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JUNE 18, 1953
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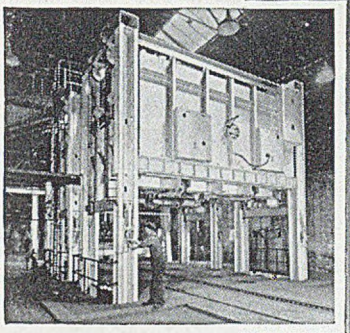
Single Copy, 9d. By Post 11d. Annual Subscription, Home 40/-, Abroad 45/- (Prepaid)

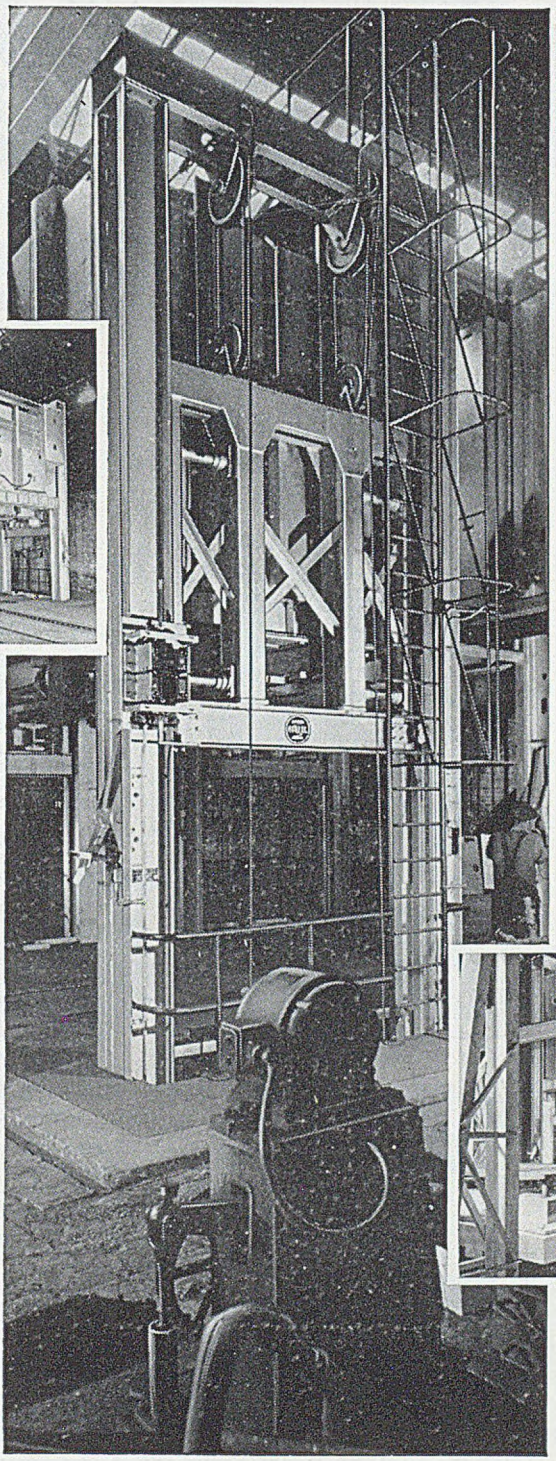
MOULDING SANDS

SILICA SANDS

BIRLEC

gaseous blackheart malleable annealing





The Birlec gaseous process of annealing blackheart malleable castings brings, to this branch of the iron-foundry industry, the same advantages that characterise the operation of Birlec whiteheart annealing equipment.

Short (e.g. 48-hrs.) total annealing cycles.

Uniform, predetermined results giving specified mechanical properties.

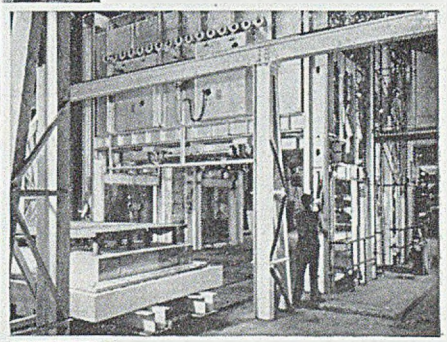
Low operating costs.

Large annealing outputs from small floor space used.

Clean, attractive working conditions.

Further details of Birlec elevator annealing furnaces for both blackheart and whiteheart (including details of comprehensive operating experience) will be readily given on application.

The installation illustrated consists of two elevator furnaces capable of annealing 50-75 tons per week. The annealing cycle consists of both high- and low-temperature operations; one furnace is used for temperatures up to 950°C, and the other up to 750°C. Bogie rails, enable the charges to be transferred from one furnace to the other.



Forty-four elevator furnaces have now been commissioned for annealing whiteheart malleable by the patented Birlec gaseous process.

BIRLEC LIMITED

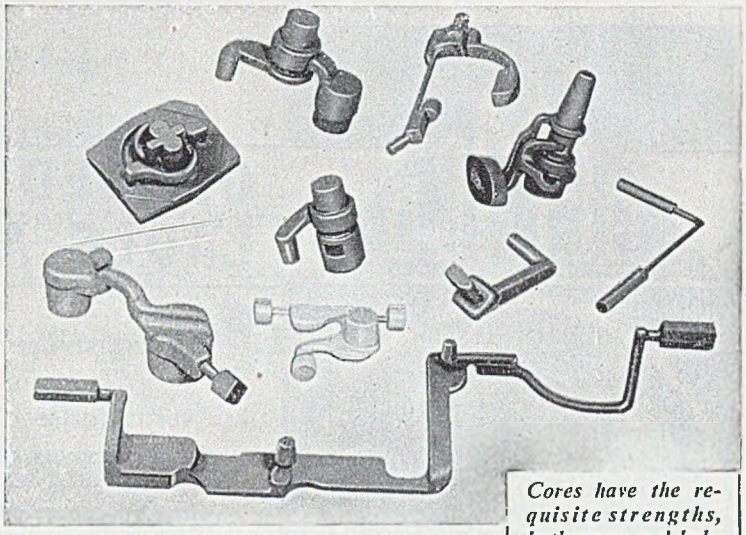
ERDINGTON · BIRMINGHAM · 24

Sales and service offices in LONDON · SHEFFIELD · GLASGOW

sm/b. 905. 53b

A

THE CORE-MIX IS AS GOOD AS ITS BOND



(PHOTO BY COURTESY OF MESSRS. WESTINGHOUSE BRAKE & SIGNAL CO. LTD.)

Cores have the requisite strengths, both green and baked, when the sand is bonded with Glyso, mixed in the Fordath 'New Type' Mixer.

GLYSO Core Bonding Compounds

A RANGE TO MEET EVERY NEED

High green bond, free flowing mix with high baked strength, quick drying without stoving—what are the requirements? The GLYSO range of Core Bonding Compounds provides every characteristic specified in the core-shop. Famed for their substantial contribution to core-making technology, GLYSO binders are widely used in foundries near and far.

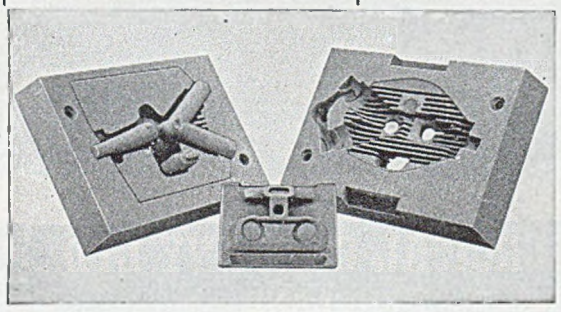
Semi-Solid Compounds give a high green bond covering a wide range of sand characteristics.

Creams combine a lower green bond and free-flowing mix with high baked strength; unsurpassed for core-blowing mixtures.

Dark Compounds provide a lower priced range giving excellent results for general work.

Permol Core Oils are in seven grades, selection being governed by relating dried strength requirements to binder cost. Permol bonded cores have good knock-out after casting.

Intricacy and accuracy with Glyso in the sand mix for this mould and core assembly.



(PHOTO BY COURTESY OF MESSRS. CENTRAL FOUNDRY CO. LTD.)

Glyso XL Core Powder, a pure film-dried cereal, produces high green strength in the mix and is best used with Permol Core Oil.

Glyso — Exol Core Powders, a range of cereal powders impregnated with core oil in accurate quantities for different classes of core work.

Glyso Airbond, quick drying without stoving, or stove-dried in half the usual time.

Glyso Resyns. A range of synthetic resin binders for quicker drying of cores by short-period stoving, or by dielectric heating. Excellent knock-out. Enquire also about Glyso Spray Oils, Fordavol, Fordath Parting Powder, Fordath Moulding Sand Regenerator and Fordath Paint Powders.

Make certain that the right binder is used for every job in the shop.

GLYSO CORE BINDERS

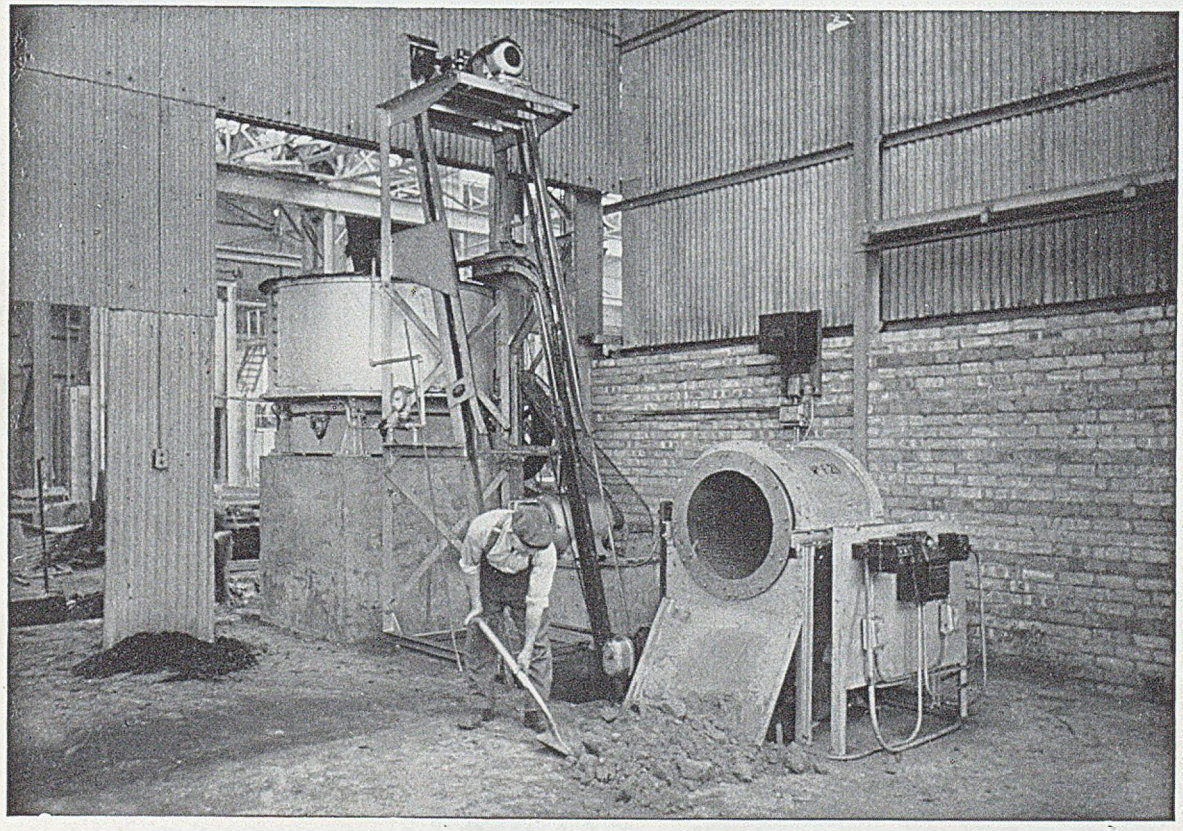
Full details obtainable from,

THE FORDATH ENGINEERING CO. LTD.
HAMBLET WORKS, WEST BROMWICH
STAFFS.

PHONE: *West Bromwich 0549, 0540, 1692*
GRAMS: *Metallical, West Bromwich*

PNEULEC *facing sand plant unit*

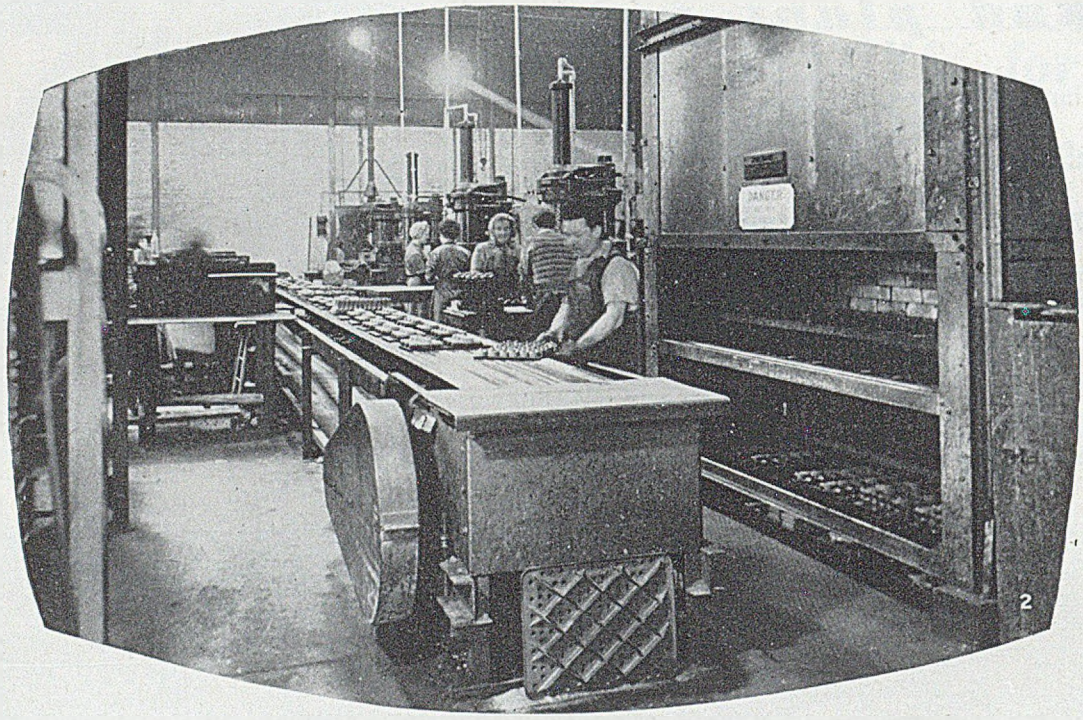
The illustration shows our facing sand plant unit which includes shovel fed rotary screen, collecting belt conveyor, magnetic pulley, loader and 6ft. 0in. diameter mill with disintegrator. The recommended batch capacity of the plant for facing is 6 cwts. and the normal batch cycle 6 minutes. This is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



Built in England by

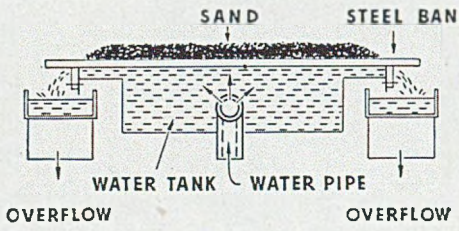
PNEULEC LIMITED, SMETHWICK, Nr. BIRMINGHAM

MODERNISE YOUR CORE SHOP . . .

