.I.Mech.E.

(*Continued from page* 686)

FINLAND

In Finland there are five enamelling plants. Of these, three are producing steel only and two cast and steel ware; there are no plants enamelling cast only. Enamelling of cast iron in Finland, both the dry and wet processes, started around 1928, although in some instances enamels used at that time were lead-bearing. Enamelling of sheet iron started earlier, *viz.*, 1918 to 1920. The total quantity of cast-iron enamelled each year in Finland is in the neighbourhood of 500 tons, and the weight of steel enamelled is approximately 2,000 tons. As is the case with Denmark and Sweden, in Finland there are some excellent foundries, the the general standard of quality is very high. In Finland also it is reasonably safe to say that with the exception of hollow-ware, the quality of cast-iron enamelware is generally higher than that of steel, although in the sheet-iron hollow-ware industry some excellent finishes can be seen, and most plants are running extremely efficiently.

* Paper presented to the Institute of Vitreous Enamellers at the annual conference in Cheltenham. The Author is attached to Stewart & Gray Limited.



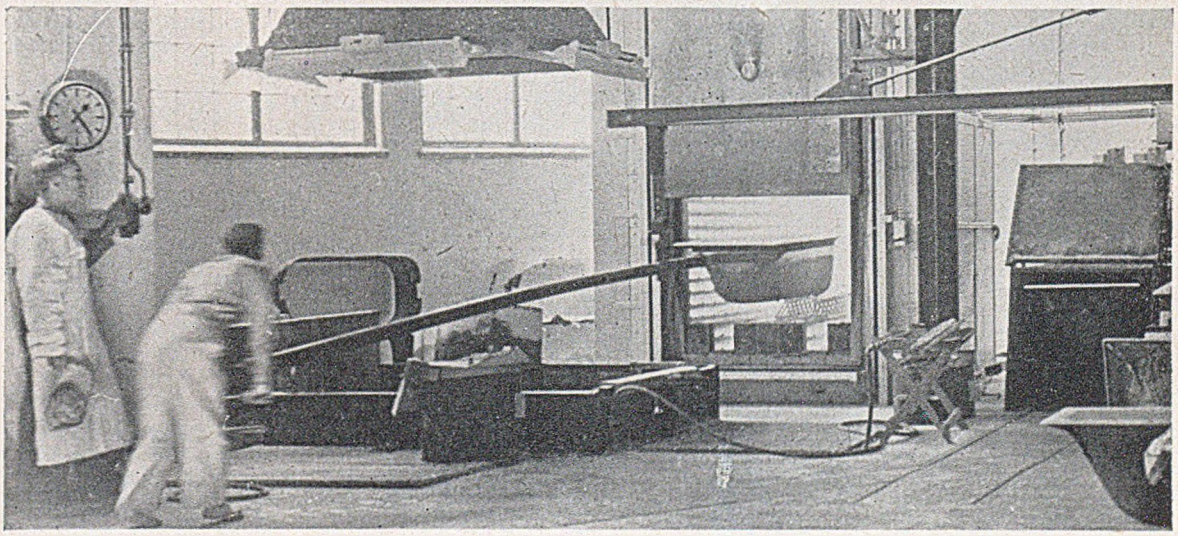
Conditions and Layout

It is considered that the standard of pay for the operators, taking into account the difference in cost of living, is rather lower than in Britain. The Finnish people are working very hard and have every confidence in the future; they are particularly proud of the fact that they have completely paid off their reparations to Russia. In almost every case, plants in Finland operate six full days per week. Enamelling plants, generally speaking, are modern, and laid out in a style to obtain the maximum efficiency. Electricity is certainly the most commonly used fuel in the enamelling industry, and the advantages of this fuel, such as cleanliness, lower maintenance costs, and better temperature control, are fully appreciated. Probably the second most popular fuel is coal. The average costs of various fuels are given hereunder: —

Electricity	.. ..	2.23d. per kwh.
Fuel oil	.. ..	2s. 3d. per gallon
Coal ..	.. ..	£9 15s. 0d. per ton

FIG. 14 (*left*).—*Batch of Three Rotary Frit Kilns.*

FIG. 15 (*below*).—*General View of a Bath Dusting Plant. It will be noted that in this Plant there is no preheating.*



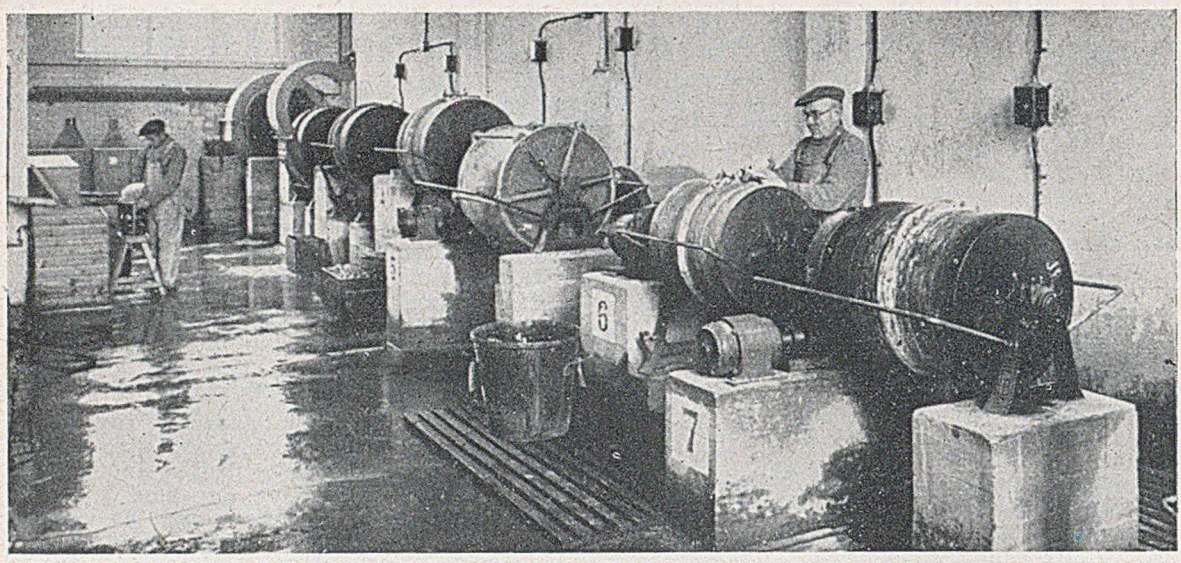


FIG. 16.—*General View of a Mill Room.*

The average size of box-type furnace is as in Denmark and Sweden, *i.e.*, 2,500 cm. long by 1,200 c.m. wide by 1,000 cm. high.

Castings Enamelled

Cast-iron enamelled ware production consists mainly of bath tubs, hollow-ware, gas and electric cookers, solid-fuel-fired heating stoves, and in sheet iron, refrigerators, hollow-ware, signs, etc. Generally speaking, annealing is only used where absolutely necessary, and in most cases castings are enamelled over matt ground-coat or direct to the iron without annealing.

There is no restriction on the use of sand, and this is used rather more than angular steel grit, although here again, to reduce costs and the dust hazard, in some plants a mixture of sand and steel grit is used in equal proportions.

Heavy castings which require a high-quality finish, such as sanitary goods, floor plates, etc., are finished over a matt ground-coat. Acid-resisting finishes on cookers are usually applied to oven linings in the case of gas cookers, and, on the outside, acid-resisting finishes are applied wherever it is considered practicable. It appears that there is no objection to the production of gas or electric cookers having non-acid-resisting finishes, but the manufacturers are aware of the greater advantages of A.R. finishes and apply them wherever possible. All cast-iron and steel hollow-ware is produced in acid-resisting finishes, and it is normal to produce such ware with enamels free of antimony. Sheet-iron self-opacifying titanium frits are gaining in popularity and are being used wherever possible

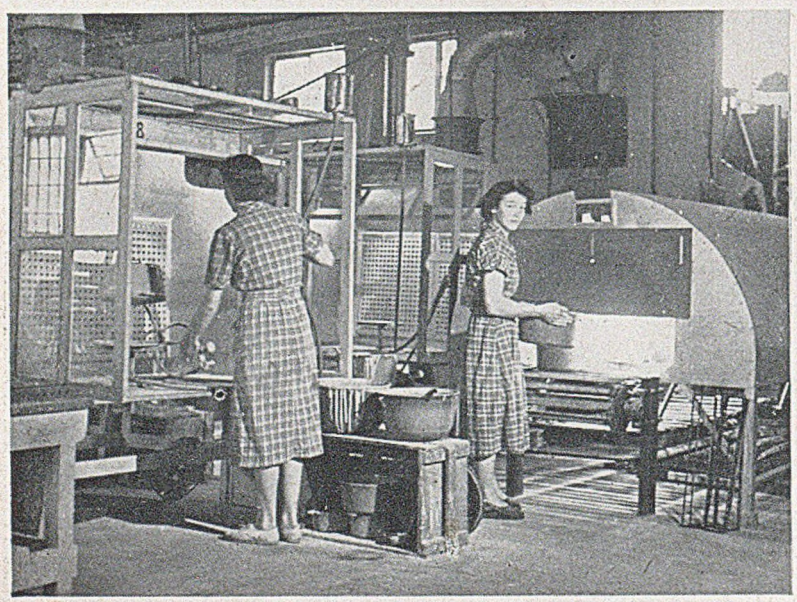


FIG. 17.—*Spraying of Cast-iron Hollow-ware and Drying by a Continuous, Horizontal, Radiant-heat Drier.*

Finishes on Steel

There is a very fine range of steel hollow-ware produced in Finland, and the finishes usually adopted are self-colour white and cream, although inside some hollow-ware, such as stewpans, a white mottle effect on ground-coat is produced. This finish is obtained by swilling the inside

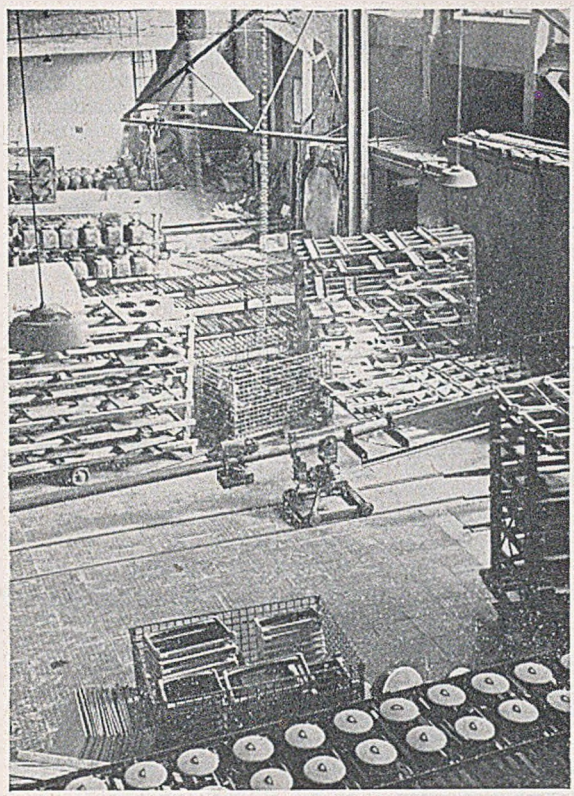


FIG. 18.—*General View of the Plant giving an indication of the Wide Variety processed in this Department.*

with a white enamel having a specific gravity of about 1.5. The ware is then placed upside down on a perforated table. Through the perforations hot air is blown, and the table top is arranged to mechanically vibrate up and down. Due to this movement the wet enamel inside is shaken to represent a mottled pattern, rather like a brush mottle. It is dried in this state by the hot air.

Much thought has been given to the general layout of enamelling plants in Finland, as in the Scandinavian countries, and there are instances where the whole of the enamel-shop floor is laid with non-slip glazed bricks, the floor having a slight incline from the sides to the centre; around the whole of the plant, with the exception of the sandblasting department, a perforated water pipe has been laid within 6 in. from ground level, and the water is turned on weekly, making a complete spray of water around the whole of the enamelling department, which can be brushed down to the centre gulley; by these means the shop is kept exceptionally clean and free of dust. This arrangement was also seen in Denmark.

The following illustrations are of interest:—

Fig. 9 shows large cast-iron pots for subsequent enamelling in white finishes over matt ground-coat after being cleaned by sandblasting; Fig. 10 is the same type of pot as in Fig. 9, being sprayed with cover-coat enamel; Fig. 11 shows a general view of a one-furnace plant, showing large pots and general hollow-ware as well as refrigerator linings, which are processed in this department; Fig. 12 illustrates the frit storage and weighing-out department, and Fig. 13 shows the mill being loaded from the first floor into mills situated on the ground floor (shown in Fig. 13A.)

The following illustrations are taken from a very large foundry in Finland, which has an enamelling plant producing cast-iron enamelled bath tubs, gas and electric cookers, cast-iron hollow-ware, etc.:—

Fig. 14 shows a batch of three rotary frit kilns and Fig. 15 a general view of a bath dusting plant. It will be noted that in this plant there is no preheating. The castings are sprayed and/or hand-brushed with ground-coat, dried, and placed directly into the furnace prior to dusting. The number of baths cracked during heating is exceptionally low; Fig. 16 is a general view of the mill room in this works, and Fig. 17 illustrates the spraying of cast-iron hollow-ware and drying by a continuous, horizontal radiant-heat drier. Fig. 18 is a general view of the plant.

In the three countries visited, not more than three companies manufactured their own frit, and even in those cases no one company manufactured the whole of its frit requirements; the general tendency, as in other parts of the world, is for frit to be purchased from recognized specialists in the manufacture of this material.

General Remarks

The three-weeks paid holiday for enamel-shop operators mentioned as prevailing in Sweden is also applicable to Denmark and Finland. Also in the last-mentioned countries it is usual for both hourly-paid and staff workers to start and finish their day's work approximately 1½ hours earlier than in this country.

It will be of interest to know that all companies in the countries visited which are engaged in vitreous enamelling or are contemplating the undertaking of this process, spend a great deal of time and money in studying the most up-to-date methods of enamelling in Europe and the United States. The sending of technicians to other countries to study various methods of production is considered to be a very good investment. As a result of this, the most-recently-installed plants are completely up-to-date, having embodied the most efficient plant to ensure maximum production with minimum manpower.

The Author has found that friends in the countries visited have always been very hospitable and have done their best to give assistance; they have never been afraid of showing visitors their products, whether these are produced by the latest methods or not. They consider it is only by general adoption of such co-operation that the industry can continue to progress. Articles appearing in trade journals relating to papers read at Institute meetings are read with interest by most managements in plants visited.