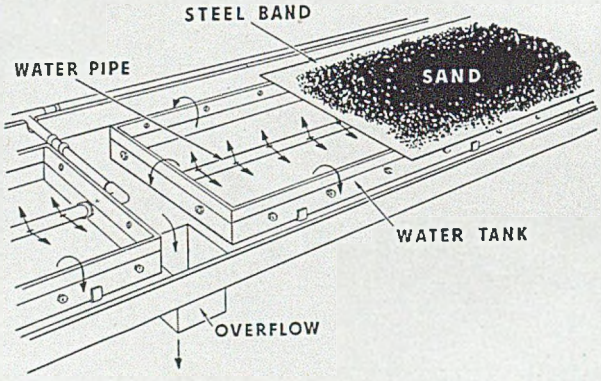


This photograph shows one of our many conveyors conveying cores from the benches to the drying stove.

WITH STEEL BAND CONVEYORS



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



SSBC

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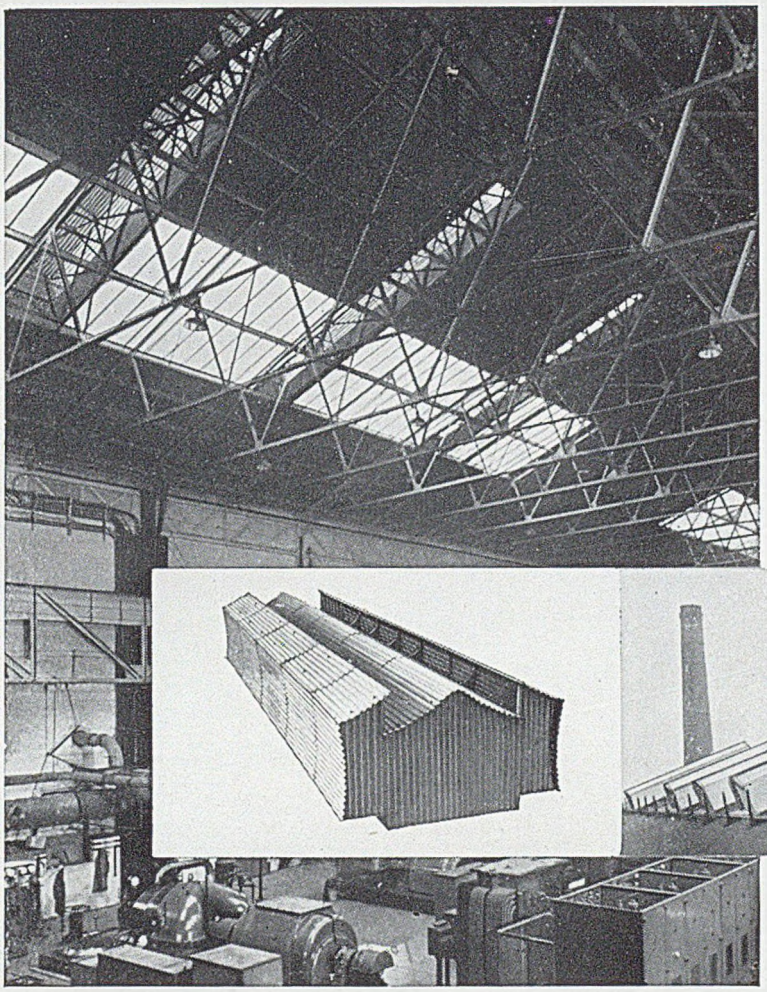
B.F.T. Division

DAWLISH ROAD, SELLY OAK, BIRMINGHAM, 29

Telephone: SELly Oak 1113-4-5 *Telegrams: Simplicity, Birmingham*



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ABOUT
VENTILATION
—WHATEVER
YOU DO

Colt continuous S.R. Ventilators have a powerful extracting action. They can be fitted to any pitch of roof and can be made to any length.

At Richard Thomas & Baldwins Ltd. . .

. . . VENTILATION *by* COLT

Extreme heat in the Power House of the Scunthorpe steel plant made working conditions very arduous. So, to improve the ventilation, Colt were consulted. On the same day, the Colt representative flew to Scunthorpe, in the aeroplane kept by the firm for such emergencies, and examined the problem. The subsequent recommendations made were accepted and Colt Continuous S.R. Ventilators were installed. Another ventilation problem was solved to the satisfaction of Management and worker alike. The roof, the Ventilators and the clear working atmosphere are shown in the accompanying illustrations. Colt have had many years' experience of solving ventilation problems of all kinds. Installations can be made without structural alterations and without interfering with production. A wide range of standard ventilating units is made. **Please send for free manual giving full specifications to Dept. G·7/299.**

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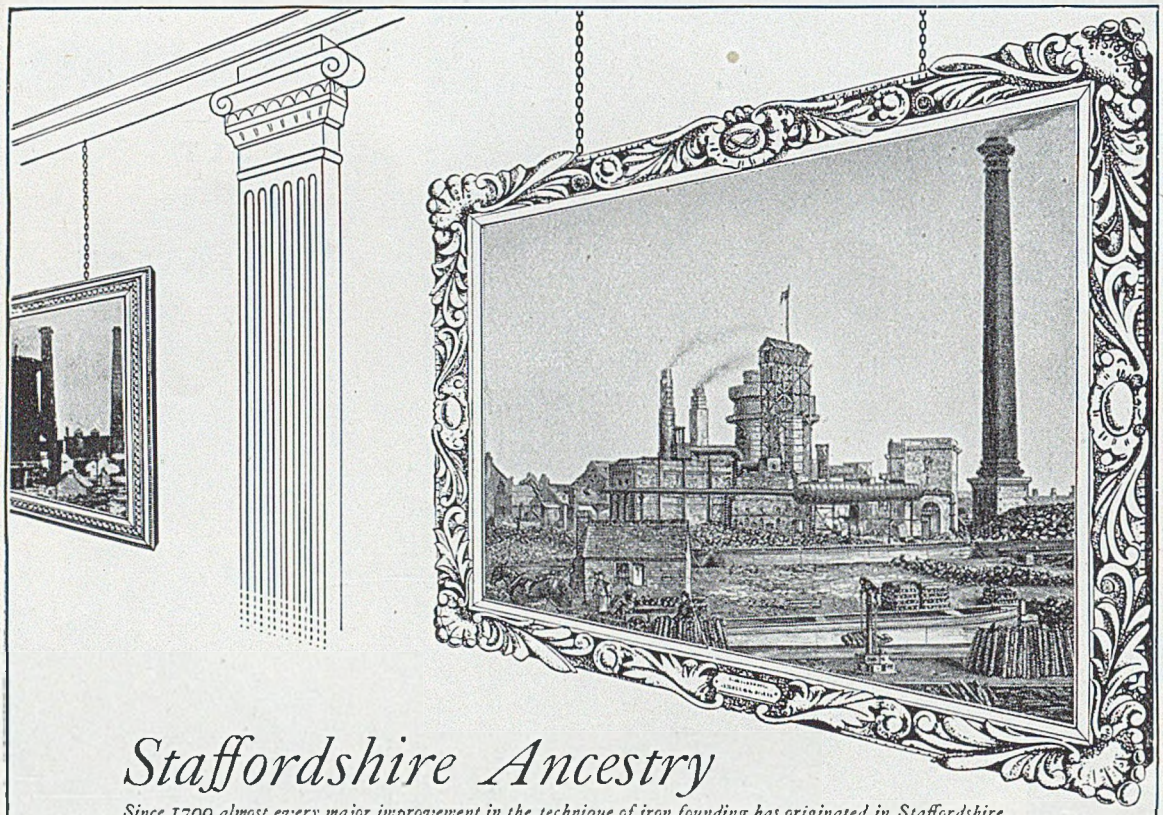
Also at Birmingham, Bradford, Bristol, Cowbridge (Glam.), Dublin, Edinburgh, Liverpool, Manchester, Newcastle-on-Tyne, Sheffield and Warwick.

G. 7



Staffordshire Ancestry

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

No. 4. THE DARLASTON STEEL AND IRON WORKS

The foundry, originally Bills and Mills, was established in 1814. On the death of the partners, it was taken over by those famous Ironmasters, the Lloyds of Wednesbury who, by their endeavours, contributed towards the expansion of Industrial England in the nineteenth century.

The years that have passed since those humble days of 1814 have slowly matured something beyond and above the paraphernalia of technical and scientific progress ..... Staffordshire craftsmanship ..... an inborn skill and knowledge, a keener eye, a surer hand. A rich legacy from our Staffordshire Ancestry.

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

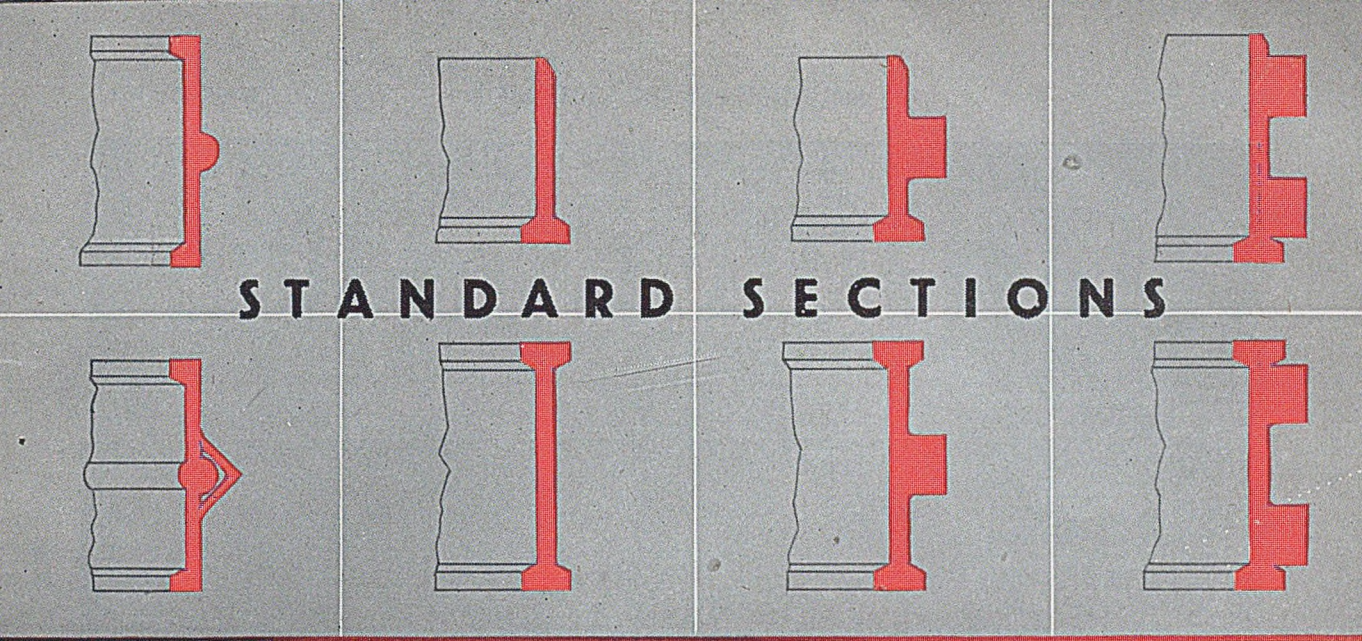
• *Pictorial reference is reproduced by courtesy of the publishers of Samuel Griffiths' "Guide to the Iron Trade of Great Britain" to whom grateful acknowledgment is made.*