In conclusion, the Author wishes to thank most sincerely his many friends in the countries referred to for their valued help and co-operation in preparing this article.

Vitreous Enamelling in Sweden, Denmark and Finland—Discussion

DISCUSSION

At the session of the I.V.E. annual conference at which the above Paper was presented, the CHAIRMAN (Mr. A. Biddulph, vice-chairman of Council), introducing the Author, said Mr. Gray had been on a business tour of Scandinavia, and the Paper recorded some of the things he had seen there and the impressions he had gained.

It was a great pleasure to welcome to the conference Mr. Almhagen, who was connected with a plant in Sweden.

MR. GRAY then presented his paper and the meeting was afterwards declared open for discussion:—

SIR GEORGE BRIGGS (president-elect) first took the opportunity to say how pleased he was to be associated with the Institute, and how much he appreciated the great honour the members had done him by electing him to the presidency.

Coming to the Paper, he said Mr. Gray had raised one or two provocative points. The reference to the necessity for visiting overseas plants was well made, and Sir George emphasized the very great importance of carrying forward that policy as far as possible. Speaking of stainless steel, he said that in Scandinavia, and also particularly in Germany, it was very much cheaper than in this country, and that might have a very substantial bearing on the situation. Further, it seemed extraordinary that the Swedes had been able to develop the Canadian market for a particular type of finish. Whether or not there was very little demand in this country he did not know, but it was a matter which might well be looked into. That was just a suggestion.

MR. GRAY said that in the Paper there was no reference to the price of gas as a fuel, and frankly he did not think it was used for enamelling in the countries visited. However, the average price of gas in Denmark was 1s. 5d. per therm, the calorific value of the gas being 450 B.T.U. per cub. ft. In Sweden the price was 1s. 4d. per therm, and the calorific value was 470 B.T.U. per cub. ft.

MR. V. C. FAULKNER asked whether any enamelling was done in Norway.

MR. GRAY replied that in the paper he had referred only to countries of which he had had experience, and he had had no experience of Norway.

Prevention of Silicosis

MR. H. WHITAKER asked what precautions were taken in the countries Mr. Gray had visited to prevent diseases such as silicosis.

MR. GRAY said he understood that a physician attended at the various works on two occasions during each year and examined the personnel operating the plants; and, of course, the Factory Inspector visited the works to ensure that the exhaust systems were working efficiently. Quite a number on the managerial side in the plants he had visited in the three countries were fully aware of the danger of silicosis and, as he had mentioned in the Paper, in lots of cases they were mixing angular steel grit with sand to reduce the hazard.

MR. J. W. G. PEDDER said the meeting might be surprised to know that when he had raised the point in a Swedish plant he had found that the people there were more concerned about the sprayers developing silicosis than they were about the people engaged in sandblasting contracting this complaint!

DR. B. K. NIKLEWSKI, enlarging upon Mr. Gray's remarks, said the sheet iron used in Sweden was not so good as that produced in this country. Speaking of the artistic lines which were produced, he said that one very large firm in Sweden had not only an enamelling factory, but also a factory producing china and pottery. Some of the leading artists in pottery were employed also in vitreous-enamelling plants, and they produced very beautiful modern designs.

With regard to Norway, he said there were some fairly large plants, though the production was smaller there than in this country because the population was smaller. One firm in Oslo was producing sheet-iron baths by one stamping operation only, there being no welding. The Swedish firm mentioned was producing them in two operations, first a half-draw and then a second-draw.

MR. GRAY agreed that in Sweden and Finland quite a high proportion of very low-quality sheet metal was used.

Ground-coats for Cast Iron

MR. A. K. WILLIAMS asked for information concerning ground-coats used for cast iron in Scandinavian countries.

MR. GRAY replied that the type of ground-coat used was similar in almost every respect to the type obtainable in this country from various sources. It was ground extremely fine; "zero" retained on 200 mesh was very fine, but if one could get it finer, so much the better. The specific gravity was very carefully controlled, in the neighbourhood of 1.7. A little sodium nitride was added, which had given improved results, and not only from the point of view of dipping but also because enamellers in Scandinavia felt that rust-spotting occurred and, owing to the colour of the ground-coat, they were not able to see it. They claimed that by the addition of the nitride and by extremely fine grinding, plus a great deal of experience in application, they obtained the good results reported. The technique was similar to that used for the dipping of hollow-ware or sheet-metal reflectors. Mr. Gray was sure that if one really got down to dipping one could make it a success, and that production per man/hour could be raised and a better job produced than by spraying. The coating was extremely thin, in the neighbourhood of 0.002 to 0.003 in. Incidentally, he believed that the technique was being used in certain plants in this country, though not to the extent that it was used in Scandinavia.

(*Continued at foot of col. 2, page 729*)

Book Reviews

Handbook on Die Castings for the Use of Service Designers and Inspectors, compiled by F. D. Penny, B.Sc. Published by the Ministry of Supply through H.M. Stationery Office, York House, Kingsway, London, W.C.2. Price 6s. net.

Whilst this book fills a real gap in British foundry literature, its primary object was to facilitate the work of the Advisory Committee (Die Casting) of the Ministry of Supply. When it is realized that well over 50 per cent. of the castings made from aluminium alloys are made by the process under consideration, the subject assumes major importance in the realm of foundry practice. Yet this book makes no pretensions to being a text-book. Whilst the various methods for the different alloys are described in some detail, including iron die-castings, the stress is laid on design and inspection. Here much useful information, greatly reinforced by a collection of ten tables, is given. At the selling price announced, the book, which runs to 78 pages and is profusely illustrated, is good value, and is confidently recommended.

Fundamentals of Physical Metallurgy, by Ralph Hultgren. Published by Macdonald and Company (publishers) Limited, 16, Maddox Street, London, W.1. Price 70s. net.

This book, written primarily for engineering students, contains much valuable information. Two of the main objectives of the author are to show how the properties of all alloys are controlled by the internal structure and to deal at length with the principles underlying the methods by which the desired structure may be obtained. The work is devoted mainly to metallography, and considerable attention is given to the various types of phase diagrams and to the changes which occur under equilibrium and non-equilibrium conditions. The author presents the information in a concise and direct manner, but it is considered that the part dealing with ternary diagrams could be enlarged with advantage. The part of the book dealing with the heat-treatment of steel is good and stresses the principles involved in each operation and the nature of the resulting changes. The effect of the addition of special elements is dealt with in a most concise manner, perhaps too concise, and it is felt that more consideration could have been given to dealing with the more fundamental effects of the addition of special elements to steel, especially with reference to the stability and constitution of the various carbides formed.

Effects of deformation, recovery and recrystallization are simply explained, and their effect on crystal size emphasized. Some consideration is given to the metallography of the chief non-ferrous alloys and reference is made to new developments in this field.

Altogether the book is most comprehensive and should prove to be of advantage to students of mechanical and chemical engineering, as a serious attempt is made to correlate theory and practice. To the student of pure metallurgy it will provide interesting reading but the overall value would have been greater if the references at the end of the various chapters had been enlarged. The value of the book to the student is further enhanced by the inclusion of many problems which serve to emphasize and illustrate many of the principles involved. It is interesting to note that the author has not neglected to include in the introduction a brief survey of the history of metals.

R.H.

New British Chemical Standards

The Bureau of Analysed Samples, Limited (now removed to Newham Hall, Middlesbrough), announce the following new standard samples, each of which has been analysed by eight or more metallurgical analysts representing manufacturers, users, and appropriate Government departments:—

Magnesium Aluminium Alloys.

	B.C.S. No. 262 (DTD 300).	B.C.S. No. 263 (DTD 165).
	Per cent.	Per cent.
Copper	0.03	0.13
Magnesium	10.57	4.23
Silicon	0.10	0.14
Iron	0.18	0.41
Manganese	0.06	0.50
Zinc	0.05	0.05
Chromium	0.06	0.34
Titanium	0.10	0.05

Low-carbon Steels.

	B.C.S. No. 264.	B.C.S. No. 265.
	Per cent.	Per cent.
Carbon	0.037	0.047
Manganese	0.36–	0.44–
Nitrogen	0.013	0.020

These low-carbon steels, together with B.C.S. No. 230, form a new series of steels standardized for nitrogen content.

The Bureau also announces a replacement of a low-carbon ferro-chromium (No. 203/1) and the standardization of sample No. 163 for phosphorus (0.049 per cent.) to provide a figure close to the specification limit of 0.05 per cent. Supplies of these standard materials may be obtained direct from the Bureau or through any well-known laboratory furnisher.

Vitreous Enamelling in Sweden, Denmark and Finland—Discussion

(*Continued from p.* 728)

MR. J. BERNSTEIN asked if he had understood correctly that the castings made in Sweden were better than in this country, or was it that purified silica sand for blasting tended to give the appearance of better castings?

MR. GRAY said he had meant it both ways. First, he was convinced that the average castings as they came direct from the foundry were better than in this country and, after blasting, the surface was smoother and cleaner; there was not the same amount of porosity and not the same amount of filling was required. He had been absolutely staggered by the thin even sections obtained with pots of probably 10 in. dia. and 4 or 5 in. deep. He exhibited a piece of one such pot and assured the meeting that the section was the same throughout the pot. The Swedish people had told him that they thought the high carbon content had a lot to do with it. He regretted that he had not seen such good castings in this country.

MR. FAULKNER commented that, where an extremely excellent surface was habitually produced on castings, the foundry producing them was invariably most extravagant in the use of new sand.

F.L.C.B. Shell-moulding Equipment

Simple Layout Giving High Productivity

The letters F.L.C.B. stand for Fairbairn, Lawson, Combe Barbour, Limited, the well-known textile-machine makers of Leeds, who have their own iron, copper-base-alloy and aluminium foundries. Though not normally associated with the manufacture or supply of foundry equipment, they have recently entered this industry with a shell-moulding plant, designed originally for " home " use, but which is now being offered for sale to other founders. In pursuance of the policy of bringing to the notice of readers new developments and equipment in the foundry industry the following is a technical summary of the construction and *modus operandi* of the new machine.

The first public disclosure of the firm's entry into shell moulding was provided in a paper given by Mr. Charles Potter, F.L.C.B. foundry manager, to the West Riding of Yorkshire branch of the Institute of British Foundrymen, when he recounted the firm's early practical experiments with shell moulding leading to the building of prototype equipment. The basic requirements were devices for (*a*) heating the patternplate quickly; (*b*) manipulating it for investment without danger of burning the operator's hands; (*c*) stripping the shells carefully and accurately; and (*d*) performing all these operations manually and so obviating the need—and expense— of elaborate mechanical gear. The prototype was soon well proven in the F.L.C.B. foundry and the larger model shown in Fig. 1 was built and put into production. It is this design which is to be marketed, the whole construction being undertaken by the firm, since it is a type of work well encompassed by the facilities at its disposal.

Construction

Briefly, the machine embodies two moulding and stripping stations in line with and on opposite sides of a common dump-box. At the other end of each line is a gas-fired furnace for preheating the patternplates and curing the half-shells. The " lines " themselves each consist of roller tracks about 1 in. wide and set 2 ft. apart, on which each patternplate can conveniently slide under manual control between the furnace and the dump-box. The latter is trunnion-mounted on easy-running bearings, also for manual turnover. It is arranged to take a patternplate size 24 by 16 in. working face, and is provided with locating and clamping devices, sealing being effected by a silicone-rubber gasket. Stripping of shells is done by a foot-pedal-operated plate which rises to contact simultaneously all the spring-loaded ejector pins which are incorporated in the underside of the patternplate.

The working plane is at bench height and the whole machine occupies a space some 12 ft. 6 in. long by 3 ft. 6 in. wide by 4 ft. 10 in. high overall. The furnaces, too, are of domestic construction, substantially lagged, and are provided with gas burners supplied at a constant pressure, the temperature being indicated on a flush-mounted dial-type thermometer. A novel and most useful provision is the incorporation in the upper part of each oven of a separate chamber in which a second patternplate (other than that in use on that line) may be preheated ready for instantaneous switch into production, as desired. Other than the necessary components mentioned, the equipment is commendably gadget free, no power line, only a gas supply, being required. The usual compressed-air blow-gun and paint-type spray are conveniently to hand at each station, respectively, for blowing-off the patternplate and applying release agent or stripping medium.

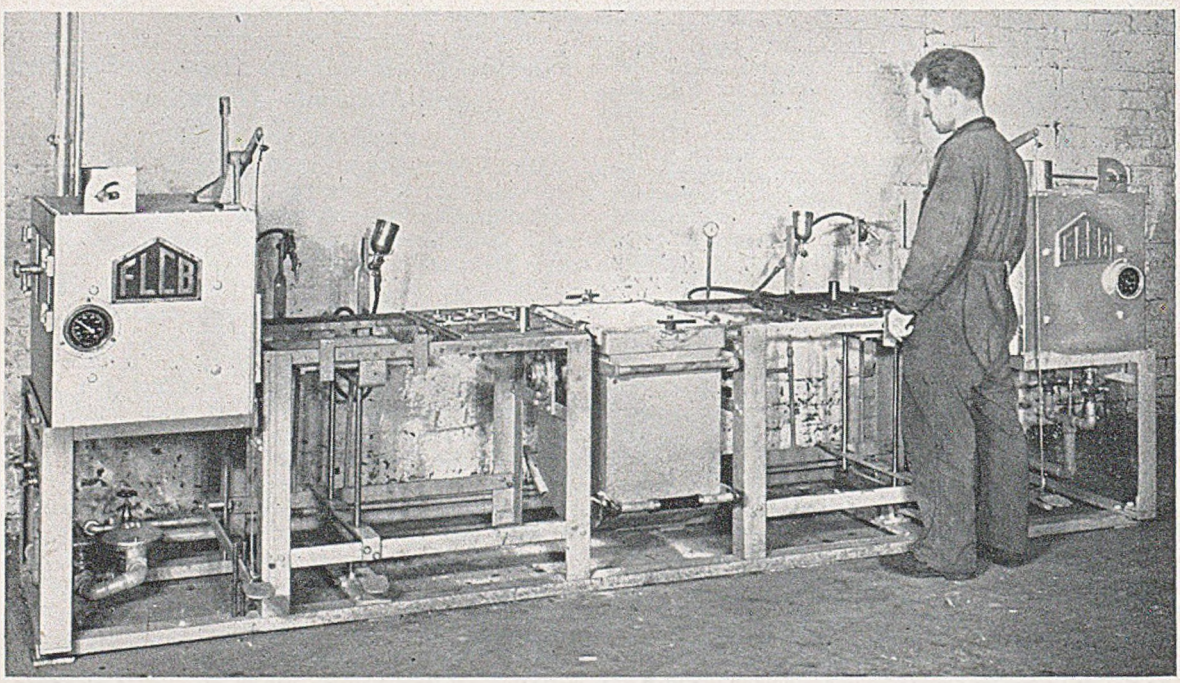


FIG. 1.—*Shell-moulding Equipment developed by Fairbairn, Lawson, Coombe Barbour, Limited, Leeds.*