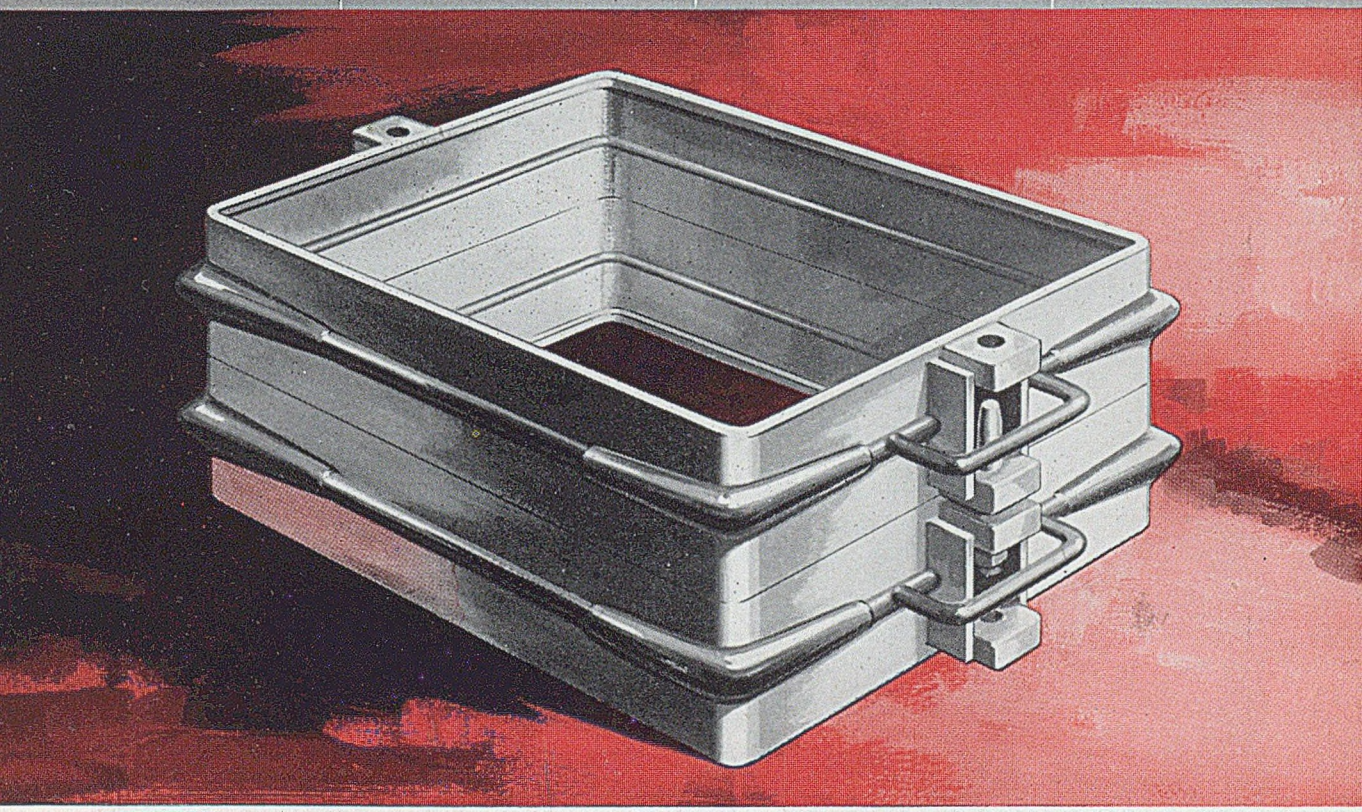
Bradley & Foster LIMITED

FOR QUALITY CONTROLLED
REFINED PIG IRON

DARLASTON · STAFFORDSHIRE

L.G.B.





Sterling rolled steel sections in standard use.

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Customers can depend on all repeat orders being interchangeable.

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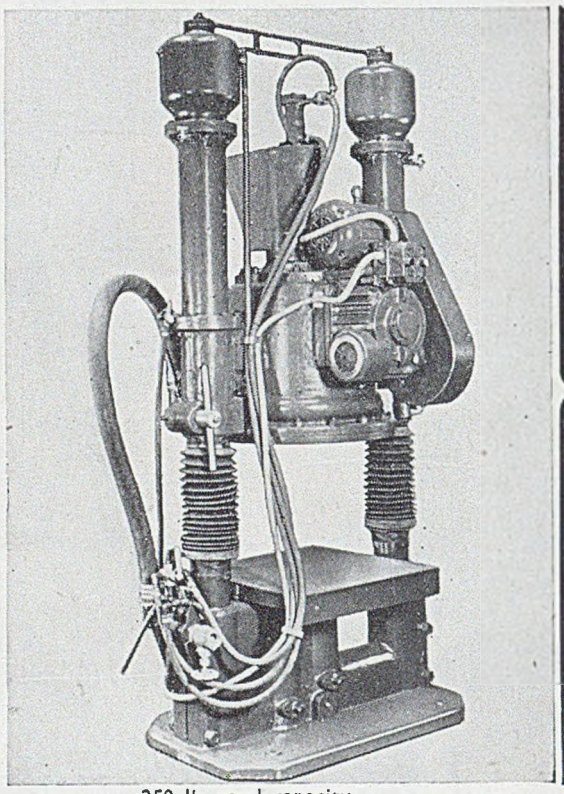
Cogent



250 lb. sand capacity

PRODUCTION FROM *One*

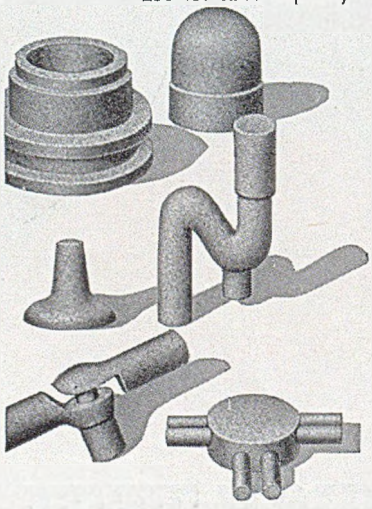
TITAN MACHINE EQUALS

THE OUTPUT OF *Ten* SKILLED

HAND CORE MAKERS

TITAN

CORE BLOWING MACHINES



can produce better quality cores in a wider range of sizes and types than any other machine on the market, and in mechanical efficiency, reliability, ease of operation and low maintenance costs they are unsurpassed.

THE CONSTRUCTIONAL ENGINEERING Co LTD

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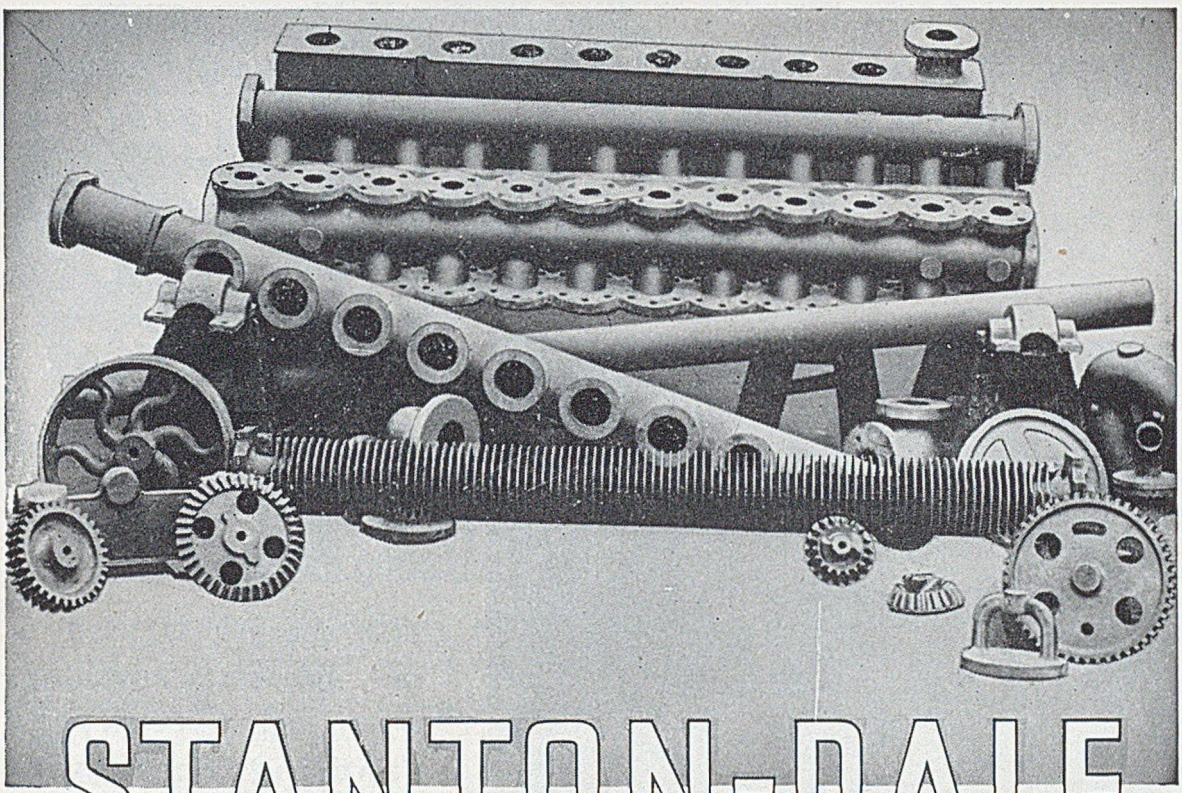
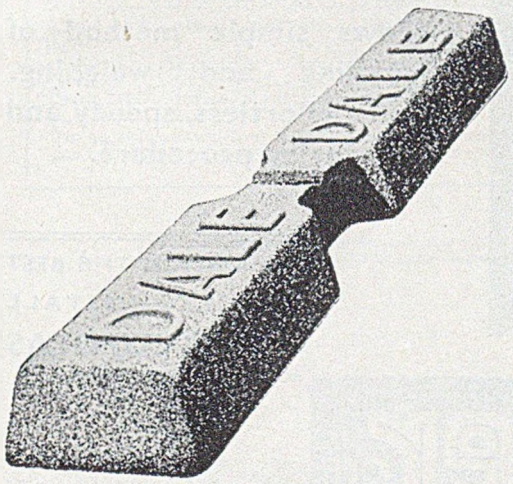


STANTON-DALE



REFINED PIG IRON

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

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

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

PROMPT DELIVERY

THE STANTON IRONWORKS COMPANY LIMITED NEAR NOTTINGHAM

Latest designs of mains frequency core type

Induction Melting Furnaces

for normal and special irons

The furnace can melt cold charges or be fed with molten metal previously melted in a cupola. In either case, alloying additions can be made to produce high duty irons, the mechanical motion of the bath ensuring complete alloying and homogeneity of product. The furnaces are particularly suitable for thin wall castings (automobile cylinder blocks, etc.).

For Normal and Special Cast Irons, standard G.W.B-A. Tagliaferri Furnaces give an output of 140 to 2,000 lbs. per hour. Other data of their performance in relation to cast irons are shown in the panel alongside.

Among the many advantages of the

GWB-A.TAGLIAFERRI furnaces

are the following:—

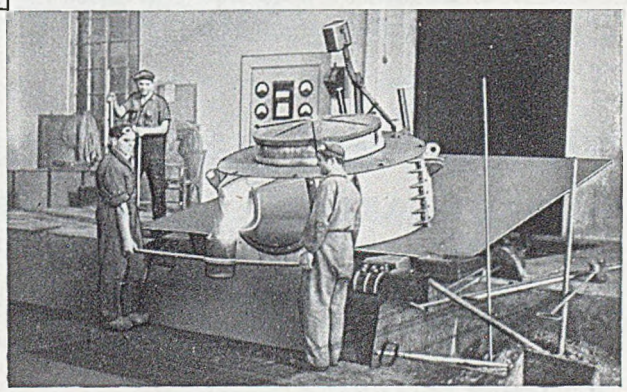
1. Initial starting without using hot metal.
2. Positive metal circulation without turbulence gives maximum refractory life.
3. The refractory lined casing is easily exchanged with the relined spare without removing electrical connections or inductors.
4. Clear indication is given when end of lining life is approaching.
5. Refractory lining of melting duct can be repaired without dismantling the furnace.

Full details of standard units suitable for all normal foundry requirements may be had on request.

Melting Furnaces for Normal and Special Cast Irons

TYPE	G 50	G 100	G 150	G 200	G 300	G 400	G 500
CAPACITY LBS. TOTAL	550	990	1760	3300	4400	6600	11,000
USEFUL	440	770	1320	2200	3300	4840	8800
RATING kW	37.5	75	110	150	225	300	450
kVA	50	100	150	200	300	400	550
OUTPUT LBS. PER HR.	143	286	396	660	990	1430	1980
CONSUMPTION kWH/TON	558	558	538	508	478	467	437
TILTING METHOD	Hand	Hand	Hydr	Hydr	Hydr	Hydr	Hydr
HOW CONNECTED	1 phase	1 phase	1 phase	3/2 phase	3/2 phase	3/2 phase	3 phase

The above figures which are for cold metal charges are not binding and will vary according to the product and the quality of the metal charged.



Two model G.300 induction furnaces, supplying molten cast-iron to a foundry manufacturing motor-car parts.

Proprietors: Gibbons Bros. Ltd., & Wild-Barfield Electric Furnaces Ltd.

G.W.B. ELECTRIC FURNACES LTD.
Dibdale Works, Dudley, Worcs. Phone: Dudley 4284

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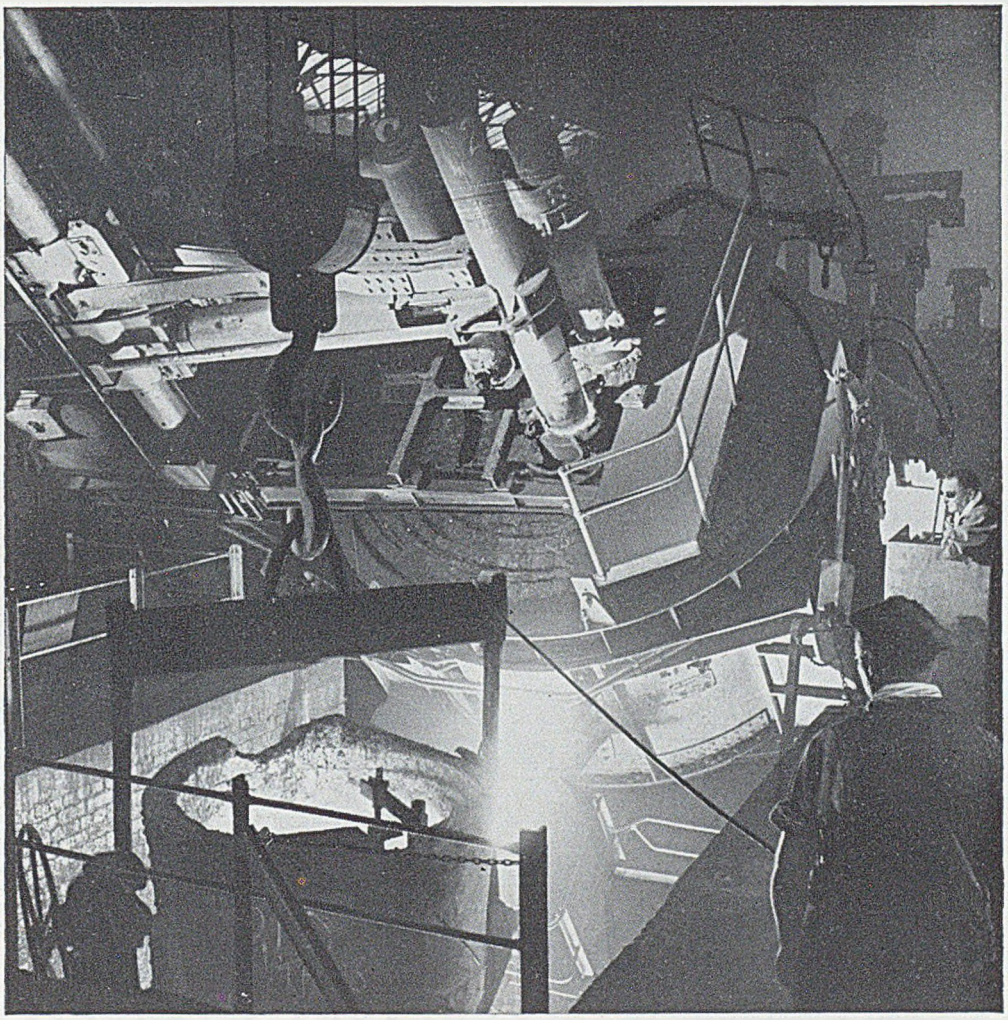

Tapping steel from an electric furnace; Kayser Ellison & Co. Ltd., Sheffield

You may not be a steelmaker, but . . .