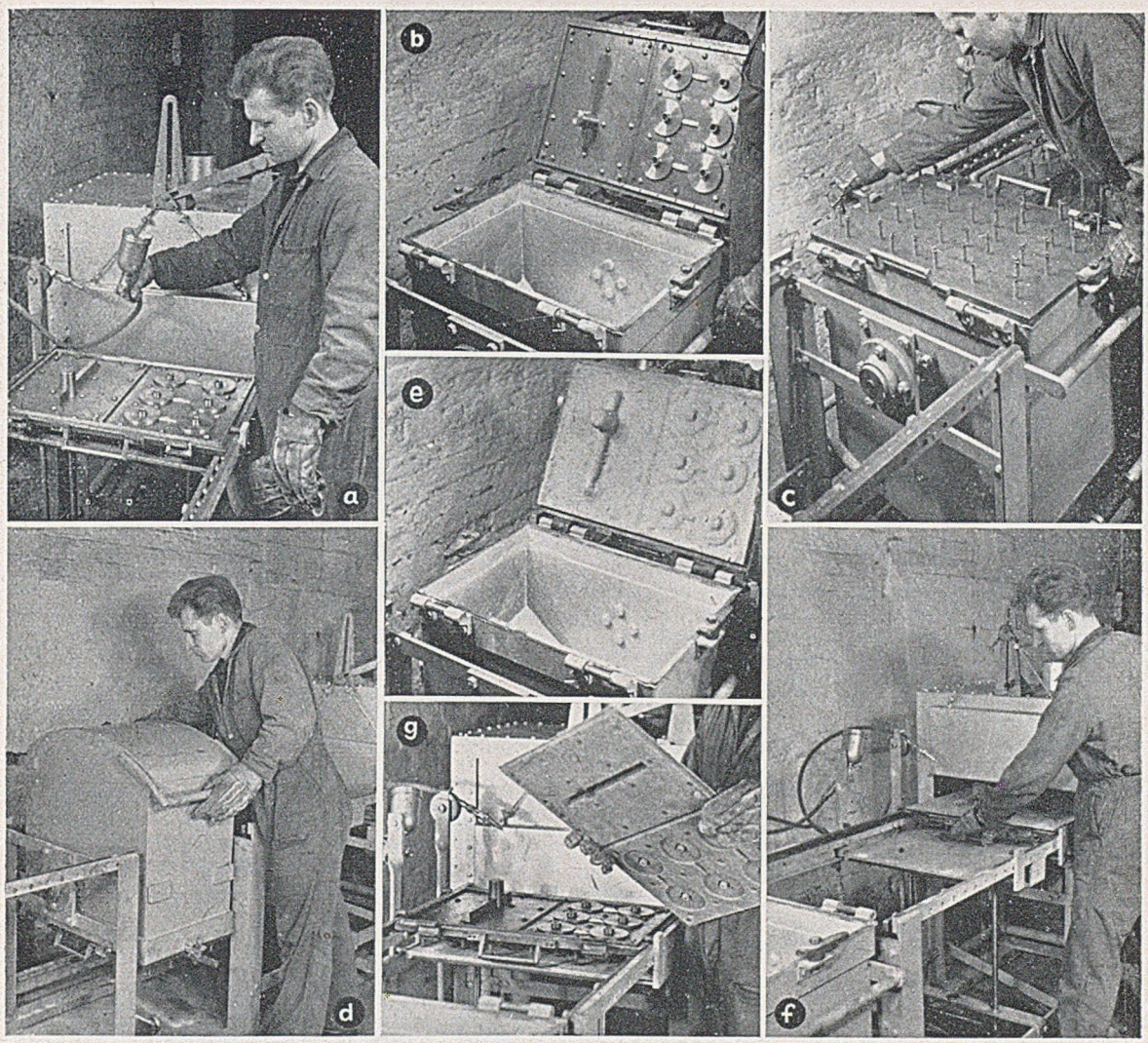


FIG. 2.—*Stages in the Production of Shells on the F.L.C.B. Equipment:* (a) *Spraying the Patternplate with Release Agent;* (b) *Hinging the Plate to cover the Dump-box;* (c) *Patternplate on the Dump-box (also showing the Ejector Pins);* (d) *Dump-box swung over for Investment;* (e) *Dump-box turned back and Patternplate with its adhering "Green" Shell;* (f) *Sliding the Pattern and Shell into the Oven for Curing; and* (g) *Finished Shell stripped from the Plate.*

Operational Cycle

Assuming that the two patternplates have been pre-heated and the dump-box (capacity 2 cwt.) filled with resin/sand mixture ready to commence work, the sequence followed by the single operator in producing half-moulds (see Fig. 2) is as follows:—

At station (A) the workman manually slides patternplate (*a*) out of the oven which is opened by a foot control. He then blows off and sprays the patterns. Next, the plate is slid to the dump-box, where it engages with half-hinges on the near edge, enabling it to be swung over, so closing the box like a lid. Clamping levers are then secured, and the dump-box is swung over with a quick rolling motion to bring the plate to the bottom. The proximate balance about the trunnions (the centre-line of which is parallel to the "lines") makes this a not-too-laborious operation. Investment is timed by the wall clock. On reversing the box, the patternplate is unlocked and swung back to reveal its shell coating. It re-locates on the roller slides on which it is immediately conveyed to the oven. While the shell on patternplate (*a*) is being cured—a period of 60 secs.—the second patternplate (*b*) is similarly treated at station (B) to the point of curing the second half-shell in its respective oven. While curing of (*b*) proceeds, plate (*a*) is withdrawn from its oven, the half-mould is stripped off by depressing the foot-pedal, so bringing into operation the ejector pins, and the finished shell is taken away.

Thenceforward, operations are continuous at stations (A) and (B) alternately. Finished half-shells are stored in racks nearby or placed immediately for casting.

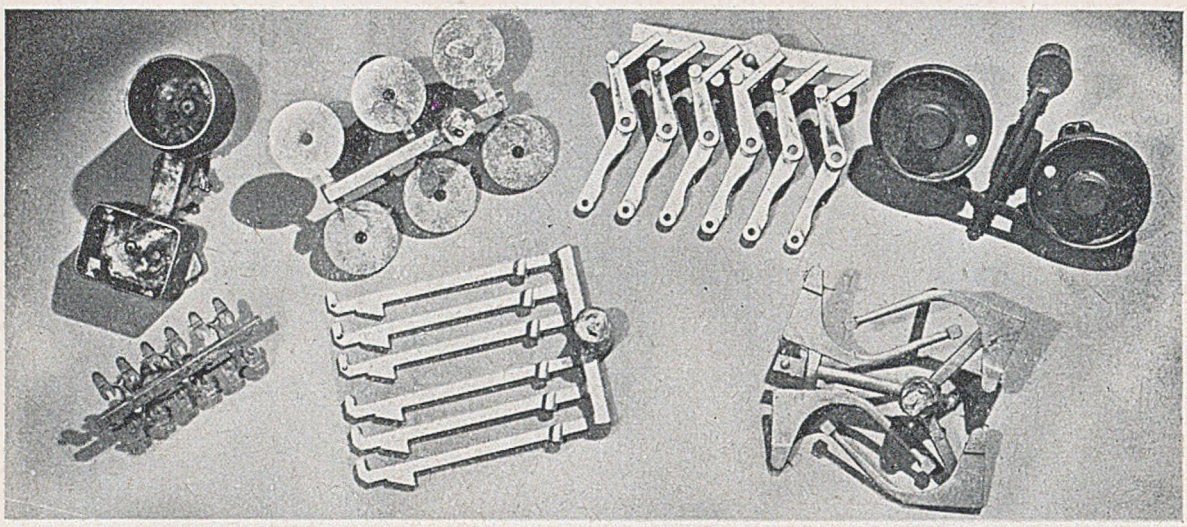


FIG. 3.—*Sprays of Castings, mainly for Textile Machinery, made on the F.L.C.B. Equipment.*

For the range so far produced by the firm, horizontal weighting and clamping of the shells has been adopted for pouring. Fig. 3 shows typical castings produced.

The simplicity of the equipment will undoubtedly commend itself to many founders and the manual nature of the operations will not, it is thought, offer much deterrent, in view of the comparatively low capital outlay involved. To meet the special requirements of a foundry employing female labour, one F.L.C.B. machine is to be equipped in that instance with a compressed-air cylinder actuating gear motivation of the dump-box, but even this introduces no undue complication. Production on the prototype machine with all-manual operation has reached 40 half-shells (24 by 18 in.) per hour which, for the job illustrated—where two half-moulds are produced from one shell—means 40 complete moulds per hour.

Other interesting "know-how" on shell moulding gained by the F.L.C.B. concern is disclosed in Mr. Potter's Paper, abstracts from which are shortly to be printed. The firm is using a local grade of sand for shell moulding which is available at quite a modest price. At present a 5 per cent. resin bond is being added and the results are certainly very satisfactory, a wide range of castings in iron, gunmetal and aluminium being produced for the firm's own textile machinery. This "proof of the pudding" is undoubtedly a good recommendation for the processes developed.

New Rolls-Royce Factory

Mr. Duncan Sandys, Minister of Supply, formally opened at East Kilbride last month an extensive new Rolls-Royce factory for the production of the latest types of turbo-jet aero engines. Since the war, Britain's lead in jet engines had, he said, been largely due to the Rolls-Royce company. Their aero-engines were in demand all over the world, and were being made under licence in France, Belgium, Sweden, Australia, the Argentine, and U.S.A. More-powerful jet engines were being actively developed under M.O.S. contracts to provide the increased performance which would be demanded for the aircraft of the next generation and beyond that.

Lord Hives, chairman of Rolls-Royce, said this country more than ever before had to rely on its ability to do difficult jobs in an efficient way. For that reason they needed skilled craftsmen. As soon as a job became easy to do it became more difficult for the firm to maintain export markets. They must always be looking for new products and new markets, and they could never allow themselves to become smug and self-satisfied.

The new factory, which has been in use for several months, now employs over 2,000, and its potential could be greatly increased in the event of an emergency. The installation of a conveyor and roller turntables for the handling of Avon engines at the factory, was carried out by Paterson Hughes Eng. Company, Limited, which firm manufacture completely mechanized foundry equipment, cranes, and lifting and moving equipment of all types used in industry. The conveyor at East Kilbride extends to about 1,100 ft. and has entailed an elaborate layout to ensure maximum efficiency in handling. In a modern factory up-to-date means of transport is essential, and this is obtained at the Rolls-Royce plant by the installation of the Pantin patent rod chain "in floor" type conveyor. The largest single unit of its type in Britain, the conveyor extends for almost 5,000 ft.; it conveys trucks up to 2 tons in weight at a slow walking pace, and has a maximum pulling load of 60 tons. It services several factory blocks and moves in a continuous trench under the floor, only a three-quarter inch slot being visible; it costs over £35,000.

THE DISPUTE between the Chesterfield Tube Company, Limited, and the General and Municipal Workers' Union has been settled. The union threatened strike action after the firm dismissed two men who refused to work alongside a non-union employee.

THE INDIAN GOVERNMENT has ordered 480 locomotives from Western Germany, Italy, Japan, and Austria, at a cost of Rs.180,000,000 (£13,500,000). Mr. F. C. Badhwar, chairman of the Indian railway board, said that British locomotive manufacturers had been unable to secure a share of these orders because their quotations were not competitive.

Elevator Furnaces at Gloucester Foundry for Blackheart Malleable

*By P. F. Hancock**

The use of electrically-heated elevator-type furnaces for controlled-atmosphere annealing of whiteheart malleable has become well established in recent years, about 50 large units having been put into operation in the period since the last war. The use of similar furnaces for blackheart, although offering comparable advantages, has not yet been adopted to the same extent in this country, although in the United States there are many installations, one of which has recently been described in the JOURNAL.[1] *The first British installation of this kind was put into commission early in 1952, and has now been in continuous operation for approximately 18 months. Designed and built by Birlec, Limited, it is located at the works of Gloucester Foundry, Limited, by whose courtesy much of the information on which this article is based has been provided.*

Description of Furnaces

The installation consists of a high-temperature furnace, a low-temperature furnace and three movable bogie-hearths, arranged to be operated in conjunction according to the "two-furnace system." General views of the equipment are given in Figs. 1 and 2, whilst Fig. 3 shows a loaded bogie being charged into the low-temperature furnace. The arrangement of the units, in plan and elevation, is shown in diagrammatic form in Fig. 4. Each furnace is of generally similar construction to the furnaces for whiteheart previously described,[2,3,4] and has load space dimensions of 14 ft. by 5 ft. by 3 ft. 6 in. high, capable of accommodating net loads of up to about 12 tons. The casings are of gastight steel-sheet construction, mounted on structural-steel framework, and the brickwork lining on which the heating elements are mounted is semi-refractory, backed by substantial insulation. The movable bogie-hearths are also lined with semi-refractory and insulating brick, the charge being carried on heat-resisting-alloy grids mounted about 6 in. above the brickwork surface.

The bogies are traversed on floor level by means of a "transveyor" chain, with suitable pick-up gear; while vertical movement into and out of the furnaces is effected by means of mechanical hoists built into the structure of each furnace. Gastight sealing is obtained by means of a skirt on the furnace engaging with a sand-filled channel surrounding the hearth. The high-temperature (h.t.) furnace has a maximum rating of 400 kw., which is automatically reduced to 130 kw. during the soaking period. The heating elements are divided into two zones in the height, each with separate temperature control, to ensure maximum uniformity from top to bottom of the load. The low-temperature (l.t.) furnace is rated at 250 kw., and is also sub-divided into two zones for temperature control; in addition, it has various special features to aid in exact control of the slow-cooling cycle. These include two high-speed circulating fans mounted in the roof of the furnace, transverse cooling tubes fed by an air blower, and programme / temperature instruments, the latter controlling both heat input and operation of the cooling blower. The whole installation is thoroughly equipped with electrical and mechanical overload protection devices, and both furnaces have excess-temperature cut-outs, which guard against control-system failures.

* Chief metallurgist, Birlec, Limited.

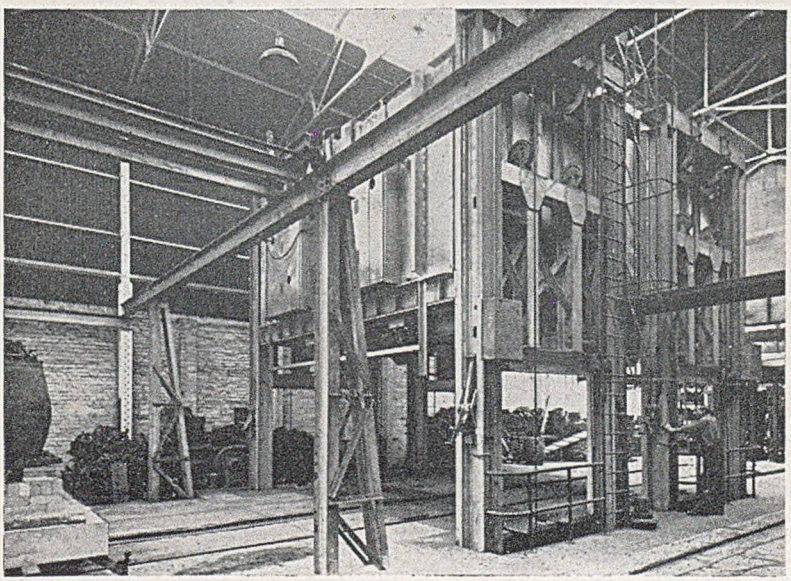


FIG. 1.—*General View of the Gloucester Foundry Installation with the Low-temperature Furnace in the Foreground.*

Operating Method and Annealing Cycle

The "two-furnace system" has previously been described,[4] and its advantages listed, but a brief *résumé* of its essential features may be desirable. For

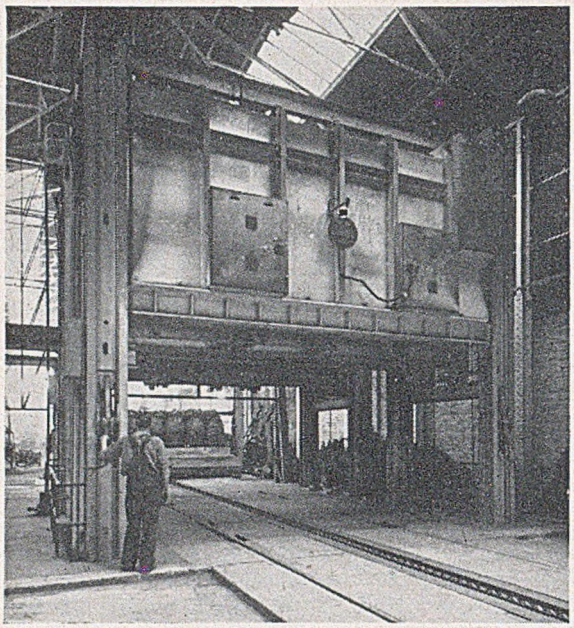


FIG. 2.—*View of the Plant, with the High-temperature Furnace in front; a Loaded Bogie can be seen in the Background.*

its understanding, some consideration of the black-heart annealing cycle is necessary, and this, in the form employed at Gloucester Foundry, is illustrated in Fig. 5. Part (A) consists of the initial stage of preheating up to 600 deg. C.; as is now well known, the rate of heating in this stage and particularly in the temperature range 350 to 600 deg. has a marked effect on the precipitation of graphite nuclei, and to obtain the maximum nodule number, and hence the greatest speed of subsequent annealing, the rate of heating should not exceed about 50 deg. per hr. The heating curve in this stage is therefore of the form shown. Part (B) comprises the further heating up to the top temperature of 950 deg. C., which may be as fast as desired, followed by the top-temperature soak, during which first-stage graphitization is completed. Part (C) consists of cooling to and equalization at a temperature just above the critical range (750 deg. C.), followed by slow cooling to a temperature just below it (700 deg. C.), and, in turn, by rapid cooling to the discharge temperature (550 to 600 deg. C.). In the "two-furnace system," part (B) is carried out in the h.t. furnace, part (C) in the l.t. furnace, while part (A) may be carried out in either, according to the relative times of (B) and (C), but is preferably carried out in the l.t. furnace. Transfers of the charge from one furnace to the other are made at the appropriate points in the cycle.

At Gloucester Foundry, a 48-hr. total cycle is employed, part (A) being of 6 hrs. duration, (B) of 24 hrs., and (C) of 18 hrs., both (A) and (C) being carried out in the l.t. furnace. Thus the total time in each furnace is equal at 24 hrs., no idle time is involved, and one annealed charge is produced per day.

Details at Gloucester

To understand the furnace operation clearly, one series of bogie movements may be followed from charge to discharge. Loading takes place at station X or Y (Fig. 4), and at the appropriate time the loaded bogie is transferred to the l.t. furnace for preheating (following discharge of a completed load from this furnace). On completion of the 6 hrs. preheating, the bogie is then moved to the h.t. furnace for the high-temperature soak (while the previous charge in this furnace is returned to the l.t. furnace for slow cooling). At the end of the soaking period of 24 hrs., the bogie returns to the l.t. furnace for cooling in 18 hrs., following which it is transferred again to station X or Y for unloading and reloading.

There are thus two series of bogie movements in any 24-hr. period. In the first of these, a completed charge is removed from the l.t. furnace, and a new charge is put in for preheating. In the second, the preheated charge is withdrawn from the l.t. furnace and temporarily parked at station X or Y; the charge in the h.t. furnace is transferred to the l.t. furnace, and finally the preheated charge is brought from its parking place and loaded into the h.t. furnace.

At Gloucester Foundry, these movements, which require between 10 and 20 min. for completion, take place at 6 p.m. and 12 midnight respectively, these times being found most convenient for two reasons. The first is due to labour organization; a completed load being discharged at 6 p.m. each day

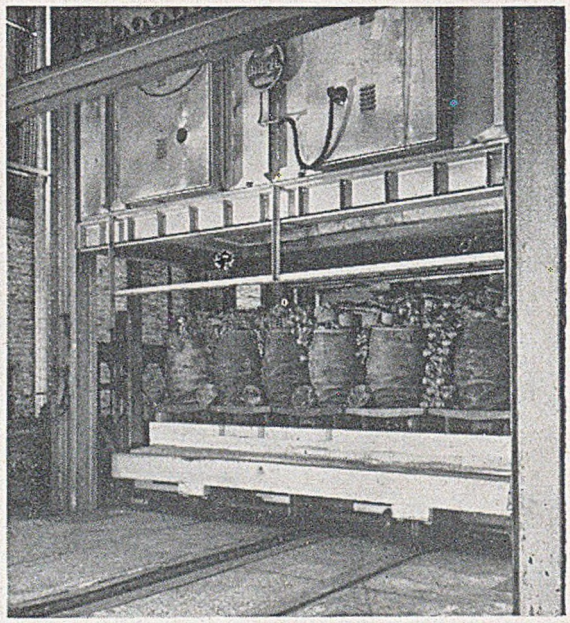


FIG. 3.—*Charging a Loaded Bogie into the Low-temperature Furnace.*

(at a temperature of about 600 deg. C.), can cool overnight ready for unloading and reloading by day-shift labour next day. The second reason is limitation of the maximum kva. demand; the heaviest demands from the furnace installation (preheating a new charge in the l.t. furnace and heating up to top temperature in the h.t. furnace) both occur during the period 6 p.m. to 6 a.m., during which the electrical power demand from the rest of the works is at a low level.

Some surprise may be occasioned by the achievement of satisfactory annealing on a standard blackheart iron in a total annealing cycle of no more than 48 hrs. This is largely made possible by the various features in the furnace construction designed to promote high speed and uniformity of heating and cooling, by means of which the unimportant parts of the cycle are completed quickly, so leaving as much time as possible for the remainder which contribute to good annealing. To emphasize this point, some figures are quoted in Table I of temperatures measured at a number of points in the charge by means of search thermocouples at various stages in the cycle.

TABLE I.—*Temperature Readings during a Complete Annealing Cycle.*

Time.	Control-temperature setting (deg. C.).	Search couples in charge (deg. C.)			
		No. 1.	No. 2.	No. 3.	No. 4.
6 p.m. ..	New charge into l.t. furnace.				
7 p.m. ..	495	409	396	448	355
10 p.m. ..	595	543	542	564	519
11.45 p.m. ..	600	577	579	572	566
12 (midnight)	Charge transferred to h.t. furnace.				
1.15 a.m. ..	885	611	695	835	696
4 a.m. ..	950	927	927	939	915
5.30 a.m. ..	950	934	935	938	934
10.45 p.m. ..	950	950	947	945	940
11.30 p.m. ..	Charge transferred to l.t. furnace.				
11.45 p.m. ..	750	827	844	767	
1.15 a.m. ..	750	751	753	751	'Couple broken.
3 a.m. ..	745	746	746	749	
3.45 p.m. ..	698	696	697	700	
6 p.m. ..	Charge removed to unloading station.				

The positions of the four search 'couples were as follow: No. 1, 6 in. from bottom of charge, No. 2, middle of charge, and No. 3, 6 in. from top of charge (all these 2 ft. from one end of bogie); No. 4, middle of charge (2 ft. from opposite end of bogie).

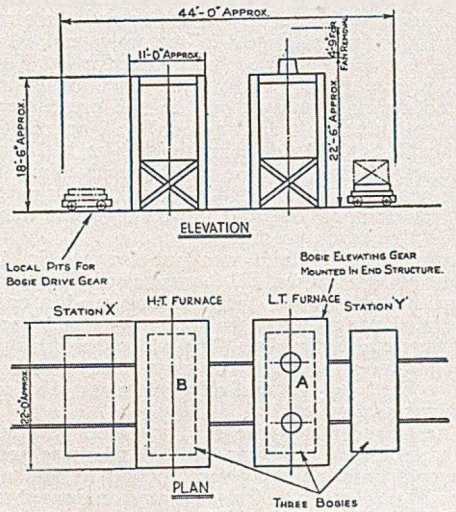


FIG. 4.—*Diagrammatic Plan and Elevation of the Annealing Plant Arrangement at Gloucester Foundry.*

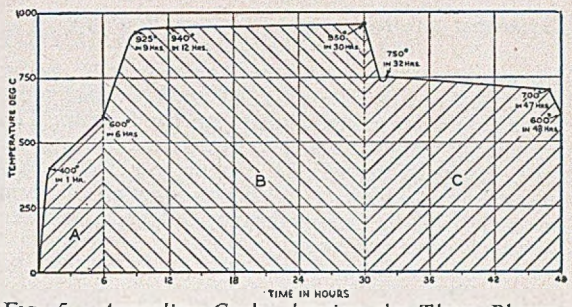


FIG. 5.—*Annealing Cycle showing the Three Phases: (A) Preheating; (B) High-temperature Soak; and (C) Cooling.*

Thus it will be seen that on loading a preheated charge into the h.t. furnace, equalization of temperature within 5 deg., as from one part of the charge to another, and within 15 deg. of the nominal soaking temperature is effected within 5½ hrs., so permitting a soaking time of at least 18 hrs. Similarly, on transferring the charge from the h.t. furnace to the l.t. furnace for cooling, equalization throughout the charge within 5 deg., and within 5 deg. of control temperature of 750 deg., is effected in less than 2 hrs., so leaving 15 hrs. for slow cooling, and permitting a rate of cooling through the critical range which nowhere exceeds 4 deg. per hr.

Furnace Atmosphere

No special provision is made for controlling the furnace atmospheres, other than ensuring an appropriate degree of gastightness in each furnace. A suitable atmosphere is thus formed by interaction of air initially present in each furnace, and that leaking-in in small amounts during the cycle, with the carbon content of the castings. That developed in the h.t. furnace is high in CO, but in the l.t. furnace CO and CO_2 are both present in nearly equal amounts, and consequently no tendency to skin recarburization is encountered. In normal operation, the total depth of decarburization never exceeds about $\frac{1}{32}$ in., and its product is mainly ferritic in nature, as is illustrated in Fig. 5. Although the hot charge is exposed to air for a short time during transfer from one furnace to the other, the amount of scale so formed is very small and presents no problem.

Production Data

The product at Gloucester Foundry consists of a wide range of castings for the automobile and general engineering trades, varying in weight from a few ounces up to more than 2 cwt. and in section between $\frac{1}{8}$ and 2 in. The metal, melted in a cupola/rotary furnace duplex plant, is of the composition commonly employed for blackheart malleable in this country, falling generally in the compositional limits 2.3 to 2.5 per cent. C, 0.9 to 1.0 per cent. Si. For annealing, the castings are mostly packed in mild-steel drums (scrap oil-drums), of which ten

are accommodated on the bogie hearth, being loaded by means of a fork-lift truck. Some types of casting are stacked directly on the hearth. The net charge weight usually varies between 8 and 11 tons, but with favourable packing, up to 12 tons is sometimes achieved. With a production of seven heats per 168-hr. week, the net output is between 60 and 80 tons per week.

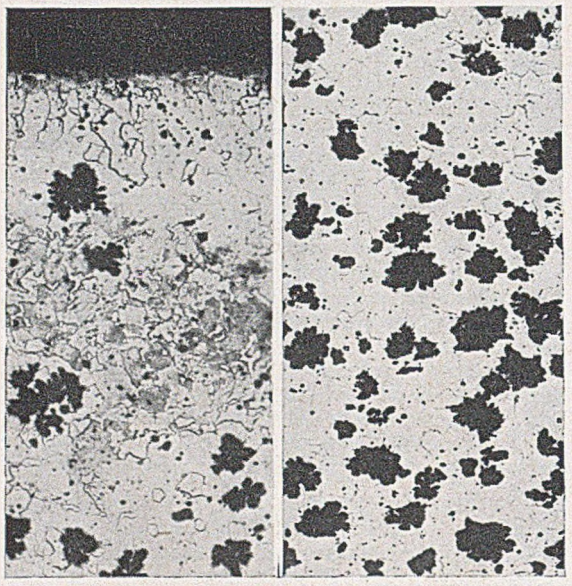


FIG. 6.—*Photomicrographs of Annealed Structure of Typical Blackheart Material: (left) Surface and (right) Matrix, both* ×56, *Etched.*

Power consumption, the main item in the operating costs, has averaged over a period between 370 and 390 kwh. per net ton of castings, the cost being 0.984d. per unit. As to the labour required, one furnace foreman and two packers with the use of a fork-lift truck are employed on day shift, and one operator on night shift, the overall labour cost being about £1 per ton of castings. This low figure (less than one-third of the corresponding figure for pack-annealing in the same plant) would be still further reduced with a larger installation. Maintenance costs are very low; minor repairs to the hearth brickwork are required at fairly frequent intervals, but can be carried out while the bogies are being unloaded and reloaded, *i.e.*, without loss of production time. Electrical gear and instruments are inspected weekly and maintenance carried out as required, this again without loss of production. In a period of twelve months, no more than two days were lost for repair work, and a recent inspection of furnace brickwork and heating elements indicates that no major repairs or replacements are likely within a period of five years. Overall maintenance costs appear unlikely to exceed about 6s. per ton of castings annealed.