. . . . YOU PROBABLY USE STEEL. Electricity has led to the production of better quality steels, and its use for heat treatment of those same steels has led to a better product again. In almost every heating process, in fact, electricity brings better results.

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Your Electricity Board will be glad to advise you on how to use electricity to greater advantage — to save time, money, and materials.

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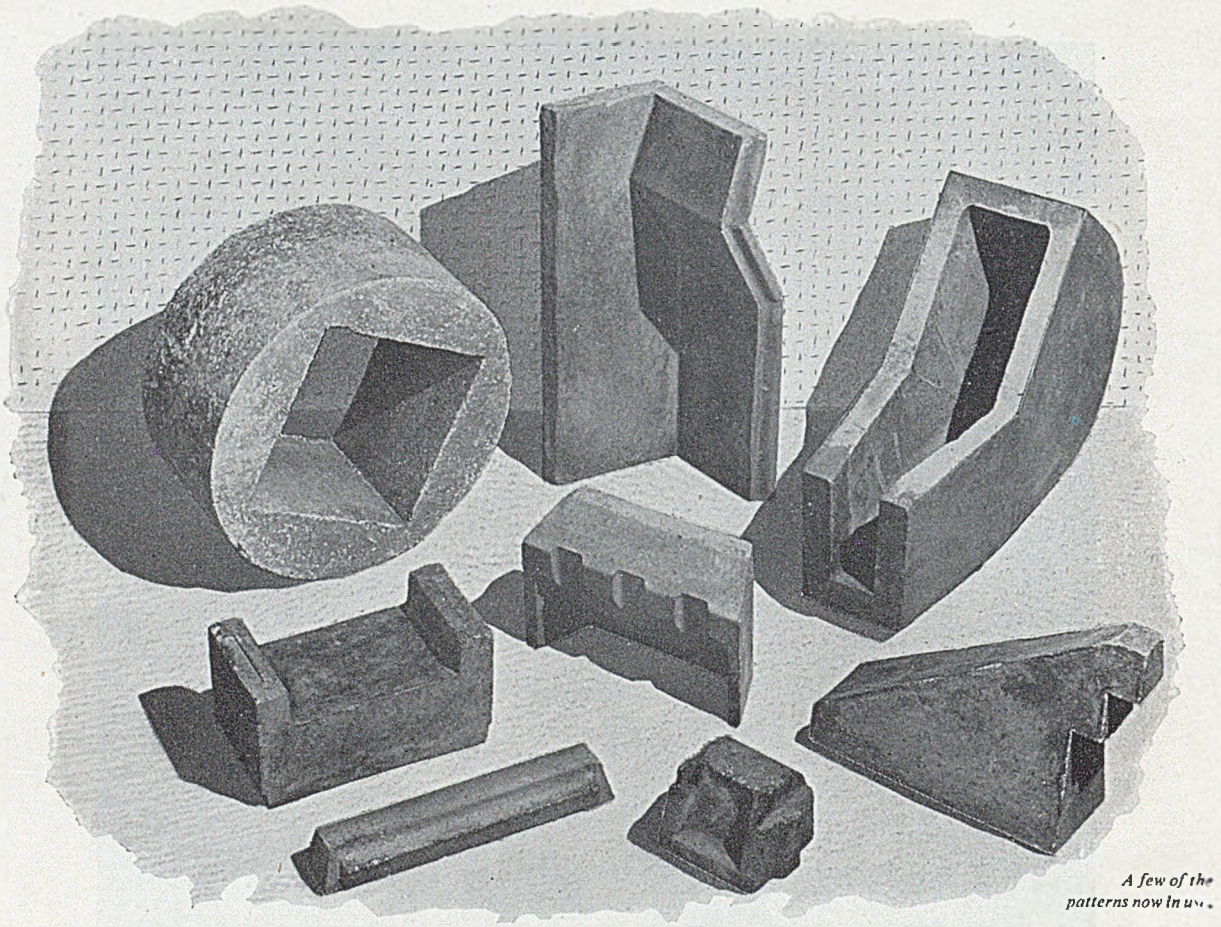

A few of the patterns now in use.

(The sectional firebrick is patented) *Photo by courtesy of Messrs. Fyreside Ltd.*

SPECIAL SHAPES of all sizes and designs quickly made in REFRACTORY CONCRETE

Instead of waiting weeks (and even months) for delivery of specially shaped firebricks, many Engineers cast their own in Refractory Concrete (composed of Ciment Fondu and crushed firebrick).

Refractory Concrete is ready for use and of great strength and hardness within 24 hours, can be cast to any shape, requires no pre-firing, is stable under load up to 1,300°C. and has no appreciable after-contraction.

CIMENT FONDU
Regd Trade Mark
ALUMINOUS CEMENT

Please write for further details and literature.

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By courtesy of C. Shippam Ltd.

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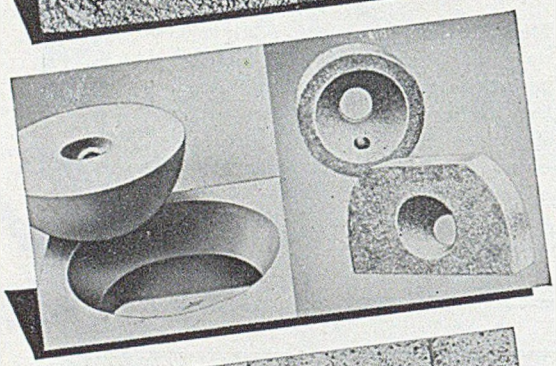
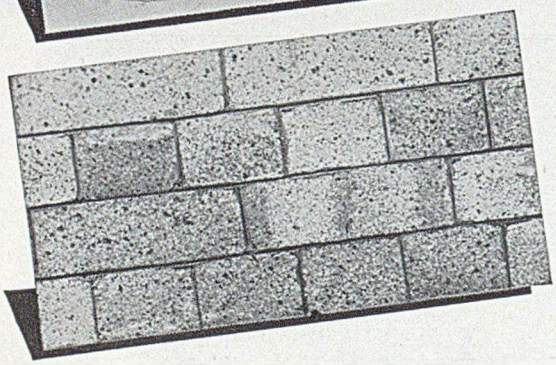
★ *THIN SOUND & STRONG JOINTING*





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Supplied ready mixed for immediate use. Suitable for rammed linings and patching existing Durax No. 1 or firebrick linings. Service temperature range 1300/1650°C.

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For casting in situ and making special shapes. Supplied dry. Special characteristics include—rapid setting as hard as firebrick: pours into position: no permanent volume change: little tendency to spall. Maximum service temperature 1300°C.

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A finely ground air setting cement for jointing all types of firebricks. Supplied dry. Special characteristics include:—produces thin and strong joints: negligible shrinkage: highly refractory: economical in use. Maximum service temperature 1650°C.

★ *Fully descriptive literature on all of these grades of Durax is available on request.*

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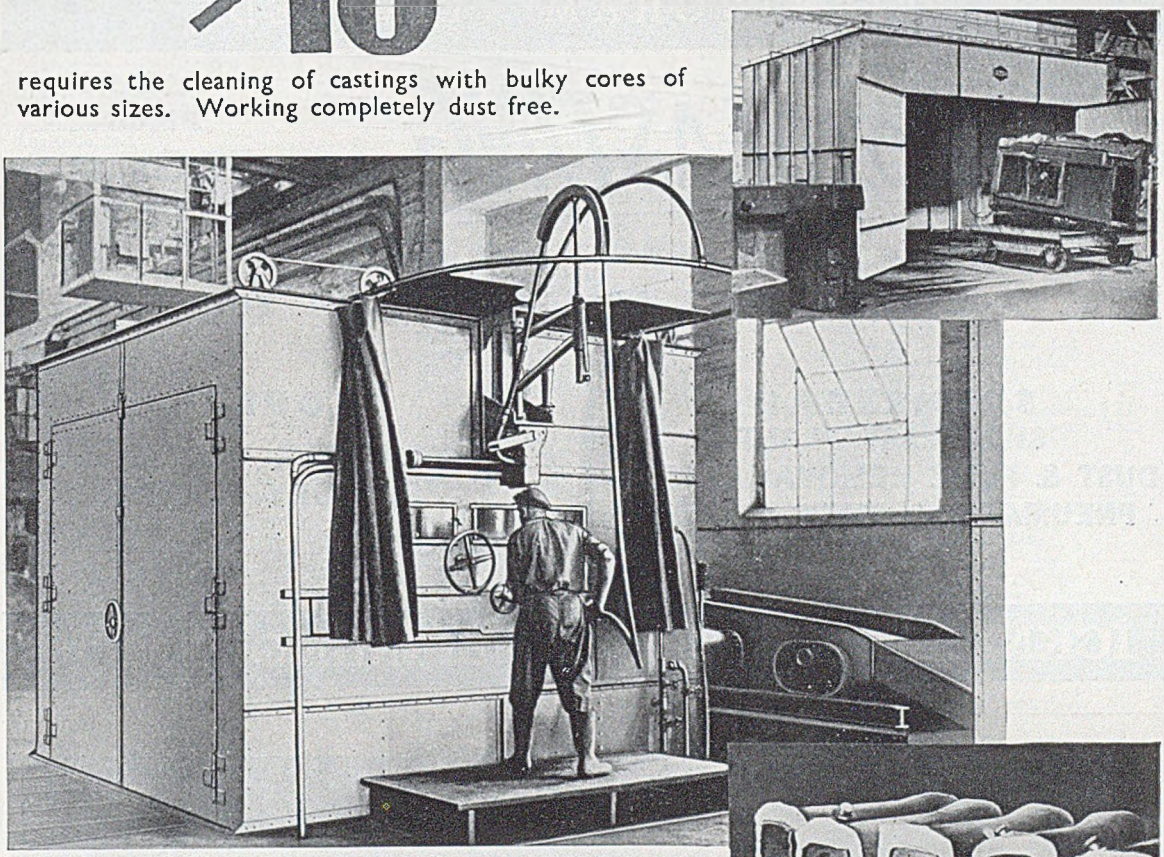
About 1/10 of the working time only

requires the cleaning of castings with bulky cores of various sizes. Working completely dust free.



Hydraulic Fettling Installations

with movable blast pipe for 1,065 — 1,400 lbs./sq. in. and automatic core sand recuperation are perfect plants for decoring and cleaning castings.

Special advantages are: Low water and power consumption, convenient method of working and SIMPLE OPERATION.

WE SUPPLY:

Cupolas, forehearths, charging installations, pig iron breakers, moulding sand preparing machines, moulding sand and foundry refuse reclaiming plants, conveying units and roller paths, continuous mould casting conveyors, vibratory knock-out grates, moulding machines (flaskless), jolt, squeeze and turnover moulding machines, core sand mixing and preparing installations, core moulding machines, core blowing machines, tumbling barrels, centrifugal sand blast machines (air-less), sand blast apparatus, cleaning chambers, hydraulic fettling installations, git cutters, compressors and accessories, dust removal plants, and so on.

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FOUNDRY TRADE JOURNAL
Established 1902
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Unchronicled Records

The Annual Report of the Institute of British Foundrymen modestly follows the usual pattern. It is devoid—as it should be—of any claims to records, yet in income and membership notable increases are announced. The latter at 5,017 (April 20, 1953) does indeed, and on that ground alone, make it rank amongst the most important in the world. At this figure it means the number of members is probably in excess of the number of foundries in the country, yet it is not pleasant to state there are still a number of concerns unrepresented. This, we fear, is often due to remoteness, and we ask such concerns carefully to read the Report (printed elsewhere in this issue) and ask themselves whether or not they can afford to neglect the opportunities open to them.

The prosperity of a technical institute depends entirely on the services it accords to its members. For members of the Institute of British Foundrymen, these services are indeed noteworthy. First there are the great number of extremely useful local meetings, where technology is disseminated to those who need it most—the men actually in charge of day-to-day process control. Next, there are the numerous technical sub-committees, to the work of which a special report is devoted annually. The subjects studied are essentially either severely practical or technical, and very seldom academic. The results of this work are reflected daily in the routine work of almost every foundry concern. Moreover, if there be any special aspect requiring co-operative study, suggestions are invariably welcomed and sympathetically considered.

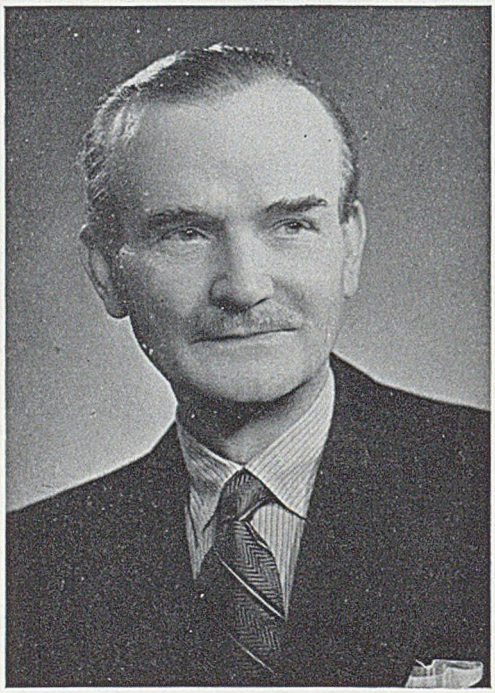
An immense amount of work has been done and is still continuing on educational matters. The examinations conducted by the City and Guilds were of the Institute's creation, and the industry has greatly benefited through the systematic training so afforded. Then, too, the foremen's conferences have had the undoubted effect of revitalizing the interest in their work of many hundreds of men, whose important task is the daily control of labour and production. It will be noted that other activities include: the initiation of standards and their periodic revision; the organization annually of a day devoted to works visits; representation on bodies doing work germane to foundry interests of all kinds and the support accorded to international technical activities. At the back of all this work, there is the major task of disseminating the information to the members, which in itself is a heavy undertaking. So long as the path laid down by five decades of enthusiastic members is zealously followed, the great progress disclosed by the Report will achieve a still more bounteous harvest.

Institute's New President

Mr. E. Longden

Mr. E. Longden, M.I.MECH.E., who was elected this week as president of the Institute of British Foundrymen for the year 1953-54, is one of the most eminent and highly-respected foundrymen in the country.

Mr. Longden received a practical training in the foundries of the British Westinghouse Company, now Metropolitan-Vickers Electrical Company, Limited, Manchester, and acquired a technical education in metallurgy and related subjects at the Manchester College of Technology, followed by studies in economics, engineering subjects and works management. He later occupied positions as foundry and pattern-shop manager with Tangyes, Limited, Birmingham, John Hetherington & Sons, Limited, Manchester, and Craven Brothers, Limited, Stockport. A few years ago, he resigned from the post of works manager with David Brown-Jackson & Company, Limited, Salford, to practise as a consulting foundry engineer.



Mr. Longden has carried out much research work on practical foundry matters, and has contributed extensively to foundry technical literature, having presented many papers to the Institute's branches and annual conferences, and to various engineering societies. In 1936, after receiving several diplomas, Mr. Longden was awarded the Oliver Stubbs Gold Medal of the Institute for his researches into liquid shrinkage and solid contraction in cast iron. He was also awarded the British Foundry Medal and cash prize in 1944. He was the Lancashire branch president from 1928 to 1930, and has served on the General Council of the Institute and its committees since 1926. In 1937, he prepared the Institute's official exchange paper to the *Association Technique de Fonderie* (France), and in 1948 he presented the official exchange paper to the American Foundrymen's Congress at Philadelphia.

Mr. Longden has travelled extensively in the United States and European countries. During the second half of 1952, he carried through a United Nations Technical Aid Mission to the Yugoslav foundry industry. He has thus gained much experience in a wide diversity of spheres, so that his opinions on foundry matters are always worth hearing.

Although of quiet disposition, Mr. Longden is a good speaker, whose logical views, particularly on technical matters, are invariably based on first-hand knowledge. His many close friends are confident that the experienced judgment, exceptional sense of duty, and unobtrusive generosity, which have distiguished his career in the foundry industry, will be prominent in his leadership of the Institute during the coming year. His hobbies include gardening, astronomy, and reading good detective stories.

NORMALLY, both the Great Bridge Foundry Company, Limited, and Pattern Crafts, Limited, of Dartmouth Street, West Bromwich, serve the heavy industries, but they have recently received an interesting commission to make castings to be incorporated in replica sets of the Crown jewels and regalia used in the Coronation ceremonial. It is understood that the replicas will "fulfil an important mission in the course of Empire and world tours" that the Queen will make. The reproductions include sections of the Sword of State, the Sceptre with the Cross, Ampullas and Spoons as used in the anointing of the Queen, St. Edward's staff and parts of the maces carried by the sergeants at arms, the spurs and the rod with the dove. All the castings have been made in bronze.

THE LONDON INDUSTRIAL CO-ORDINATING COMMITTEE has arranged a Conference to be held at the Caxton Hall, London, S.W.1, on September 30.

BIRMINGHAM CHAMBER OF COMMERCE has held two meetings at which members were given hints on how to secure increased trade from the dollar markets. The first meeting, on June 12, was addressed by Sir William Rootes, chairman of the Dollar Exports Council and Mr. H. Eccles-Williams, who was a member of the recent mission to five countries in Latin America. The second meeting on June 15 heard from Mr. M. R. Garner, U.K. Trade Commissioner in Ottawa, how exporters could legally surmount the difficulties raised by complex Canadian tariff laws.

Institute of British Foundrymen

Science, Technology and Craftsmanship*

Presidential Address by E. Longden, M.I.Mech.E.

The caption could be re-stated by the motto of the Institute, "Science Hand in Hand with Labour," if one corrects the oft misinterpretation of labour as purely bodily effort instead of exertion by body or mind.

It is of the first importance for an Institute, as with an individual, occasionally to take stock of the present position and possible future developments, or trends. The principal progression over the past 20 yrs. has involved the steady but firm shift of emphasis from the purely practical work and art of founding to the scientific, technical and engineering aspects of casting manufacture. Trends indicate an intensification of these phases. This acceleration of interest in the scientific and technical possibilities of improving industrial efficiency, undoubtedly is partly a by-product of the late war, however much one may deplore its ghastliness and negation of Christian love and compassion, which are masked, or conveniently forgotten, during a combat for physical survival.

The most convincing justification for the existence of a technical institute is clearly revealed in the types of men it attracts and from whom there is, naturally, a corresponding flow of work, which inevitably follows if facilities are available. If we find, as we surely do, that the impact of their efforts on the progress of the foundry industry is considerable, it may be concluded that the nation is directly benefited—the result of a desire for better things and a more prosperous future.

Strata of Membership

The membership of the Institute is diverse in its make-up and the variety of its interests and problems would appear to be greater than those of other technical bodies catering for the needs of industry. Seen operating are the collective efforts of an excellent cross-section of scientific and technical workers, ranging from highly-skilled craftsmen to the most eminent of scientists. What attraction there is in a grain of sand, or a crystal of metal!

It is said that modern civilization is constructed around the use of mechanical power. And yet, in spite of the remarkable metallurgical progress witnessed during the past two decades, it is still the properties of metals and their soundness which limits the efficiencies and outputs of various kinds of equipment. Metallurgical solutions invariably follow the need for still more reliable material to meet the constantly-improving mechanism conceived by designers. In other words—"necessity is the mother of invention." This is well exemplified in the development of metals to withstand the exacting thermal conditions experienced in the operation of the jet engine. We are for ever searching and encountering perplexities to be overcome in the use of metals. Therefore, an interpretation which reduces scientific discovery to workable technique yields all that is useful.

Human Limitations

Progress continues and solutions are reached, but we so often fail from imperfect terminology, human weakness, lack of understanding, and the reluctant co-operation between the craftsman and the scientist. Of the possible number of solutions, the most remote one may be the answer sought, or a step leading to other steps in the structure of clear understanding, but, in the meantime, we are compelled to bear the frustration of false tracks. Yet, on the other hand, there is often quite evident difficulty in seeing something right under our noses and we continue to worry our heads about some remote and involved solution of a problem. Of a great accumulation of scientific knowledge, much is not being used correctly, or at all, by the operative craftsman. On the other hand, there is failure on the part of certain scientists to understand production procedure and the parochial-mindedness of workers. It is necessary for the scientist and technologist to teach and elaborate understanding of that which is inefficiently practised, with a view to its improvement and also of that which is new in knowledge and discovery. In imparting a better understanding of either old or new knowledge, simplicity in expression and arrangement will yield the most speedy and satisfactory results. From this it must not be assumed that the shortest solutions, or explanations, are always the clearest way to a workable understanding of things.

As an Institute, we are fortunate in the co-operation given by so many eminent scientists and technologists who have added lustre to the science of metallurgy and complementary sciences generally, but specially to the metallurgy of cast metals. They have made important discoveries, they have endeavoured to establish scientific principles on a logical and practical basis, but, as with all true scientists, they would not claim to be certain about anything, or that they have built on immovable foundations. In physics, it may be assumed that an atom which is not radioactive is stable until a physicist decides otherwise. The true scientist inevitably develops a broad view of things. Thus, there is an ever-broadening horizon and we only increase our sense of the infinite.

* The Address followed the induction of the new president to office on Wednesday this week at the Institute's annual conference in Blackpool.

Science, Technology and Craftsmanship

Future Viewpoint

However, it may be stated with some certainty that the scientists and technologists of a century hence will define things in a more reliable way. In that age they may be amused at our comparative simplicity to-day. This we know from our own experience of the attitude of the present younger generation to just ordinary things. For instance, note their derision when viewing a cinema film showing early models of cars, aeroplanes, or the wearing apparel of their forebears. Far too many take to-day's standards of living and amenities for granted without any deep thought for the pioneers of bygone days. We hear glib expressions by those who think they can create a new and perfect economic state in next-to-no-time and that science can, and will, solve all problems of production and reduce effort to ridiculously low levels. It is very surprising how this idea has developed since the late war among those who, at one time, ridiculed the work and claims put forward by scientists. Nowadays, they do not know the limitations of the scientists. We shall awaken to the need to use more of the old-fashioned elbow-grease, I hope, and to the knowledge that science cannot suddenly take on the burdens of untenable and premature demands. Science, as a source of economic and industrial technique has been practised for only about 130 yrs, and only extensively for about 50 yrs.

Craftsmanship Defined

The meaning of technology and science is more broadly and more frequently defined than that of craftsmanship, but is craftsmanship properly defined? The term "craftsmanship" should mean the skills which are exercised in the production of anything that is necessary for the well-being of a people. The fulfilment of our aims, or needs, can only be accomplished by the use of suitable materials in the manipulation of which art and skills are employed. In this, there is the need for knowledge of the make-up of materials, for creative faculties, resourcefulness and general technical understanding.

Industrial science and technology are concerned with production from A to Z. Thus, their activities merge into those of craftsmanship. No clearly defined dividing line between the industrial scientist and the technologist can be seen, or between the technologist and craftsman, just as there appears to be no clear division between pure science and applied science.

The improvement of craftsmanship depends, to a large extent, on its ability to absorb scientific and technological discoveries and mechanical developments and on a willingness to accept a scientific organization of production. Thus, a combination of experience, technology and science is the key to continued improvement in production and productivity which is the fountain of all material wealth and well-being for all. We are, and must continue more vigorously, developing a new class of skilled worker —I almost would say, a scientifically skilled worker. Science may be described as the systemized arrangement of demonstratable facts relating to the material world. These facts are firm laws which direct and control practical operations. Therefore, art and craftsmanship cannot effectively function without actually carrying out certain scientific principles. So, if the craftsman is made more aware of his dependence on science, one can hope to have more co-operation between the craftsman and the scientist.

Ultimate Aims

There have been revolutionary developments from the times of the individualist worker to the great and complex industrial workshops of to-day, with their machinery, organization and high production rates. It is obvious that this modern craftsmanship, with all its faults, is creating more and more food, clothing and leisure for millions who might otherwise die at an early age from want. It has deferred (but not permanently, if population continues to increase at its present rate) the forecasts of the philosopher and economist T. R. Malthus, who in his essay on the Principles of Population, 1798, stated that "Population tends to increase faster than the means of subsistence." Thus, the urgent need for self-preservation and a better life has caused the craftsman to turn for help to scientific knowledge, that is to the principles of physical and chemical sciences. In this, craftsmanship and science have grown in stature.

The most successful of foundries have based their activities on scientific research and technological endeavour, and have adapted themselves to new sources of knowledge. During the past two decades there has been a great awakening as to the efficient training of scientific and technological leaders. Modern educational facilities are adequate to the needs and an excellent flow of informed men is now being released. I am sure that we in this Institute have always had the greatest admiration for those who, without the advantages of a university or technical-college education, have acquired a knowledge of the scientific aspects of foundry metallurgy and foundry technique, which compares favourably with that of those who have had the more traditional education. It is a quality of education which demands great energy and resourcefulness, that is so frequently absent in many who have had studies made convenient and easy.

Taking Stock

Thus, when we pause to take stock, we realise that we are rich in the collective experience of many trained minds. They are endeavouring to leave as little as possible to chance, although chance may occasionally yield solutions, as well we know from discoveries such as penicillin. I believe it was Pasteur who said "chance favours the prepared mind." The explanation of many things cannot be fully understood until they have been personally experienced and many obstacles can only be effectively dealt with when one approaches them face to face from dire necessity.

To-day there are excellent facilities for learning, if learning be desired. We learn from various sources such as by experience, knowledge and information. In spite of the advances in fundamental knowledge, behaviour in practice is mostly responsible for changes, just as dependable conclusions to reasoning must, in most cases, be proved or supplemented by reliable chemical and mathematical analysis. Thus, it is experience in the workshop and laboratory which creates the most reliable evidence of a permanent nature. It is valuable education through one's work, soundly based on observation and practice and not on unsupported authority. That which recommends a theory is that it works.

INSTITUTE'S TECHNICAL COUNCIL

Our technical competency as an Institute is based on scientific foundations and the interpretation of scientific findings, so that they may be realized in practice, through technical leaders and the skill of craftsmen. In retrospect, there is every reason to find satisfaction in the recorded work of the Institute's Technical Council which, with its technical sub-committees, has poured out a great volume of reliable foundry technical literature, based on the investigations and experience of a splendid cross-section of technological experts. These men, selected from various parts of Britain, are making considerable contributions to the store of foundry knowledge, gained from close contacts with the realities of casting manufacture. This work is of a voluntary nature and cannot be done effectively without painstaking efforts and actual sacrifice of normal leisure, although we deduce from our acquaintance with these men that the work is a source of mental enjoyment, the true mark of the cultured. They have been inoculated with the spirit of experiment, adventure and the fascination of research.

Members of the Technical Council and its sub-committees are largely responsible officials of industrial firms of national and international repute, along with certain representatives of the cast-metals research associations. These enlightened industrial firms are the first to feel the benefits from any scientific and technological research probe or effort. They also realize that they are not only helping themselves, through active representatives, but, indeed, contributing to the general pool of knowledge for the benefit of the foundry industry. Usually, reluctance on the part of a firm to help is an indication of either a Victorian outlook, or that their degree of competence provides little that could be contributed. Just the same, they are receiving the benefits, in many ways, of the technical contributions of the informed firms.