Quality of Annealing

The quality of the product is shown by typical microstructures of the matrix and skin of an annealed casting which are shown in Fig. 6. As would be expected, excellent machinability accompanies this structure, and the level of physical tests is well up to the requirements of the relevant British Standard. It is often suggested that distortion during annealing is greater with the gaseous method, as compared with pack annealing. This, however, is not the experience at Gloucester Foundry, where it is found that the degree of distortion relates mainly to the care exercised in packing, whichever annealing method be employed. On average, distortion is found to be no worse with gaseous annealing, and on some types of casting is noticeably reduced. As regards surface finish, the gaseous-annealed castings are found somewhat easier to clean than those treated by the pack method.

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Action on Pneumoconiosis Recommended

The jury at a West Bromwich inquest last month on a pneumoconiosis victim called for national action to ensure that an X-ray examination of foundry workers be carried out at intervals of about six months in an effort to put a stop to the disease or at least help the fight against it. The factory inspector (Mr. W. A. Goldfinch) said he would see that the jury's rider was forwarded to the Home Office.

A verdict was returned in accordance with the medical evidence, which attributed the death of John Thomas Causer, aged 63, hollowware moulder, of West Bromwich, to heart failure due to emphysema and pneumoconiosis.

The coroner (Mr. Lyon Clark) said the reason he was sitting with the jury was because there were so many moulders employed in the town and the matter was of considerable importance industrially. There had been a number of deaths from pneumoconiosis contracted during employment. In the present case, the man had not worked as a moulder since 1946, when his health began to deteriorate, and he had died from the disease, yet at no time had he received any disablement compensation. Dr. J. C. Ford, who made a post mortem examination, said the damage was done more than six or seven years ago.

Apparently, a claim was put forward in 1950 on behalf of Mr. Causer, but it was rejected by the Benefit Board because he was then not employed in one of the scheduled pneumoconiosis occupations and because he was not totally disabled. The widow said this year her husband was unable to do any work at all, and he had worked only on and off at a lighter job during the previous two years.

The Coroner said the man was totally disabled so far as moulding was concerned. As he was not getting any compensation, however, he had to find a job of some sort in order to live. He was anxious that justice should be done to the widow.

The Coroner added that the post-mortem findings of Dr. Ford had been confirmed by the Silicosis Board, so there would not now be any difficulty in the matter of compensation.

Proposed Master Patternmakers' Association

After a luncheon party held in a private room in a London club, given by the FOUNDRY TRADE JOURNAL, Mr. Faulkner, who presided, presented apologies from Mr. Perry and Mr. Wetherell and said the meeting would make history, in so far as it was the first time a national meeting of master patternmakers had ever been held. He explained that few trade associations dealt with labour conditions, but there were other activities for an association which he envisaged, such as the maintenance of economic prices, and such problems could be dealt with through a unified costing system, through specifications or through a code of good practice. Other activities were conditions of sale, and insurance of patterns.

[Mr. Faulkner passed around the meeting a translation of a Belgian code of good practice and stated similar work had also been done by the French, Dutch, Swedes and Germans.]

One thing that can usefully be done by such an association is the grading of patterns, thereby reducing unintentional price cutting. Also there was the question of the conditions of apprenticeship.

Mr. Faulkner remarked that in his experience the best feature of such an association would be the friendships that were formed. Friendships were one of the main ways of preventing such unpleasant aspects as poaching.

Unity Required

Mr. Faulkner then called upon Mr. L. Brown of the Premo Pattern Company, Birmingham, to express his views favouring the formation of a master patternmakers' association, which was long overdue. It was necessary in his opinion for the members of the patternmaking industry to get together and speak with a united voice. It was essential that a uniform system or code of good practice be evolved, so that buyers should know exactly what they are purchasing.

Very often a buyer will buy a cheap pattern, because of price only, disregarding the bad workmanship. His policy was good patterns at an economic price.

He made the point that the essential things were a uniform code of good practice, and the friendships. The patternmaking industry was one upon which the industry of this country stood. Greater degrees of accuracy were constantly being demanded. Patternmaking was a specialized job and should be left to the patternmaker-specialist.

In the Birmingham area there were about 25 to 30 master patternmakers, all of whom he was sure would be whole-heartedly in favour of a national association. This association might negotiate wages, but wages were negotiated by the Engineering and Allied Employers' Association and there would always be difficulties. Everybody knew that the standard rate bore no relation to what a patternmaker took home in his weekly wage packet.

MR. WHITEHOUSE began by hoping that Mr. Wetherell would fully recover from his operation, and that he would co-operate should it be decided to form an association of master patternmakers. He said that he would prefer the title "corporation." He explained that he could not speak with full authority as he was at the meeting as the representative of the Coventry and District Master Patternmakers' Association and would have to report back what was decided at the meeting.

The Coventry and District Patternmakers' Association was formed in March, 1942, and the Birmingham, Wolverhampton and Staffordshire Association's formation followed soon after. Immediately the two associations knew of the others' presence, meetings were arranged between the two. Because of this friendship, Mr. Whitehouse had envisaged a Midland association, but this idea had not been fulfilled. His association was formed in a harmonious way, an association which it was decided to form to negotiate with United Patternmakers' Association. They had worked happily until 12 months ago, when a split occurred over the question of apprentices. It was the rule to have 1 in 3, 4 or 5 apprentices and in order to break the rule it was necessary to discontinue as a negotiating body.

In regard to this question of a master patternmakers' association, Mr. Whitehouse stressed the importance of proceeding carefully. He stated that as the representatives of the master patternmakers, those present should move a resolution recommending that in the interests of the patternmaking trade an association should be formed.

By working together, Mr. Whitehouse declared, a group could be formed to give better delivery dates and better patterns than firms with their own patternshops—in fact, working towards a common end, and this could not be solved by a single individual. A single individual did not possess of the knowledge—but a group could and should capture all the patternmaking trade.

Summing up, Mr. Whitehouse stressed again the strength of a group, especially with regard to economic prices. He again mentioned that he was not present to say "yea" or "nay" to the formation of an association; he was only there to report back. However, he personally would give the idea his fullest support.

MR. SEYMOUR said he thanked Mr. Faulkner for his hospitality. He represented a small firm which used good quality patterns in their non-ferrous foundry. To be a success this association should include everyone, and the smaller firms should certainly welcome a lead by the bigger firms. If the big people are interested, the smaller people would surely follow. His views were that every master patternmaker in the country, whether he employs 10, 20 or 150 men, should join together.

Finally he wished to be associated with a company such as was present, and believed that something would come out of the meeting.

MR. GOTT said that he had listened to the three previous speakers, but believed that not one of them had touched the basic problems. He said that they were contemplating the formation of an association and it was interesting to note that those present represented a total employment of about 700 patternmakers. On the question of deliveries, the association in mind by those present would be able to offer far better deliveries. He would like to ask what was the degree of co-operation as envisaged with the foundry trade?

Wage Matters

MR. LEVY explained that his remarks were something of a summary of what the previous speakers had already covered quite comprehensively. He emphasized what he was for and what he was against. He was against any organization negotiating wage matters or with trade unions, which would be better dealt with by existing organizations.

He favoured a code of good practice, the training of apprentices and social activities; also the maintenance of economic price levels, conditions of sale, and general labour questions which were not matters of argument, and load spreading between members of the association. The main difference between another proposed association and the one he had in mind was the question of trade union negotiations. As a means to positive action

Proposed Master Patternmakers' Association

he suggested that that afternoon a resolution on the lines outlined by Mr. Whitehouse should be formulated. He also proposed the establishment of a steering committee for the purpose of looking into the possibility of this association's formation and to give consideration to the matters which had been put forward. He proposed, too, that the names of members present and their views should be circularized to see what response would be received to the organization such as they envisaged.

MR. SEYMOUR here queried whether a small association would be heard by the big unions, and other organizations.

Co-operation with Other Bodies

MR. LEVY maintained that the answer was "yes" provided that one is prepared to make heard one's views. He had made himself heard at a meeting of the London and District Association of the Engineering and Allied Employers' on the question of apprentices not because he was the largest patternmaker, but purely because he was a member. Apprentices were called up for service training whether they had finished their term of indenture or not. Following soon after his expression of opinion, action was taken to allow apprentices to finish their training before entering the services.

MR. BROWN here interpolated to state that although his association had tried they could not obtain any co-operation from the Engineering and Allied Association.

MR. LEVY then queried whether any members of their association was represented on the Engineering and Allied Association.

MR. BROWN replied that 85 per cent. were members of Engineering and Allied.

MR. GOTT, after stating again that their number of operatives was near the 700 mark, queried with Mr. Whitehouse whether it was his aim to persuade the foundry industry that they could operate better than the present association?

MR. WHITEHOUSE'S reply was "yes."

MR. SCOTT went on to say that a working capacity 1,000 strong was a considerable body. The big associations might not listen to a small group, but they would certainly listen to a larger body of men.

MR. SARGINSON suggested that a small committee be set up to go into the question thoroughly so that something could be started. He did not wish to say more as the notes he had made were covered by the previous discussion.

Steering Committee

MR. BROWN then proposed: That this meeting considers it desirable to form a committee to study the possibility of forming a Master Patternmakers' Association.

This proposal was carried unanimously.

The following gentlemen promised to serve on the steering committee:—Mr. Brown of Birmingham, Wolverhampton and Staffordshire Master Patternmakers' Association; Mr. Whitehouse of the Coventry and District Master Patternmakers' Association; Mr. Seymour from the East Midlands; Mr. Gott from Manchester; Mr. Levy from London. Mr. Levy to act as convener.

The first meeting would take place on December 16 at the Queen's Hotel, Birmingham.

Mr. Levy proposed a vote of thanks to the chair and Mr. Brown seconded the proposal.

Personal

MR. A. MORCOM has been appointed a director of Belliss & Morcom, Limited.

MR. C. H. KAIN, A.M.I.MECH.E., has succeeded Mr. F. N. Lloyd as chairman of the British Steel Castings Research Association.

MR. CHARLES ADDISON EBERLE of Owen Sound, Ontario, has been appointed a director of Millspaugh, Limited. Mr. Eberle is the general manager of the company's Canadian subsidiary, William Kennedy & Sons.

BIRMINGHAM PRODUCTIVITY ASSOCIATION has appointed as full-time organizing secretary, Mr. Ernest Tonkinson, a 37-year-old expert in economic and commercial affairs. He will have an office at Birmingham Chamber of Commerce.

MR. GEORGE T. GEDGE, who has been works manager of Short Bros. & Harland, Limited, aeronautical engineers, of Belfast, since 1948, has been appointed assistant general manager. MR. B. PENNEY succeeds him as works manager.

THE UNITED STEEL COMPANIES, LIMITED announce that they have appointed Commander K. H. S. Cohen, C.M.G., as their European adviser. For some time, the Company has wished to make a closer study of the trends in European industry and economics and Commander Cohen is to undertake this work.

LORD PIERCY, chairman of the Industrial & Commercial Finance Corporation, Limited, and a director of the Bank of England, has been elected president of the Institute of Works Managers in succession to Lord Braintree. He has served as president of the National Institute of Industrial Psychology and as a member of the council of the British Institute of Management. MR. R. S. SILMAN has accepted the office of chairman of the executive council of the Institute of Works Managers in the place of MR. J. CONNELL, whose term of office has expired.

Obituary

MR. STEPHEN ADAM JARDINE, shipping manager to the Carron Company, ironfounders, etc., of Carron, Falkirk, died on November 27.

THE DEATH is announced of Mrs. Elizabeth Broughton, chairman and senior director of Thomas Carling & Company, Limited, Salop Street, Breightmet Street, Bolton.

THE DEATH has occurred of MR. GEORGE OVERTON who, as Midlands area manager for Dorman, Long & Company, Limited, was widely known in the steel trade in the Midlands. Mr. Overton joined the Birmingham office of the firm 24 years ago, and was appointed area manager in 1934. He was 53.

THE DEATH is announced of MR. FRANK W. SHEPHERD, a special director and superintendent of production of Dorman, Long & Company, Limited, of Middlesbrough. He was 57 years of age and had been with the company for over 40 years. He was a past president of the Cleveland Institute of Engineers.

WIDELY KNOWN through Midland foundry circles, MR. A. DUDLEY EVANS, secretary for 42 years of the Birmingham Iron Exchange, died on December 1. He was in his 82nd year. Mr. Evans' work as secretary of the Iron Exchange and as secretary of various trade associations covering the interests of iron merchants, foundry-coke merchants, and so on, was greatly valued. He retired from the Exchange in 1950.

News in Brief

THE FIVE-YEAR-OLD BAN on exports of ferrous scrap from Ceylon has been lifted. An export duty of Rs. 50 (75s.) per ton has been imposed.

THE SELSON MACHINE TOOL COMPANY, LIMITED, one of the 600 Group of companies and sole distributors of Cleveland automatics in the U.K., announce the availability of three additions to the Cleveland range of single-spindle machines.

AT THE ANNUAL MEETING of the Cambridge and District Engineering Society, the following officers were elected:— As secretary, Mr. Donald MacKay; treasurer, Mr. L. Bonnett; chairman,, Mr. A. L. Gray. The president of the Society is Mr. L. W. Jones.

FIRST USED in 1898, a horse-drawn fire-engine and steam pump combination has been presented to the Birmingham Museum of Science and Industry by Mr. Charles H. Rowley, deputy general manager of the service department of the Austin Motor Company.

STEEL PRODUCT DELIVERIES by domestic mills in the United States declined in September for the first time this year, according to the American Iron and Steel Institute. The delivery total for September was 6,400,757 net tons, which was 141,000 tons less than in September, 1952.

THE ANNUAL DANCE of the West Riding of Yorkshire branch of the Institute of British Foundrymen will be held at the Connaught Rooms, Bradford, on Thursday, February 4, 1954, from 8 p.m. to 1 a.m. Tickets, price 6s., are now available from Council members and the branch secretary.

MACHINE-TOOL OUTPUT in the United States this year will be about the same as in 1952 when deliveries totalled $1,125,900,000, according to the National Machine Tool Builders' Associaton. At the end of September, the backlog of orders stood at seven months' production at present capacity.

FOR THE FIRST TIME since 1936 a cargo of manganese ore from Russia has arrived in the Tees. The s.s. Paz, flying the Panamanian flag, has brought in a cargo of 8,800 tons from the Black Sea port of Poti and another consignment of 8,000 tons from the same source is expected in January.

SHIPYARD UNEMPLOYMENT on Tyneside has jumped by 50 per cent. in the past month, and is now at its highest level since the Spring of 1951. On November 16, 1,221 workers from Tyne shipyards were unemployed, compared with 800 on October 12. A falling off in repair work is mainly responsible for the rise.

THE NETHERLANDS TECHNICAL FOUNDRY ASSOCIATION is to hold a one-day meeting on December 16 at the Esplanade, Lucas Bolwerk, Utrecht. The lecturers are Professor Zuithoff, Mr. H. van Suchtelen and Mr. C. C. M. Hardebeck, all of whom are dealing with the training of the various grades of employees ranging from apprentices to managers.

A SET OF SILVERWARE, including a salver, two serving trays, a cocktail shaker, cigarette box and six ashtrays, together with a Godiva clock, all made by Coventry craftsmen, has been presented to the city by the Coventry and District Engineering Employers' Association. The gift is to mark the raising of Coventry's first citizen to a Lord Mayoralty and is to be used in his parlour.

IN AN EFFORT to speed up Argyll County Council house-building in the island of Islay, a consignment of kitchen grates was landed at Port Ellen airport on December 2 by freight 'plane. An official of the architect's department said that this method was chosen in preference to cargo steamer because of greater speed and convenience. The grates are for houses at Bowmore and Port Ellen.

EXPORT CONTROLS on certain nickel products have been eased in the fourth quarter by the U.S. Department of Commerce. An "open-end" quota has been set for exports in the final quarter. Under such a quota, no quantitative limit on exports is established, but exports are controlled to safeguard national security. The new quota arrangement affects nickel metal in bars and other forms, nickel-alloy metal in bars, and nickel and nickel-alloy semi-fabricated forms.

AGREEMENT HAS BEEN REACHED between the board of Associated Manganese Mines of South Africa, Limited, and the Manganese Corporation for the purchase of certain mining leases, freehold farms, mineral rights, and buildings and plant for £480,000. The purchase is to be financed by accommodation loans and for this purpose the directors are seeking to increase their borrowing powers by up to £500,000. It is planned to repay the loans over a period of five years.

AS FROM LAST MONDAY the London plant branch office of Crompton Parkinson, Limited, moved to 1-3, Brixton Road, London, S.W.9 (telephone: RELiance 7676). The branch is responsible for the sale of generators, motors, transformers, switchgear, power cable, instruments, traction batteries, and ceiling fans. It also negotiates contracts for complete electrical power installations in oil refineries, paper mills, cement works, textiles factories, and all other industrial plants.

SINCE THE Cardiff Port Development Association was formed in 1951, a great deal has been achieved in making Cardiff known as a general cargo port. The annual report of the association shows that during this year up to October 4 imports increased by 35,094 tons, but there was a decrease of 145,281 tons in exports. This resulted in a net decrease in the total trade of 110,187 tons. The fall in exports is attributed entirely to the decreased exports of coal and patent fuel, which were subject to economic considerations outside the scope of the association's activities.

THE FIRST NEW SHIPYARD to be laid down in Britain for more than 26 years was opened at Newport (Mon) recently by Sir David Maxwell Fyfe, Home Secretary and Minister for Welsh Affairs. The construction of prefabricated vessels in a dry dock under cover—the latest method of welding construction—will be undertaken at the yard by the Atlantic Shipbuilding Company, Limited. The yard is being built in stages. The first stage, opened last week, enables vessels of up to 8,000 tons to be built—already two 3,000-ton pulp carriers are under construction for a Canadian firm. The second stage will include a dry dock capable of taking vessels of up to 45,000 tons.

A JOINT CONFERENCE between the Institution of Chemical Engineers, the Chemical Engineering Group of the Society of Chemical Industry, the *Koninklijk Instituut van Ingenieurs* (Royal Institution of Engineers—Chemical Engineering Group) and the *Koninklijk Nederlandse Chemische Vereniging* (Royal Netherlands Chemical Society—section for Chemical Technology) on "Unit Processes of Oxidation" will be held in the Netherlands at the Hague on May 6 and 7, 1954, a third day being reserved for excursions. The conference language will be English and requests for further information should be addressed to Mr. R. C. Odams, Institution of Chemical Engineers, 65, Victoria Street, London, S.W.1.

Raw Material Markets

Iron and Steel

The blast furnaces are well supplied with ore, coke, and limestone, and are achieving satisfactory outputs. The overall demand for pig-iron is still high and small tonnages continue to be imported from near-Continental ports. The light-castings trade is emerging from its prolonged period of slack business, but coverage for increased supplies of high-phosphorus iron is not difficult to arrange. Other grades of iron, however, are scarce and deliveries of hot metal to the steel furnaces are barely adequate, with the result that steelmakers are not infrequently compelled to resort to withdrawals from stock.

The recent sharp decline in the intake of steel semis from the Continent is no more than the expected consequence of the expansion of British ingot production and billet mill capacity. Marginal supplies are still coming in, but in the provision of steel semis a much greater measure of self-sufficiency has been achieved. Moreover, the requirements of the bar re-rollers are still very limited, owing to the dearth of foreign business. The difference between European and British export prices for merchant bars is nearly £4 per ton. Thus re-rollers are almost wholly dependent on the home market and demand is too limited to provide full employment for the mills.

There is no hint that the export price cuts announced last week will be followed by any concessions to home consumers. It is, of course, the established rule that steel must be invoiced at the price ruling on the day of despatch, but if there were any hope of reductions, consumers would naturally be inclined to delay further purchases. In any event, the flow of new business is likely to remain sluggish until the end of the month, but the finishing mills have plenty of work in hand. There is still a deficiency in the supply of steel plate, but this is due to the abnormal expansion of demand. It is pointed out that plate production has increased by approximately 50 per cent. since 1946 and is still expanding. No less impressive is the pressure upon the capacity of the sheet mills, which promises to continue throughout the early months of 1954.

Non-ferrous Metals

Somewhat reactionary markets were in evidence last week, but in most cases initial losses were recovered and values closed rather better on balance. True the gain in copper was limited to a rise of 10s. in the cash position, three months being 10s. down, but, at £234 10s., cash was £4 above the lowest point touched during the week and the forward quotation also was above the lowest. After coming in to nearly £8, the backwardation widened slightly, to finish at £9 10s., and there is a growing belief that for the moment the gap between the two positions is unlikely to decrease any further. Business was fairly active and the turnover up to average. In New York the export price was quoted ¼ cent down at 29 to 29.25 cents per lb. f.a.s., but values on the Commodity Exchange kept very steady. The puzzle of the Chilean stock disposal is still unanswered, but discussions are reported to be in progress in Santiago, although it is admitted that weeks may elapse before a decision is reached. In the meanwhile, the strikes in progress since mid-October at two of the largest copper-mining properties in Chile have been settled and the men are back at work. The stoppage of work cut down seriously the output for October and November. In this country some consumers appear still to be short of prompt copper and premiums are being paid to secure supplies.

The tin market lost ground rather badly, finally closing £10 lower for cash and £15 10s. down for three months. Progress at the Geneva conference is believed to have been good. Hopes of a better price for tin were rather dashed last week when it became known that the United States expects to have a surplus of some 40,000 tons to its stockpiling needs by next March. Zinc showed a good deal of resistance as the decline in values took the price nearer to £70 and the final result of the week's trading was a gain of £2 for December and £1 10s. for March. Business was fairly active. Lead, too, did fairly well, closing 17s. 6d. up for December and 10s. better for the March position. The backwardation stood at £2 2s. 6d. No change has occurred in the cent prices of either zinc or lead and both metals present quite a firm front. Scrap prices are still high, for supplies of both brass and copper are still scarce.

Official metal prices were as follow:—

COPPER, Standard—*Cash:* December 3, £233 to £233 10s.; December 4, £233 to £233 10s.; December 7, £233 10s. to £234; December 8, £234 to £234 10s.; December 9, £235 to £235 10s.

Three Months: December 3, £224 to £224 10s.; December 4, £224 5s. to £224 10s.; December 7, £224 to £224 10s.; December 8, £224 10s. to £224 15s.; December 9, £224 15s. to £225.

TIN, Standard—*Cash:* December 3, £627 10s. to £632 10s.; December 4, £635 to £637 10s.; December 7, £655 to £660; December 8, £665 to £670; December 9, £660 to £662 10s.

Three Months: December 3, £615 to £617 10s.; December 4, £617 10s. to £620; December 7, £640 to £645; December 8, £645 to £647 10s.; December 9, £645 to £647 10s.

ZINC—*December:* December 3, £74 10s. to £74 15s.; December 4, £74 to £74 5s.; December 7, £73 15s. to £74; December 8, £73 17s. 6d. to £74; December 9, £73 15s. to £74.

March: December 3, £74 5s. to £74 7s. 6d.; December 4, £74 to £74 5s.; December 7, £73 15s. to £74; December 8, £73 17s. 6d. to £74; December 9, £73 15s. to £74.

LEAD—*December:* December 3, £91 5s. to £91 10s.; December 4, £93 to £93 5s.; December 7, £92 to £92 10s.; December 8, £90 15s. to £91; December 9, £90 15s. to £91.

March: December 3, £89 15s. to £89 17s. 6d.; December 4, £90 15s. to £91 5s.; December 7, £90 to £90 10s.; December 8, £88 15s. to £89; December 9, £88 10s. to £88 15s.

Delta Metal Presentations

Mr. A. F. H. Dick, chairman of the Delta Metal Company, Limited, celebrated his completion of 50 years with the firm by presenting a clock to every employee of the company, numbering 1,700 in all. Employees at the Birmingham factories of the company and its subsidiaries, Moore Brothers, Limited, and Heaton & Dugard, Limited, subscribed towards a presentation to Mr. Dick, their gift being a sundial to be installed in the garden of his London home. The Delta Metal Company was founded by Mr. Dick's father and tradition has it that so keen a follower of Aston Villa football team was Mr. Dick senior that he was constrained to establish a factory in Birmingham so that he could combine business with pleasure. The Birmingham branch of the business (which was founded in London), was set up towards the end of last century. Mr. Dick senior invented the extrusion press which bears his name, and of which, for a long time, the firm held the patent rights.

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

(*Delivered unless otherwise stated*)

December 9, 1953

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2:—Middlesbrough, £13 18s. 0d.; 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. 0d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £18 3s. 0d.; South Zone, £18 5s. 6d.

Refined Malleable.—P, 0.10 per cent. max.—North Zone, £19 3s. 0d.; 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. 0d.; Scotland (Scotch iron), £16 18s. 6d.; Sheffield, £17 13s. 0d.; 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. 0d., basis 45 per cent. Si, scale 21s. 6d. per unit; 70/84 per cent., £82 10s. 0d., basis 75 per cent. Si, scale 23s. per unit.

Ferro-vanadium.—50/60 per cent., 23s. 8d. to 25s. 0d. per lb. of V.

Ferro-molybdenum.—65/75 per cent., carbon-free, 10s. 0d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., carbon-free, £165 0s. 0d. to £181 0s. 0d. per ton; 38/40 per cent., £229 0s. 0d. to £235 0s. 0d. per ton.

Ferro-tungsten.—80/85 per cent., 13s. 6d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 16s. 6d. per lb. of W.

Ferro-chrome (6-ton lots).—4/6 per cent. C, £85 4s. 0d., basis 60 per cent. Cr, scale 28s. 3d. per unit; 6/8 per cent. C, £80 17s. 0d., basis 60 per cent. Cr, scale 26s. 9d. per unit; max. 2 per cent. C, 2s. 0½d. per lb. Cr; max. 1 per cent. C, 2s. 1 d. per lb. Cr; max. 0.15 per cent. C, 2s. 2d. per lb. Cr; max. 0.10 per cent. C, 2s. 2¼d. per lb. Cr; max. 0.06 per cent. C, 2s. 2½d. per lb. Cr.

Cobalt.—98/99 per cent., 20s. 0d. per lb.

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

Metallic Manganese.—93/95 per cent., carbon-free, £225 0s. 0d. to £232 0s. 0d. per ton; 96/98 per cent., £255 0s. 0d. to £262 0s. 0d. per ton.

Ferro-columbium.—60/75 per cent., Nb + Ta, 52s. 6d. to 70s. 0d. 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 0s. 0d.; silico-manganese, £33 16s. 0d.; free-cutting, £28 16s. 6d. SIEMENS MARTIN ACID: Up to 0.25 per cent. C, £32 12s. 0d.; case-hardening, £33 0s. 0d.; silico-manganese, £34 17s. 6d.

Billets, Blooms, and Slabs for Forging and Stamping.—Basic soft up to 0.25 per cent. C, £29 16s. 0d.; basic, hard, over 0.41 up to 0.60 per cent. C, £30 16s. 0d.; acid, up to 0.25 per cent. C, £33 0s. 0d.

FINISHED STEEL

Heavy Plates and Sections.—Ship plates (N.-E. Coast), £30 6s. 6d.; boiler plates (N.-E. Coast), £31 14s. 0d.; 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. 0d.; 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.

NON-FERROUS METALS

Copper.—Cash, £235 0s. 0d. to £235 10s. 0d.; three months, £224 15s. 0d. to £225 0s. 0d.; settlement, £235 10s. 0d.

Copper Tubes, etc.—Solid-drawn tubes, 26⅞d. per lb.; wire, 262s. 9d per cwt. basis; 20 s.w.g., 291s. 9d. per cwt.

Tin.—Cash, £620 0s. 0d. to £662 10s. 0d.; three months, £645 0s. 0d. to £647 10s. 0d.; settlement, £662 10s. 0d.

Zinc.—December, £73 15s. 0d. to £74 0s. 0d.; March, £73 15s. 0d. to £74 0s. 0d.

Zinc Sheets, etc.—Sheets, 15 g. and thicker, all English destinations, £102 10s. 0d.; rolled zinc (boiler plates), all English destinations, £100 5s. 0d.; zinc oxide (Red Seal), d/d buyers premises, £90 0s. 0d.