Since the activities of the Technical Committee (subsequently renamed the Technical Council in 1946) started in 1930, investigation and research have covered many representative phases of foundry technique. The result of the work has been recorded in some 36 valuable reports, carrying well on towards a quarter of a million of well-chosen words, elucidated by hundreds of illustrations. At the present time, there are some fifteen separate investigations in progress on various phases of ferrous and non-ferrous foundry metallurgy and practice. This work is spread over about 150 selected technologists. The Institute and the foundry industry are, indeed, much indebted to these men for their expert guidance. From its inception, the activities of the Technical Committee and, later, the Technical Council have been ably directed by its successive chairmen, namely: Mr. J. W. Gardom, Mr. P. A. Russell, and Mr. A. E. Peace, the present chairman, who has held the office for many years.

UNIFICATION OF RESEARCH AND TECHNOLOGY

On investigating the activities of the Technical Council, it is clear that it covers all phases of foundry science, technology and practice, in both ferrous and non-ferrous metals. It is a forum for the co-ordinated study of foundrywork and its product, the casting—not only for an improvement in quality but, also, indirectly to confer the increase in productivity which inevitably follows a reduction of defectives and a more ordered control of manufacture. This co-ordinated effort of the collective experience of experts in all branches of foundrywork sets a standard which might well be emulated by the classical research organizations. A parent research organization for cast metals can be envisaged, the object being: a unification of research into the *common* problems of cast metals and their economic fashioning into castings. There has always appeared to be a common basis of approach from the research level through its technological interpretation right down to its application at the production levels, for all cast metals. All are but too familiar with comments such as " he is used to cast iron; to steel; to brass or bronze, or perhaps aluminium."

So far as the technical and research leaders of the industry are concerned, it is difficult to agree that *too much* specialization is conducive to achieving the best all-round results in practice. There is a motto which runs: " in the land of the blind a one-eyed man is king." Broadly applied, this suggestive sentence is only true of a body, or community of excessive ignorance. For instance, a fully-qualified foundry metallurgist should have a reasonable general knowledge of the origin and manufacture of all metals and a specialized knowledge of cast metals and their behaviour when poured into moulds of various kinds. The properties of a crystal of metal are the basis of the structure of all metals and their mutual study is complementary. It is true that a man may consume his whole life in the study of a single mineral without arriving at the basic " know-how " of its make-up. However, there are so many obvious similarities and so many common denominators in cast metals, for it to appear that unified studies are desirable—a common basis for research.

Common Factors

Take the case of the craftsman moulder, there are so many common factors in the construction of moulds that it has always been a source of wonder why there should be such opposition on the part of so many craftsmen, who have worked in one class

Science, Technology and Craftsmanship

of metal to engage in another class of metal. The industry has so often been compelled to suffer an inadequacy of skilled labour on the ferrous side when, at the same time, the non-ferrous department has been short of orders for castings. A general knowledge of the gating and feeding of all cast metals should form part of the basis of apprentice training. The qualifications of a leader in the foundry should include this general knowledge. The design and volume of liquid-shrinkage feeder gates and heads for steel, malleable iron, aluminium-bronze and light alloys are somewhat similar and their mutual study is helpful. The treatment of these metals could well be studied by those engaged in producing cast iron, especially high-duty and alloy cast iron.

In the last resort, all our efforts are directed to producing more and more and better things for the wellbeing of all. In the United States, the increase in the rate of productivity during the past decade, measured in output per man/hour, is equal to doubling the output in 26 yrs. In 1900, there was one engineer to 250 industrial workers, but to-day there is one to every 60 workers. Chemists have doubled in number in 15 yrs. and physicists in eight years. The number of scientists, technologists and engineers in industrial and government research laboratories is four times as large in 1952 as in 1932. Science and technology are, therefore, the path-finders to industrial efficiency and still more clearly apparent becomes the economic shape of things to come—if the rate of consumption of raw materials does not outstrip natural supplies which may be available in the world.

Finally, industrial research and professional management has paid high dividends. Normally unprogressive firms have been compelled to interest themselves in research to keep up with their naturally research-minded competitors. A wise Government expenditure on scientific research is returned many times in the economic advantages which accrue to the state.

Rolls-Royce Assurance

Reassuring statements about the future of the Rolls-Royce aero engine factories at East Kilbride and Hillington were given on June 10 by a senior official of the firm and by Sir Patrick Dollan, chairman of East Kilbride Development Corporation. Commenting on the report that production of jet aero engines would taper off in a year's time, when Avon engine assembly was completed, Mr. J. D. Pearson, chief executive of the firm, who is visiting Glasgow, said that this possibility had been known for some time. "However," he said, "Rolls-Royce engines are fitted to the Comet II and Comet III, and to the Vickers Viscount, and if the future for these and other British civil aircraft is as bright as we confidently believe, then, to a considerable extent, orders for engines for these aircraft and their successors will replace the reduced orders for engines for the R.A.F." Sir Patrick, who is a director of British European Airways, said that a large number of civil planes now in operation would eventually be replaced by machines powered by Dart engines. The British aircraft industry had more orders on hand to-day than ever before.

Foundry Training in Salop

Shropshire's ironfounding industry—which employs between 5,000 and 6,000 workers—is an industry with a big future, but only five per cent. of local school-leavers go into the ironfounding business. An effort is being made to rectify this low intake into one of the county's key industries, and one possibility is that now-disused foundries may be used to train apprentices.

A principal advocate of the scheme is Mr. J. A. Kirkham, personnel manager of the Sinclair Iron Company, Limited, Ketley, Wellington. He feels that if a central area apprentice-school embracing all local ironfounding firms were set up, entrants to the industry would get a training covering both light and heavy work. The difficulty in the past has been that, at Shrewsbury and the Walker Technical Colleges, foundry practice has been included in the syllabus, but it was found that the number of students wishing to take the courses was insufficient.

Mr. Kirkham maintains that any one of a number of now-disused foundries in the area could be used by the apprentices and could be made ready at a cost of a few hundred pounds. If local firms came into the scheme they could perhaps give the school various small jobs to do with appropriate payment for such work. This system, he thinks, would not only give apprentices a feeling that they were doing something useful and that what work they did would not just be "scrapped," the payment made would help towards the upkeep of the school. As for equipment, the major part of this would probably be given or loaned by the various interested parties.

If such a training scheme came to fruition, the trainee would have one year's schooling to get a grounding in the work. After this he would go for a few months into various local works taking part in the scheme, reporting back to the school from time to time to see if what was learned had been absorbed.

Notes from the Branches

Australian—Victoria

The meeting of the Australian branch (Victoria) of the Institute of British Foundrymen, held at the metallurgy school, Melbourne Technical College on May 7, took the form of a joint meeting at the invitation of the Australian Institute of Metals. A paper, "Low-frequency Heating Units," was given by Mr. R. K. Treloar, of Allmet Industries, which proved of considerable mutual interest. On Wednesday, May 20, branch members paid a visit to army workshops at Broadmeadows.

"Coats Off" Required. The extra effort needed to stabilize the country's economic position is a "coats off" job, Mr. Frank Bradley, president of the West Bromwich, Smethwick and District Manufacturers' Association says in the annual report to be submitted to the Association's annual meeting on June 25. "In spite of what we may think," he writes, "no other country owes us a living. Our future depends on ourselves and on our efforts will the issue be decided." Mr. Bradley states that shortages of materials eased during the past year, and this factor had ceased to be a controlling element in most industries. That the shortages were artificial and caused by stock-piling for security reasons, particularly by the United States, was now only too apparent. The coming year can be looked upon with more confidence, says Mr. Bradley.

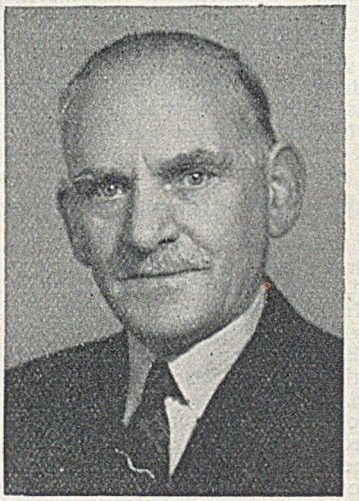
Elected Senior Vice-President

Mr. John Bell

Mr. John Bell, senior vice-president of the Institute of British Foundrymen for the year 1953-54, began his working life as a patternmaker, having served his apprenticeship with Sir William Arrol & Company, Glasgow. His early technical training was obtained at evening classes organized by the Glasgow School Board, and later, at the Royal Technical College. He left the pattern-shop to take up a position as draughtsman with Robert McLaren & Company, Glasgow, and in this position was responsible for the design and installation of the plant required in a foundry having a daily melt of 200 tons. He later became works manager of the same company.

During the 1914-18 war, he laid down a new melting, stamping, and extrusion plant capable of handling 300 tons of brass per week, and in the same plant carried through some work on the extrusion of small (¼-in. bore) tubes in aluminium alloy. After the war, he visited foundries in the United States and Canada, to both of which countries he has since paid quite recent visits, being a member of the British contingent at the recent International Congress.

In 1920, Mr. Bell acquired the business of Albert Smith & Company, of which firm he was for many



years sole partner. He was joined in partnership in 1950 by Mr. Alexander Marshall, a past-president of the Scottish branch of the Institute. Mr. Bell joined the Institute (then the British Foundrymen's Association) in 1917, and was appointed honorary secretary of the Scottish branch in 1923. His predecessor continued in office until December of that year, since which date Mr. Bell has continuously held office. Since his appointment, he has attended every meeting—council, branch, social function, and works visit—held by the Scottish branch, and of course, he has been an *ex-officio* member of the Institute's General Council over the same period. He is also a member of the American Foundrymen's Society.

During the war, Dr. Everest acted as secretary to the Technical Advisory Panel to the Director for Iron Castings in the Ministry of Supply. He is a Fellow of the Institution of Metallurgists, and a member of several other metallurgical institutions both at home and abroad.

Junior Vice-President

Dr. Arthur B. Everest

Dr. Arthur B. Everest, F.I.M., who has been elected junior vice-president for the year 1953-54, was educated at Rugby School. After following a special apprenticeship at the British Thomson-Houston Company, Limited, including periods in the laboratories under the late Mr. W. B. Parker, and short spells in the engineering shops, foundry, and drawing office, he graduated at Birmingham in metallurgy under Prof. T. Turner. Grants from the British Electrical and Allied Manufacturers' Association enabled him to continue his studies, and in 1926 he obtained the degree of Ph.D. for his researches on aluminium in cast iron. He then turned his attention to nickel, and for two years carried out research and development work on nickel cast iron at Birmingham University and local foundries, under arrangements by the International Nickel Company of Canada. Throughout his research, he worked in co-operation with the British Cast Iron Research Association. Dr. Everest joined the newly-formed Bureau of Information on Nickel Limited, in 1928, then an office of Inco, and the following year was transferred to the Development and Research Department of the Mond Nickel Company, when the merger between Mond and Inco took place.

Dr. Everest joined the Institute in 1926, and was president of the London branch in 1937-38. After earlier periods on the General Council, he has, since 1937, been an elected member, and has participated in the work of the Council as a member of the Literary and Awards and other Council committees continuously since that date. In 1932 he was co-opted to the Technical Council, and since then has actively participated in the work of various sub-committees, in several cases, as chairman. Since 1951, he has acted as vice-chairman of the Technical Council. In 1947 he was awarded the Oliver Stubbs Gold Medal.

Over 150 papers on cast iron and allied subjects have been presented by Dr. Everest to the Institute branches, annual and international conferences, several being the official exchange papers. He has travelled extensively abroad, and has also lectured before foundrymen and engineers in many countries; he is well known in the industry throughout Europe and the United States.

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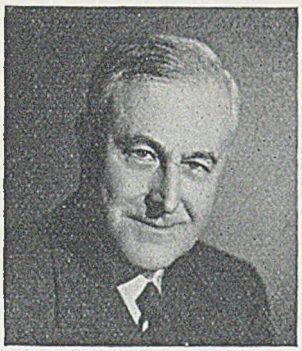
Edward Williams Lecturer

Mr. E. W. Colbeck, M.A., F.I.M., delivered the Edward Williams Lecture at the Annual Conference of the Institute of British Foundrymen at Blackpool on Wednesday. The lecture is printed on the adjoining pages.

Eric Wincarls Colbeck was born in London in 1899, and was educated at Rugby School. On leaving in January, 1918, he became an Officer in the Special Brigade, Royal Engineers, going out to France with the B.E.F. in September, 1918. On the termination of his military service in 1920 he entered Gonville and Caius College, Cambridge, taking the Mechanical Sciences Tripos. He obtained honours with special distinction in engineering chemistry in 1922.

Commencing his metallurgical career as a junior scientific officer in the Metallurgy Department of the National Physical Laboratory under Dr. Walter Rosenhain (1922-1924) he widened his metallurgical experience by becoming technical assistant to the general manager of the Openshaw Works of Sir W. G. Armstrong Whitworth & Company (1924-1928). He



took his M.A. in 1927. In 1928 he joined the Research Department of the Alkali Division of the Imperial Chemical Industries, Limited, Northwich, becoming chief metallurgist to this Division and consulting metallurgist to several other Divisions during the period 1928-1947. Mr. Colbeck was loaned in 1945 to the Department of Atomic Energy, Ministry of Supply, as metallurgical adviser to the director of research, Sir John D. Cockcroft, and the controller of production, Lord Portal. This assignment lasted until the end of 1946. In 1947 he returned to the heavy steel industry, when he became the metallurgical and research director to the Hadfields Group of Companies, of which he is also the director in charge of Hadfields Steels, Limited, and a director of Hadfields Forgings, Limited. Mr. Colbeck is the author of numerous scientific papers on a wide variety of metallurgical subjects. He is a Moulton Medallist of the Institution of Chemical Engineers for his papers on the low temperature properties of ferrous and non-ferrous materials. He is also a founder fellow of the Institution of Metallurgists and was president of that body in 1950.