Lead (Refined Pig).—December, £90 15s. 0d. to £91 0s. 0d.; March, £88 10s. 0d. to £88 15s. 0d.

Brass Tubes, etc.—Solid-drawn tubes, 22d. per lb.; rods, drawn, 32½d.; sheets to 10 w.g., 247s. 3d. per cwt.; wire, 29¼d.; rolled metal, 234s. 0d. per cwt.

Brass (Brazing).—BS1400, B3 (65/35), £165 to £169; B6 (85/15), £210 to £215; BS249, £182 to £187.

Brass (High Tensile).—BS 1400, HTB1 (30 tons), £199 to £205; HTB2 (38 tons), £207 to £210; HTB3 (48 tons), £220 to £225.

Gunmetal.—RCH, 3/4 per cent tin, £188 to £193; BS 1400, LG2 (85/5/5/5), £197 to £200; LG3 (86/7/5/2), £207 to £210; G1 (88/10/2/½), £262 to £265; (88/10/2/1), £251 to £253.

Phosphor Bronze.—BS 1400, PB1 (AID released), £275 to £283 per ton; strip, 348s. 6d. per cwt.; sheets to 10 w.g., 370s. 3d. per cwt.; wire, 43¾d. per lb.; rods, 38½d.; tubes, 36½d.; chill cast bars: solids 41d., cored 42d. (C. CLIFFORD & SON, LIMITED.)

Nickel Silver, etc.—Rolled metal, 3 in. to 9 in. wide × .056, 3s. 0¾d. per lb.; round wire, 10g., in. coils (10 per cent.), 3s. 6d.; special quality turning rod, 10 per cent.; ½ in. dia., in straight lengths, 3s. 5d. All prices are net.

Other Metals.—Magnesium, ingots, 2s. 10½d. per lb. Antimony, English, 99 per cent., £210 0s. 0d. Quicksilver, ex warehouse, £61 15s. 0d. Nickel, £483 0s. 0d. Aluminium, ingots, £150 0s. 0d.; aluminium bronze (BS 1400), AB1, £247 to £252, AB2, £257 to £262. Solder, brazing, BS 1845, 2s. lb.; granulated, 2s. 7d. lb.

Forthcoming Events

DECEMBER 14

Institute of Metals

Scottish Local section:—"Corrosion, Particularly under Marine Conditions," by P. T. Gilbert, Ph.D., 6.30 p.m., in the rooms of the Institution of Engineers and Shipbuilders in Scotland, 39, Elmbank Crescent, Glasgow, C.2.

Institution of Production Engineers

Derby section:—"Effective Utilization of Materials," by F. Nixon, 7 p.m., in the Midland Hotel, Midland Road.
Oxford section:—"Design and Manufacture of Refrigerators on Mass-production Lines," by A. O. B. Brandon, 7.15 p.m., the Randolph Hotel, Beaumont Street.

Sheffield Society of Engineers and Metallurgists

Annual General Meeting. "Design and Development of the Deltic Light-weight Diesel Engine," by E. Chatterton, 7.30 p.m., in the University Building, St. George's Square, Sheffield.

DECEMBER 15

Chemical Engineering Group

London:—"Instruments for Quality Control," by G. C. Eltenton, 5.30 p.m., at the Geological Society, Burlington House, W.1.

Institution of Works Managers

Wolverhampton branch:—"Costing as an Aid to Management," by H. H. Norcross, 7 p.m., at the Star and Garter Royal Hotel.

Purchasing Officers' Association

Birmingham branch:—Film, "Conveyors as your Servants," 6.30 p.m., in the Grand Hotel.
Watford/Harrow group:—"Standardization, Simplification and Specification," by F. Kay, 7.15 p.m., at the Railway Hotel, Wealdstone.

Institute of British Foundrymen

Coventry and District Students' section:—Official visit by Branch President, T. H. Taft. Lecture: "Some Impressions of U.S. Foundries," by T. Makemson, M.B.E., 7.15 p.m., in Room A.5, of the Coventry Technical College.
East Anglian section:—"Any Questions," 7.30 p.m., in the Central Hall, Public Library, Ipswich.

DECEMBER 16

Scottish North-eastern section:—"Variety Production in a Jobbing Foundry," by C. B. Scarliffe, 7.30 p.m., at U.L.R.O. Wallace Foundry," Dundee.

Institution of Production Engineers

Cornwall section:—"Recent Developments in the Economic Use of Materials," by M. P. H. A. LeVie, 7.15 p.m., at the Cornwall Technical College, Trevenson Park, Pool, Redruth.

Incorporated Plant Engineers

Glasgow section:—"Application of Fuel Oils," by Peter Wilson, 7 p.m., at the Scottish Building Centre, 425/427, Sauchiehall Street.

Society of Instrument Technology

South Yorkshire section:—Symposium on "Instrument Maintenance," 7 p.m., in the University Buildings, Sheffield, 1.

Institution of Works Managers

Tees-side branch:—Open discussion on "Management, Trade Unions and Productivity," 7.30 p.m., at the Vane Arms Hotel, Stockton-on-Tees.

DECEMBER 17

Association of Bronze and Brass Founders

Lancs and Cheshire area:—Informal luncheon meeting for all members, 12 noon for 12.30 p.m., at the Midland Hotel, Manchester.

Institution of Production Engineers

Glasgow section:—"Maintenance and the Production Engineer," by A. J. Macintyre, 7.30 p.m., at the Institution of Engineers and Shipbuilders in Scotland," 39, Elmbank Crescent, C.2. Joint meeting with the Institute of Industrial Supervisors.

DECEMBER 18

Birmingham branch:—"Industrial Safety," by E. E. Jellife, 7.30 p.m., at the Imperial Hotel.

DECEMBER 21

Sheffield graduate section:—Film evening 7 p.m., at the Sheffield College of Commerce and Technology, Department of Engineering, Pond Street.

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.

SITUATION WANTED

POSITION with prospects as FOREMAN/MANAGER required. Fully experienced practical foundryman (28). 14 years' experience all branches non-ferrous. Used to responsibility. Not afraid of work. Good organiser. Able to get results.—Box PW112, 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.

INSPECTOR wanted for Mechanised Foundry. Staff appointment.—Write, stating age, experience, and salary required.—Box IW113, FOUNDRY TRADE JOURNAL.

ASSISTANT WORKS MANAGER required for well-known cooker factory in Midlands. Applicants must be about 30 years of age, and have foundry, vitreous enamelling, machine shop experience. State training, experience, and salary required to Box 3919, FOUNDRY TRADE JOURNAL.

IRON FOUNDRY SUPERINTENDENT required by well-known Midland engineering company. Applicants should have sound metallurgical training, and knowledge of modern techniques relating to production of approximately 50 tons/week high duty and general engineering castings.—Box 3910, FOUNDRY TRADE JOURNAL.

HIGHLY qualified ENGINEER required, to take charge of organisation responsible for design and sales of foundry plant and associated equipment. Post advertised constitutes key position in internationally known group of engineering companies. Applicants are asked to supply details of experience, qualifications, age, etc.—Box 3908, FOUNDRY TRADE JOURNAL.

BAMFORDS LTD., Agricultural Engineers, Uttoxeter, require Metallurgical Chemist for Foundry producing repetition high duty and light grey iron castings. Applicants should have a sound knowledge of metallurgical analysis and experience in cupola control, sand testing, etc. State age, experience, and present salary.

WANTED.—CHIEF METALLURGIST, to take complete charge of well-equipped Metallurgical Laboratory in progressive Steel, Iron and Roll Foundry. Experience in manufacture of Chilled and other special Rolls will be an advantage. Salary according to experience and qualifications. Pension scheme in operation.—Apply GLANMOR FOUNDRY CO., LTD., Llanelly, S. Wales.

SITUATIONS VACANT—*contd.*

EXPERIENCED ENGINEER wanted for Maintenance work for Ironfounders in Falkirk having Mechanised Moulding Departments. Good opportunity for steady man. House available if required.—Box EE113, FOUNDRY TRADE JOURNAL.

EXPERIENCED UNIVERSAL MILLER required for Ironfounders in Falkirk. Good opportunity for steady man. House available if required.—Box EU114, FOUNDRY TRADE JOURNAL.

PATTERNMAKER (wood and/or metal), West Bromwich district. Must be able to estimate weights with accuracy of light and medium ferrous and non-ferrous castings from drawings. Progressive position for right applicant. Full particulars, stating age and wages required.—Box 3924, FOUNDRY TRADE JOURNAL.

WANTED.—Loose Pattern Moulders, for small firm of Iron and Non-ferrous Founders in Lincolnshire. Good wages and regular employment for the right men.—Box 3925, FOUNDRY TRADE JOURNAL.

METALLURGIST required for Steel Foundry in Sheffield district, operating High Frequency furnaces. Knowledge of analysis, sand testing heat treatment, and high frequency furnace melting practice essential.—Write, stating salary, experience, to Box 3927, FOUNDRY TRADE JOURNAL.

AN old-established Leicestershire Foundry, producing Grey Iron Castings, require a man about 30 years of age as ASSISTANT to the Manager. Must have experience of practical moulding and all foundry practices; also be well versed in the craft and metals used. The post offers an excellent opportunity for the man with the necessary ability and knowledge.—Write, giving full details of experience, age, and salary required, in strictest confidence, to Box AO111, FOUNDRY TRADE JOURNAL.

REFINERY MANAGER required, to be responsible for the Management and Control of the Reverberatory Furnace Section of Copper Works. Staff lunch room. Superannuation scheme established.—Applications should be addressed to the TECHNICAL DIRECTOR, James Bridge Copper Works, Ltd., Darlaston Road, Walsall, giving details of education, training, and experience and salary required.

ASSISTANT MANAGER wanted for Iron Foundry. To have special responsibility for technical control of Sand and Metal in Jobbing and Mechanised Foundries and development of new processes. In addition to practical experience, it is essential that the applicant is capable of an academic approach to foundry problems, including scrap reduction. High salary and good prospects.—Apply in writing to WILMER LEA FOUNDRIES, LTD., 32/62, High Street, Stratford, E.15.

SITUATIONS VACANT—*contd.*

METALLURGIST required for large Engineering Works in the Lancashire area. Experience desirable in Iron Foundry Control. Carrying out of Mechanical and Analytical tests of materials, and control of Heat Treatment Plant.—Write, stating age, experience, and salary required, to Box 3923, FOUNDRY TRADE JOURNAL.

METAL STORES CONTROL.—Man required by Merseyside Non-ferrous Founders to develop and take charge of comprehensive control system. Costing background preferred, with some foundry and metallurgical experience. Salary: £550-£650, according to qualifications. Good pension scheme.—Apply, giving full details, to Box 3891, FOUNDRY TRADE JOURNAL.

FOUNDRY MANAGER required for medium sized foundry producing Blackheart Malleable Iron and Grey Iron Castings. Applicant should be fully experienced and have the necessary technical knowledge to control all branches of the foundry.—Please reply, giving full particulars of past experience and salary required, to Box 3912, FOUNDRY TRADE JOURNAL.

ENGINEER required as head of Production Control office. Foundry, drawing office and production control experience essential; A.M.I.Prod.E. or equivalent; age 30 to 40. Must possess initiative, drive and organising ability. Excellent prospects. Superannuation scheme. First-class canteen and welfare facilities.—State age, education, qualifications, experience, and salary required, to Box ER114, FOUNDRY TRADE JOURNAL.

FOUNDRY SUPERINTENDENT, with all-round production experience, used to operating mechanised moulding unit. Fully conversant with both grey iron and alloy iron automotive castings of all descriptions. Must have a thorough knowledge of core-making as well as light and heavy moulding, also cupola practice. Present daily melt 60 tons. First-class conditions, offering permanent position, superannuated. Foundry situate North Midlands.—Box 3916, FOUNDRY TRADE JOURNAL.

THE MOND NICKEL COMPANY invites applications from ENGINEERS and METALLURGISTS for a post in Johannesburg in connection with the technical development of nickel-containing materials in South Africa and the Rhodesias. Applicants should have University degree or equivalent and industrial experience in the uses of ferrous and non-ferrous materials. Candidate appointed would be eligible for membership of the Company's non-contributory pension scheme.—Apply, stating age, qualifications and salary required, to MANAGER, Development and Research Department, The Mond Nickel Co., Ltd., Sunderland House, Curzon Street, London, W.1. Mark envelope "Confidential D.26."

SITUATIONS VACANT—*contd.*

METALLURGIST-CHEMIST required for Foundry in East Anglia. Applicant requires knowledge of modern cupola practice, sand control, etc. Position offers wide scope for interest and enterprise, as range of products is wide and covers various finishes. Commencing salary up to £800 a year, according to experience and ability to cover company's various activities.—Box MC107, FOUNDRY TRADE JOURNAL.

LABORATORY ASSISTANT required by Metallurgical Department attached to large non-ferrous alloy foundries in the London area. A man with foundry experience will be preferred.—Write, giving full particulars, to Box LA108, FOUNDRY TRADE JOURNAL.

FACTORY SUPERINTENDENT required, West of Scotland. Pipefounders and Engineers require Practical Qualified Engineering Superintendent of New Factory, comprising Foundry and Machine Shop, employing 150 men. Applicant must be engineer of good character and education; strong and fair, with floor management experience. Aged 30/36. Salary: £900, plus pension contributions, and house.—Applications, which will be treated in confidence, write to 02X2, WM. PORTEOUS & Co., Glasgow.

MACHINERY WANTED

WANTED—Laboratory Sand Mill or Mixer with 5 to 10 lb. capacity. Apply: The Purchasing Department, Parkinson Stove Co. Ltd., Stechford, Birmingham, 9.

WANTED.—Wheelabrator, size 27 in. by 36 in., or similar tumblast, or shot blast barrel.—Box WW104, FOUNDRY TRADE JOURNAL.

WANTED.—Pneumatic or Hand Runner Bush Maker. Coleman preferred.—ERIFO, LTD., Erith, Kent.

WANTED.—Secondhand Rotary Dryer, for sand or swarf. Capacity ½ to 1 ton per hour. Oil or coke fired.—Box 3928, FOUNDRY TRADE JOURNAL.

WANTED.—Drop Bottom Cupola. 3 ft. 6 in. dia. inside shell. 17 ft. from floor to bottom of charging hole. Spark Arrester, Fans and Motor, 400 volts, 3-phase, 50 cycles.—Box 3926, FOUNDRY TRADE JOURNAL.