Mr. Colbeck is also a member of a number of metallurgical committees including British Iron and Steel Research Association Council. He is chairman of the Metals Advisory Committee and a member of the Harwell Power Committee of the Department of Atomic Energy. He has been a member of the Iron and Steel Institute since 1924 and is a member of the Institute of Metals and a number of other British and American metallurgical societies.

Saved from the Scrap Heap

A 10-ton steam roller named "Gertrude," on June 7 trundled on her last journey along roads in the Birmingham district which she helped to make 60 yrs ago. The next day, the roller—as full of ponderous strength and as spotless as the day she was built—stood in the Birmingham Science & Industry Museum in Newhall Street honoured for work done, and saved at the last minute from the scrap heap.

Officially, A.B. 9331, the steam roller was built in 1892 and was the first to be registered in Worcestershire. Two years ago, the roller was rusting away on a roadside near Lichfield. It was there that two steam-engine enthusiasts, Mr. Alfred Kent, of Smethwick, and Mr. Frederick Tapper, of Harborne, found it and asked the owner, a Kidderminster contractor to give it to the museum. With Mr. Thomas Hunt, managing director of an Oldbury foundry, they spent much of their spare time restoring it to its former condition. Between them, on this work they have expended over £1,000.

In a new coat of bright green paint, steel brightly burnished and brassware shining, the roller did the 10-mile run from the foundry to the museum, taking five hours and consuming a hundredweight of coal. At the controls were Mr. Hunt and Mr. Kent, both in overalls, taking "Gertrude" on a last tour of the city including City Road, the making of which was one of her first jobs. "We decided to bring her in ourselves, because we are enthusiastic about anything that uses steam," said Mr. Hunt. "She hasn't given us the least trouble—quite different from the day we first got her when it took us two days to get her from Lichfield to Oldbury.

A.B.B.F. London-area Meeting

Last Thursday, London-area members of the Association of Bronze and Brass Founders met at the Clarendon Hotel, Hammersmith, to hear a talk on shell moulding by Mr. D. N. Buttrey, M.Sc., of Imperial Chemical Industries, Limited (Plastics Division). He took it for granted that his hearers were familiar with the fundamental principles and devoted most of his remarks to the difficulties encountered and the steps to overcome them. For instance, to avoid warping, a large number of mushroom-headed stripping pins were advocated. Again, the colour of the "biscuits" may range from light yellow to chocolate and the best strength is to be had by keeping towards the darker shade. It was a really interesting and instructive lecture.

Latest Foundry Statistics

According to the May Bulletin of the British Iron and Steel Federation, employment in iron foundries again showed a decline. During March the total was 147,931, whilst in April the figure was reduced to 144,805, as against April, 1952, at 155,624. Steel founding, on the other hand, shows a different picture. In April, 1952, total employment stood at 20,282, in March, 1953, it was 20,814, and in April this year 20,868. The average weekly production of liquid steel for pouring into moulds during April was 2,870 as against 3,110 in March and 2,490 in April last year.

Mr. G. W. Robinson, of 47, Ullswater Avenue, Acklam, Middlesbrough, has been appointed to represent Jenolite, Limited, in the north-eastern area.

I.B.F. Edward Williams Lecture

Aspects of Nuclear Fission of Interest to Foundrymen and Metallurgists

By E. W. Colbeck, M.A., F.I.M.

Introduction

I greatly appreciate the honour which your president and Council have done me in their invitation to present the Edward Williams lecture this year, and have chosen as my subject, "Aspects of Nuclear Fission of interest to Foundrymen and Metallurgists." I believe and hope that this is the type of subject which the founder of these lectures had in mind when in 1935 he first inaugurated the series.

It has been said that a new era in warfare was opened that August day in 1945 when the first atomic bomb was exploded above the town of Hiroshima. I believe that we should provide a counter-statement of far greater import by saying that the pioneer work of Rutherford, Cockcroft and Walton, Hahn and others has started the Atomic Age in which developments of incalculable good for mankind will take place. A very similar sentiment was expressed by Mr. Williams himself at the conclusion of his presidential address to your Institute in 1933, when he expressed the hope that the discovery of aluminium alloys, though potentially of such importance in war might lead to an era where, as he said, wars and rumours of wars came to an end.

I do not propose to re-state the basic facts about nuclear fission, or to give you a disquisition on atomic piles, nuclear reactors, atomic explosions and the like. I would refer those of you who wish to study such matters to the so-called "Smyth Report",[1] to Sir Wallace Akers' "May Lecture" to the Institute of Metals in 1947,[2] and to Sir John Cockcroft's "James Clayton Lecture" to the Institution of Mechanical Engineers.[3] Though relatively old, these three references are still outstanding in providing a clear picture of the fundamental problems involved.

The metallurgy of uranium and its alloys is a closely allied subject, which is fascinating in its complexity, but here again I feel there is need to follow the main theme and to content myself with a brief reference to two recent publications which give some account of the occurrence, metallurgy and properties of this metal. The first is a paper I gave to the London branch of the Institute of Metals[4] and the second an article by Dr. H. M. Finniston in *The Times Science Review*.[5]

Even after this extensive elimination I find myself embarrassed by the magnitude of the field which is covered by the title I have chosen. I intend to deal with the subject under a number of main headings, which are briefly as follow:—

(i) Non-destructive examination by means of radio-isotopes.
(ii) The use of radio-isotopes as tracers in metallurgical processes and in physical metallurgy.
(iii) Nuclear energy as a source of power.
(iv) Some problems connected with constructional materials for atomic piles.

NON-DESTRUCTIVE TESTING

Of the three types of discernible radiation emitted from radio-isotopes, only gamma rays, which in nature resemble exactly the familiar X-rays, penetrate metals sufficiently to be useful for the radiography of castings. Though in the course of my description of gamma radiography I shall claim that the advent of these isotopes is causing something approaching a revolution in technical foundry control, we must not lose sight of the fact that radiography is not a new technique.

X-rays were discovered before the turn of the century; but the field lay almost dormant for ten years after the original six weeks of feverish experimental work by Röntgen, in which he carried out all sorts of crucial tests with the new rays he had discovered including the shadow radiography of metallic objects. Then, in about 1908, the medical profession started radiography in earnest; X-ray diffraction was discovered by von Laue and the Braggs in 1911-13. Five years later the pioneer work for radiography in the foundry was carried out by Sir Robert Hadfield, Dr. Main and their collaborators at the Hadfields Research Laboratories. Even to-day their papers[6] make quite remarkable reading, in that most of the major applications of radiography were foreseen clearly.

Since then, it has been found possible to examine

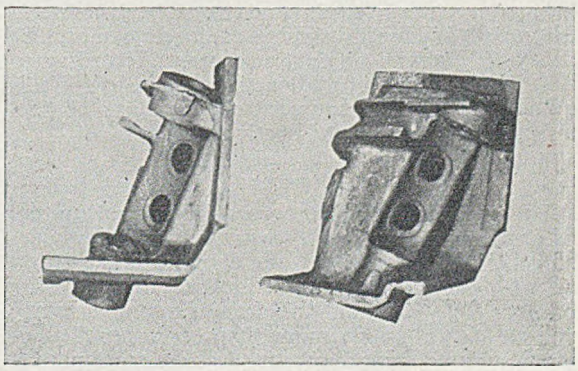


FIG. 1.—*Pivot-bracket Casting for an Aeroplane Undercarriage.*

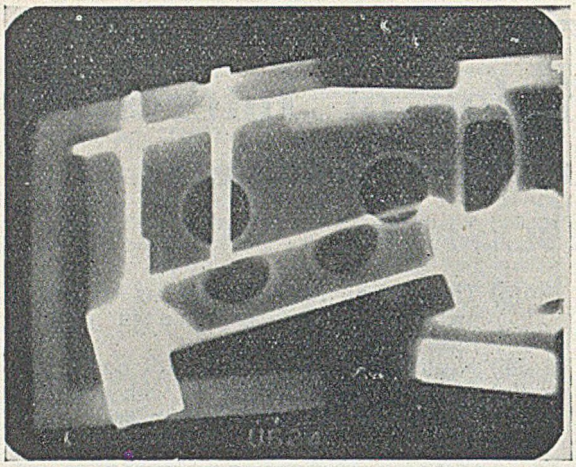


FIG. 2.—*Typical Radiograph of a Pivot Bracket.*

by X-rays the internal soundness of castings of ever increasing complexity and section thickness. During the past ten years, X-ray equipment has been extensively used for the non-destructive testing of steel castings—especially aircraft castings upon the soundness of which depend the lives of pilots. A well-known casting of this type is shown in Fig. 1, while Fig. 2 shows a typical radiograph taken of such a casting, which is an undercarriage pivot bracket. In Fig. 3 is shown the most modern method of radiographing these castings. They are seen jigged with fixed angulation for simultaneous radiography by a central radio-isotope source of gamma radiation.

But even gamma radiography is not entirely new. Its potentialities have long been appreciated, because of the ready portability of the necessary equipment for site radiography of heavy castings, and because one can put gamma sources at inaccessible places within castings where it would be impossible to position an X-ray tube. In our own laboratories we have, in fact, been using natural radium and radon gas sources of gamma rays for the last five years. Radium tends to give somewhat inferior radiographs owing to the relatively large sizes of sources of adequate strength. Radon gas sources have the disadvantage of a very-short-lived activity, the half-life being only just over three days. The half-life is the period of time in which a radioactive substance decays to half its original strength. According to the physical laws of radioactivity, this half-life is quite independent of source strength and is a characteristic of particular radioactive isotopes.

Sources

By the use of radio-isotopes, concentrated sources of gamma radiation with reasonable half-life values are obtainable. Even so, the choice is limited, but cobalt-60, for example, a pile product, has a half-life of over five years and the activity per unit source volume can be made more than ten times that of the best value for radium sources. As more powerful neutron densities become available in newer piles, this factor will be further improved.

Cobalt-60 is, however, not the solution to all radiographic problems in the foundry. Its very penetrating radiation, corresponding roughly to an X-ray tube operating at a peak voltage of 1.8 million volts, makes it very suitable for radiographing steel sections from about 2 to 8 in.; but the relative ease with which these rays penetrate less dense metals or thinner sections of steel renders cobalt-60 unsuitable for their radiography. After all, we must remember that it is the absorption in the metal which enables us to differentiate between sound and unsound areas. As an example of an isotope emitting softer radiation (corresponding to an X-ray tube peak voltage of about 900 kv.) I would liket o mention caesium-137. This is a relatively rare fission product of uranium-235 and has a half-life time of more than 30 yrs. I hasten to add, however, that this isotope is only in the research stage, but we have good reason to believe that experiments with it will prove successful.

One of the most important advantages that arises from the availability of the new sources of gamma rays is an economic one. Until two or three years ago a foundry wishing to instal suitable apparatus for radiographic examination was faced with the alternative of buying a relatively costly X-ray set or purchasing its own radium, either of which could well result in an expenditure of some thousands of pounds. To-day, it is possible for an outlay of a few hundreds of pounds to use these new radio-isotopes. Furthermore, with these relatively inexpensive sources of gamma rays it is possible to penetrate far greater thicknesses of steel, brass or bronze, than could be radiographed with a medium-size X-ray set. As a result of employing these more penetrating radiations, the amount of information obtainable per radiograph has increased considerably; the pivot-bracket castings shown in Figs. 2 and 3 provide an excellent example. Originally, coverage of these castings using a 400 kv. X-ray set was achieved with eight shots. To-day, using radio-tantalum, which has rather similar characteristics to radio-cobalt, a more comprehensive examination has been secured with only three views per casting. This is a direct result of the additional penetrating power which enables the numerous section junctions in this casting to be covered fully.

Foundry Applications

The use of these new isotopes is now providing the foundryman with a rapid and relatively inexpensive method of checking the techniques for new designs of castings before going into full-scale production. In many instances, they are indicating ways in which old foundry methods can be improved, particularly in respect of obtaining higher yields of steel. A full description has been given by some of my colleagues at Hadfields of the great changes and benefits that have arisen through the introduction of gamma radiography in our own foundry.[7] I should not like to imply, particularly to an Institute the members of which are specialists in the art of founding, that sound castings capable of giving first-class service have not

been made in the past, but rather that the methods which had to be employed to ensure such desirable results were frequently long and expensive, involving as they did, the cutting up and sectioning of pilot castings or the provision of over-size heads. The new approach enables reliable foundry procedures and methods to be laid down at the start, which will help in securing the regular production of commercially-sound castings at a maximum economy in metal usage and production costs.

Fig. 4 is a radiograph of a wheel centre taken obliquely through its rim beneath a head position. This is typical of castings made by original methods. It will be seen that a small shrinkage defect does in fact exist below the head, but castings similar to these have given excellent service for many years. The new technique developed with the help of gamma-ray examination was not so much concerned in improving the soundness of the casting, but rather with increasing the yield of steel.

Fig. 5 shows a radiograph of the same type of casting as made by present methods. It will be seen incidentally, that the defect has disappeared; but of considerably greater importance is the fact that the yield has increased by as much as 12 per cent., and experience has shown that fettling costs have also been lowered noticeably. This is not at all an exceptional example and it is worth noting that we have carried out some 500 similar technique investigations during the past two years. In nearly every instance, appreciable savings have been achieved and I believe that this supports my earlier somewhat sweeping statement that "something approaching a revolution in foundry practice has been achieved by the use of gamma radiography."

Further Research

I propose to survey briefly further research work which we are now undertaking, having as its object the improvement and further development of the uses of this new technique for the purpose of speeding up the work and reducing the costs. In this connection, tribute should be paid first and foremost to the excellent work which is being carried out by the Radiochemical Centre at Amersham and the Isotope Division of the Atomic Energy Research Establishment at Harwell. We are co-operating closely with these organizations in exploring the radiographic applications of new isotopes such as caesium-137 and cerium-144, because the former will provide good defect-detection sensitivity in thin metal sections, while the latter may penetrate great metal thicknesses.

Some mention must also be made of the relatively new technique of radiological scanning. Here, the main objective is to eliminate the use of photographic methods and to give a quick survey of a specimen by traversing it through its thickness with a collimated gamma-ray beam, the intensity of which is recorded with the help of Geiger-Müller proportional, or scintillation counters. Fig. 6 shows a scan we have prepared along the axis of the heads of two castings made by different steel processes, the one being basic-, the other acid-open-hearth steel; both are nominally of the same composition and were cast at the same temperature. In this illustration you can compare the intensity-distance graph against the shape of the section head. You will agree that the experiment is quite promising in that the curves would show a foundryman adequately the type of feeding which these two heads of different types of steel have provided.