PORTABLE Coke-fired Mould Dryer Wanted. Give particulars and price.—Box PC106, FOUNDRY TRADE JOURNAL.

WANTED.—Izod Testing Machine, with or without notch miller.—Box 3913, FOUNDRY TRADE JOURNAL.

WANTED—10 to 15 cwt. Steel Electric Induction Furnace—Box 3898, FOUNDRY TRADE JOURNAL.

MACHINERY FOR SALE

FOR SALE—1 20-in. dia. Cupola complete with motor control gear and blower; spare set of bricks for lining, together with charging platform size 20 ft. × 12 ft. approx., gantry and electric hoist block and bucket, etc. A complete installation in first class condition. Apply: H. & E. LINTOTT, LTD., Horsham, Sussex.

MACHINERY FOR SALE—*contd.*

HAND OVERHEAD TRAVELLING CRANES. 1 to 5 ton. Fitted with Electric Hoist if required. All spans from stock.—

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SHELL Moulding Unit, Single Station, size 16 in. by 12 in. Very little used. £235.—RICHARDS, LTD., Phoenix Works, Leicester.

"MINOR" Sand Rammer, by Foundry Equipment, Ltd. Very little used, and in perfect condition. Complete with spare parts.—MORRIS MOTORS, LTD., Engines Branch, Wellingborough.

ONE only 46-in. diameter Pan Coggan "Rocket" Sand Mixer Miller. Motorised, 400 volts, 3-phase.
Four 30-cwt. Morris Hand Operated Chain Hoists, with Trolleys.
One 5-ton, Underslung, Hand Operated Crane Crab.
R. H. BOOTH & SON, West Brampton, Newcastle, Staffs. Telephone: Newcastle 67187.

NO. 2½ Size, ton per hour, Cupolette, with Drop Bottom. Complete with motor-driven Fan, 400 volts. Steel girder section loading Platform, with steps; all complete. Used only 4 weeks since brand new. Cost £280; accept £125.—MACHINERY SUPPLIES, 20, Brazennose Street, Manchester, 2. Tel.: Deansgate 3118.

No. 1 TITAN CORE SAND MIXER. 7 cwts. per hr. 3 h.p. Practically new. Cost £168 10s.; price £138.
MORRIS SCREENARATOR FOR RIDDLING SAND. Capacity 1,500 lbs. per minute. 3 h.p. Almost new condition. Cost £297: price £250.
BAND SAW FOR ALUMINIUM. 2 h.p. £20.
BUFFING MACHINE. 2 h.p. £10.
BUFFING MACHINE. 3 h.p. £15.
All suitable for 440/3/50 supply.
Two 10-ft. MORRIS BALL-BEARING ROLLER CONVEYORS. 18 in. by 2½ in. dia. rollers; 4 in. centres. Almost new. Cost £47; price £30.

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THREE 260-c.f.m., Broom & Wade. 4-cylinder watercooled; 100 lb. w.p. Arranged "V" belt driven from 50/55-h.p. Mawdsley S/R Motor, 400/3/50, with Ellison control gear.
Two 80-c.f.m., Reavell. Vert., twin cyl., watercooled, 100 lb. w.p.; "V" belt driven from 25-h.p. S/R Motor, 400/3/50, with stator/rotor Starter.

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

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NEW Centre Axis Tilting Furnace. 600 lbs. Oil-fired, with Morgan Oil Burner and new Keith Blackman A.C. Blower. £375.
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Over 40 Bale-Out Furnaces in stock, cheap.
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LABORATORY Fume Cupboard, with double chamber, made by George Becker. Unused.
0-1,200 deg. Centigrade Temperature Indicators. Unused.
Core Oven, 5 ft. by 5 ft. by 3 ft., on stand, 0-500 deg. Centigrade, with two Kent Recorders and Thermo-couples.
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8,000 Fire Bricks, as delivered from the makers. Sizes on application.

H. B. BARNARD & SONS, LTD.
Dudley Port, Tipton, Staffs.

FOR SALE.—100 Sterling Moulding Box Parts. Style D.G., 16¾ in. by 16¾ in. by 7 in. deep; drilled for ¾ in. dia. pins; fitted with two central lifting handles, double lugs and wedge clamp keys. Strongly constructed, and can be used for multiple or two-part work. Price £1 each part.—ARTHUR LYON & Co. (ENGINEERS), LTD., Park Works, Stamford, Lincs.

NEW D.S.S.3 Moulding Machines, B.I.C.C. Frame size for boxes 22 in. by 15 in. Adjustable draw up to 6 in. Four identical machines unused and as delivered from maker's works.
ONE only Mercury Arc Rectifier. 400/440 volts, 3-phase, 50 cycles, with full equipment for operation of above machines.
100 only MOULDING BOXES. 22 in. by 15 in. by 4 in., for above.
Write for inspection at our Works to ALEXANDER DUNN, LTD., Uddingston, Glasgow.

NEW FOUNDRY PLANT FOR SALE AT HALF NEW PRICE.

MOTORISED Bandsaw. 3 ft. size.
New small Sand Mixer. Motorised.
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Two new and unused Cupolas. 31 in. diameter and 36 in. diameter, with new blowing fans and linings.
New Bridges electric suspended Sieve.
Four new Osborne Moulding Machines. Jolt Squeeze type.
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New Tilghman 36 in. Shotblast Barrel Plant.
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"SAND WIZARD" Shot Blast Machine for Sale. Barrel size, 44 in. by 40 in. Electric, 400 volts, 3-phase, 50 cycles. Machine almost new and in excellent condition, complete with sack-type dust extraction plant. Offers.—Box SW109, FOUNDRY TRADE JOURNAL.

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AIR COMPRESSORS.

600 C.F.M., BROOM & WADE. Vert., 4-cyl., 10 in. by 12 in. str., 310 r.p.m.; belt driven.
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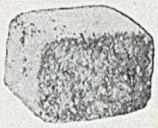

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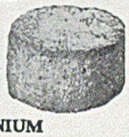

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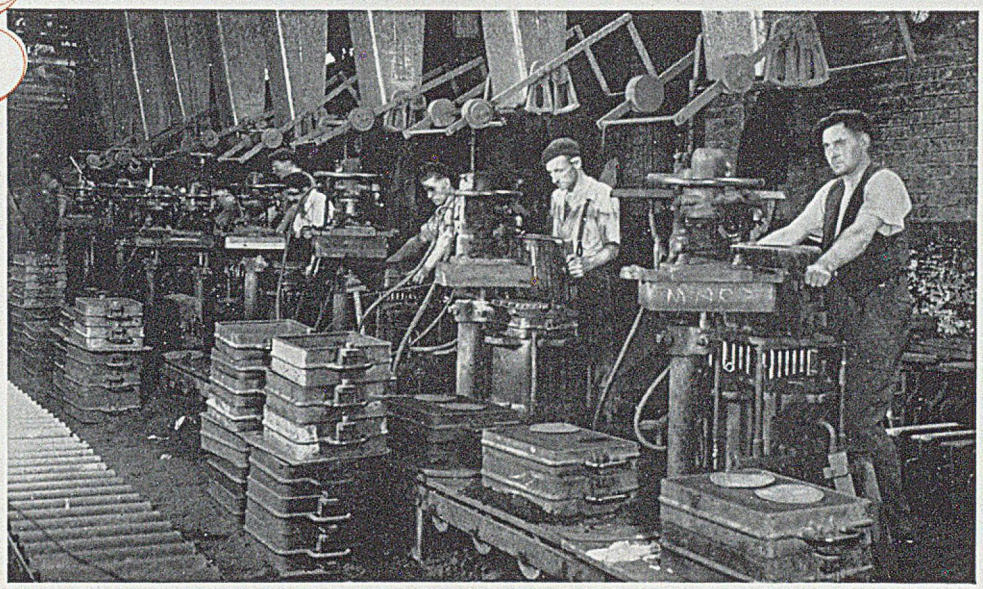

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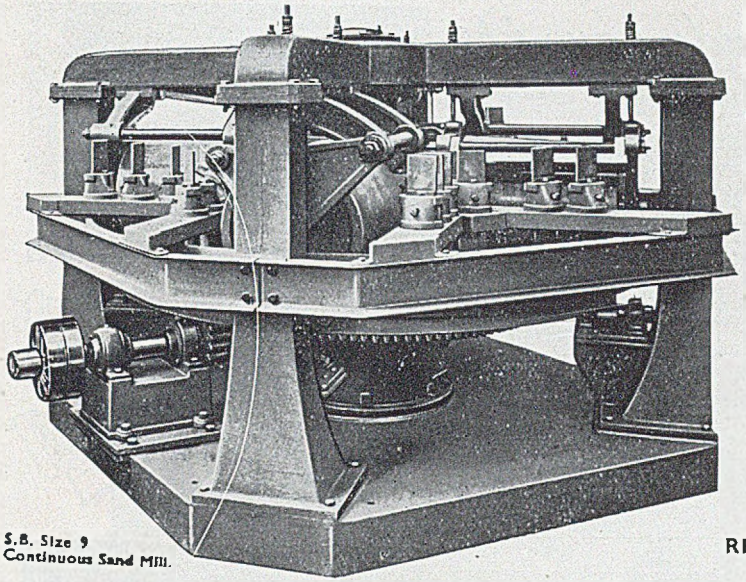

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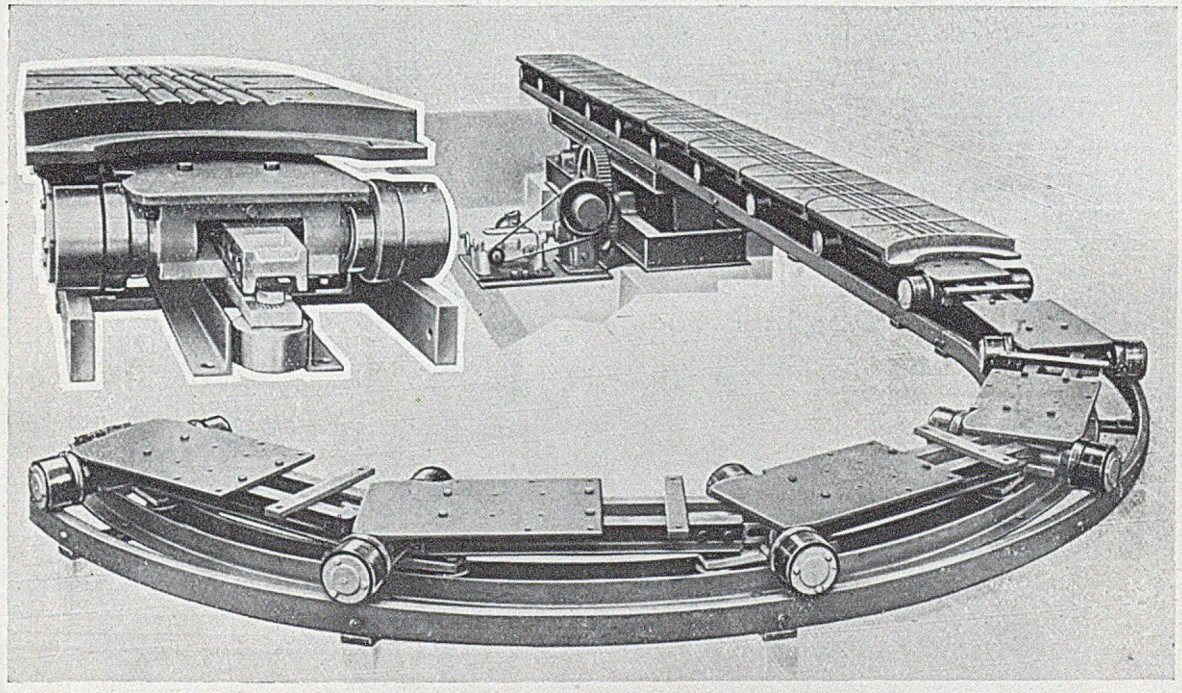

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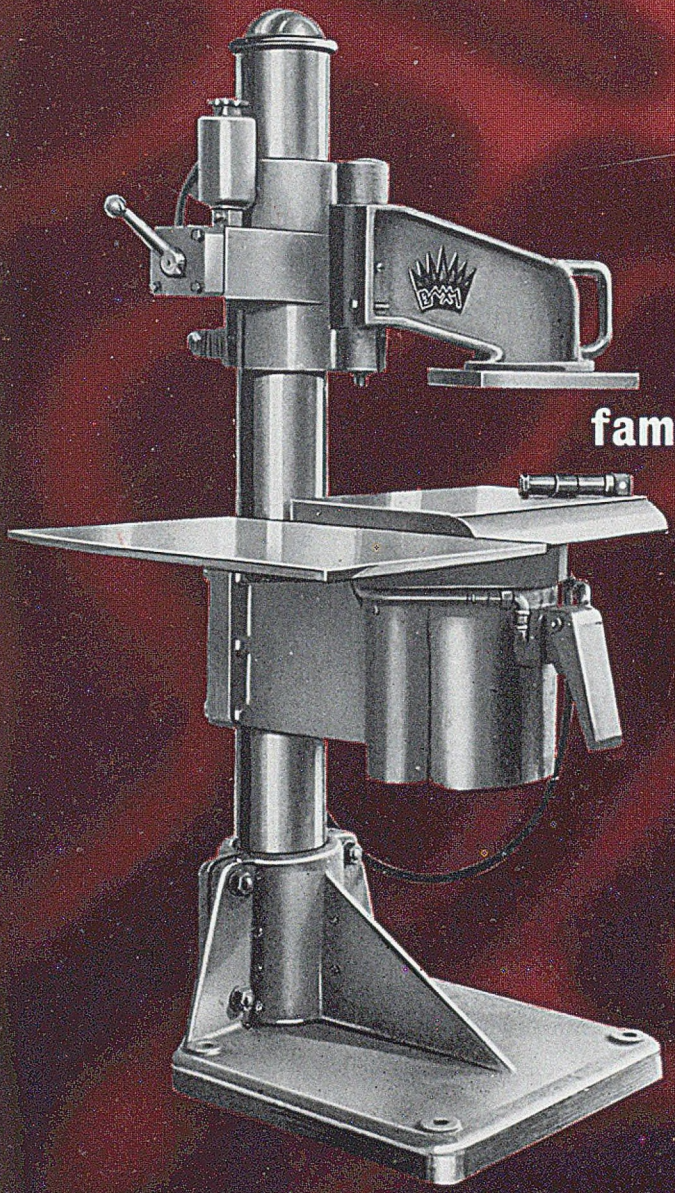

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