Gamma radiography, however, is by no means the only benefit that will accrue to non-destructive testing techniques from the advances in nuclear-physical research and technology. The foundryman will watch with much interest developments in the construction of synchrotrons and linear accelerators that will be capable of providing radiation sufficiently penetrating for the examination of metal sections two or three times greater than those which we have been able to handle so far.

We need not, however, look so far into the future for other applications to non-destructive testing. As long ago as 1939 Kaiser[8] drew attention to a novel use of radioactive substances in non-destructive testing. He has described a method of crack detection in which specimens can be dipped in radioactive solutions or coated with greases con-

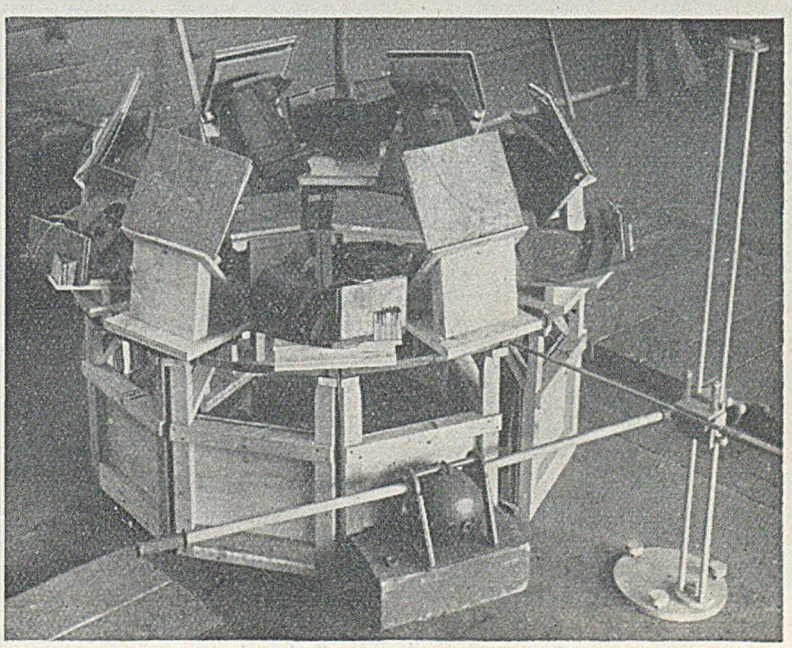


FIG. 3.—*Assembly of Jigged Pivot Brackets for Gamma Radiography.*

taining radioactive substances. After removing the solution or grease from the surface of the specimens sufficient radioactive material is left in the cracks or flaws to enable them to be detected by the use of photographic films. The method is of course very similar to the age-old oil and chalk method which, like the radiation method, is applicable to non-magnetic as well as magnetic materials.

TRACERS

The radioactive method of crack-detection is typical of the tracer methods I am about to discuss. All of them depend on the fact that by virtue of radiation emitted it is possible to trace minute quantities of radioactive isotopes which in their other physical, chemical and metallurgical behaviour resemble elements in their ordinary state. It is thus possible to obtain detailed knowledge on how individual substances behave in complex industrial processes. This tracer method therefore conforms closely to one of the outstanding principles of experimental science; the abstraction of the relevant from the irrelevant. To illustrate the argument by a simple example, when Ohm studied the voltage/current relationship in simple electrical circuits, the precision with which he was able to prove his law was due to the ease with which the circuits could be isolated from external, uncontrolled influences of their environment. Complex industrial processes respond to scientific investigation only in so far as scientists can isolate one controlled feature from all other influences upon a physical measurement. In tracer studies, it is possible with great sensitivity to observe almost exclusively radiation from one selected type of atom in the system. Therein lies its unique attraction.

Industry in general, and foundries in particular, should realize the versatility and power of this new technique. Burning problems which might be solved by its use abound. How often, to quote one type of such problem, are foundrymen and metallurgists in general involved in disputes relating to impurities in castings, ingots or forgings? Have they been carried over from the melting furnace, picked up from refractories, or are they the result of chemical reaction?

While my mention of the origin of impurities in steel and in metals generally, was chosen to arouse

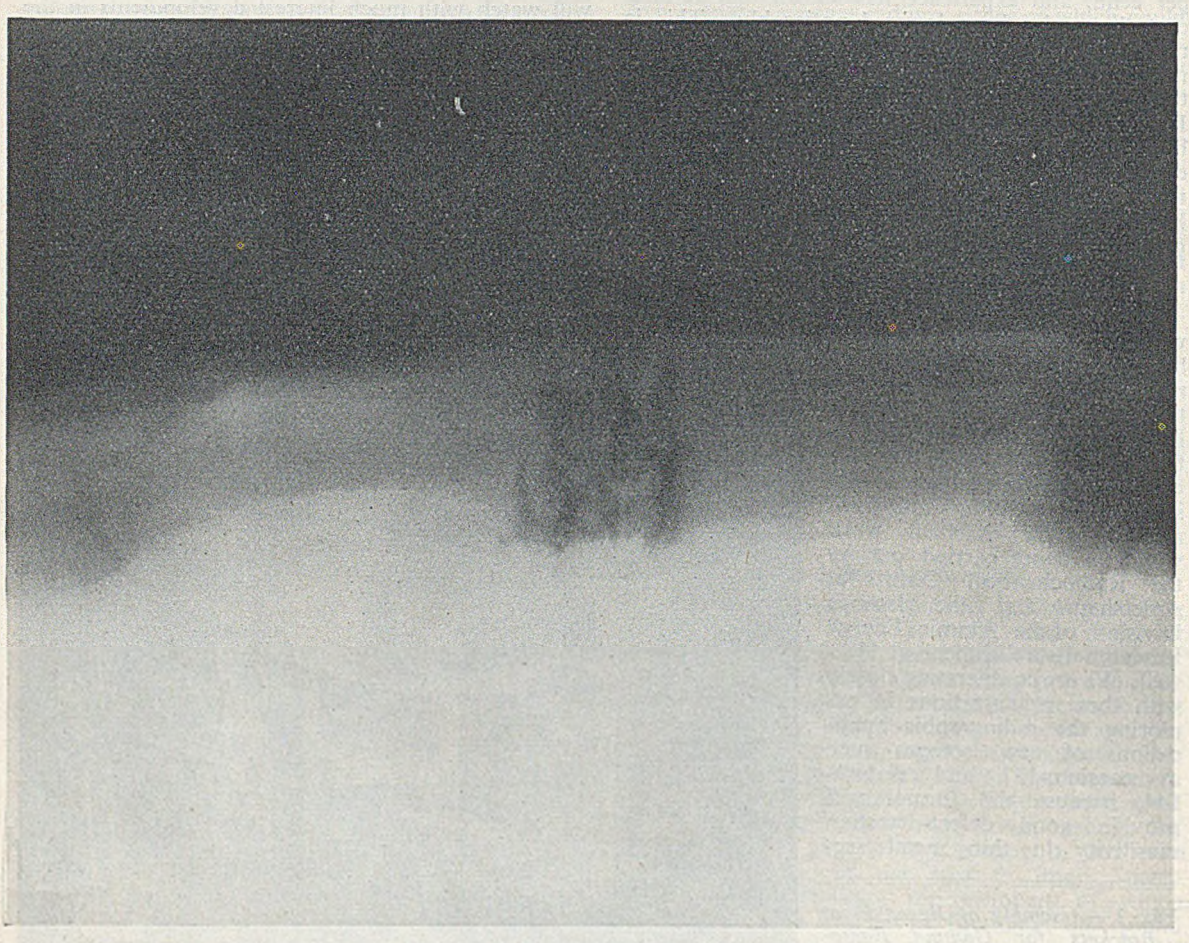


FIG. 4.—*Radiograph of Wheel Centre (old method).*

your interest, the self-same example serves to illustrate the limitations, or at any rate the experimental difficulties, of the new technique. For what use is it, say, to introduce radioactive material into the refractory lining of a ladle, unless the physical behaviour of the lining remains the same, unless the radioactive constituent wears away at the same characteristic rate—unless its stability within the molten steel typifies that of the refractory material studied and unless the operators and the users of the steel are to remain undamaged by the experiment! It would thus not be proper to discuss such individual applications without first discussing the general considerations underlying tracer studies and above all issuing a general warning of the medical hazards involved.

Operational Hazards

The handling of gamma ray sources in radiography necessitates safety precautions which are now fairly well understood. In tracer work, however, every individual experiment must be designed with a view to avoiding not only exposure of personnel to excessive radiation but also ingestion of appreciable quantities of radioactive materials. This is a subject which everyone should study before experimenting with any radioactive materials. Sound advice is available in an introductory manual on the control of health hazards from radioactive materials issued by the Ministry of Supply.[9]

Medical hazards are not, however, the only limitation to the mode of planning of tracer experiments. One must refer first to the detecting—and often measuring—of the activity itself which depends on the type, energy and intensity of radiation as well as on the half-life of the nuclide chosen —usually from all-too-few alternatives*. In addition, the physical or chemical behaviour of the radioactive material must often be experimentally typical of the material the course of which is being "traced" through some more or less complicated physical, chemical, metallurgical, or biological system. The radioactivity itself must not, furthermore, significantly alter the characteristics of the system. Ideally the radioactive material must in some experiments admix itself evenly over part of the system and in others it must be drawn

*As introduction to this subject the reader is referred to general textbooks such as [10].

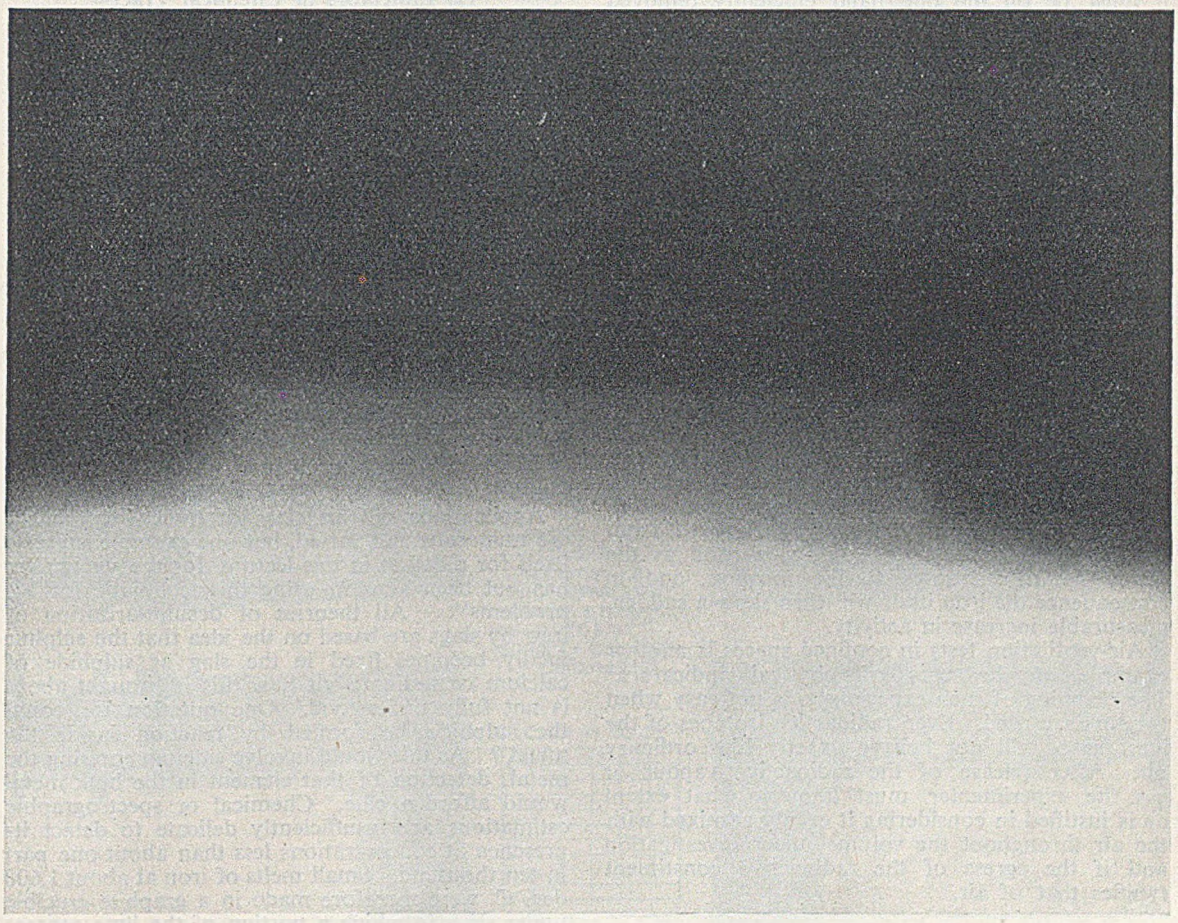


FIG. 5.—*Radiograph of Wheel Centre (new method).*

Aspects of Nuclear Fission

exclusively to special chemical or physical sites. These points are best explained by examples† classified into the three types of tracer experiments:—

(1) Physical Indicators

In this class, the course of materials is followed through systems without, however, entailing chemical interaction. The chemical nature of the tracer need not always be identical with the traced substance. A bee-keeper—to start with an almost trivial example—who labels his queen bees with radioactive material for ease of locating them must be sure that the source is of such size and radioactive power, and is so affixed that it will neither disturb the queen in her work nor influence appreciably her inheritance characteristics by gene mutations. Yet the radioactivity must be sufficiently potent and lasting to enable the queen to be rapidly and accurately located.

The method of crack-detection in metals by radioactive materials discussed in an earlier section is another instance of tracer work in this class. If the radioactive material is to indicate the cracks it must be on the one hand efficiently removed from all surface features other than cracks and it must on the other hand be sure to enter cracks if present. Furthermore, the solution or suspension used must not be corrosive to the metal.

Precisely similar planning is used for locating leakages in pipes or cables, for following the descent of the ball in the falling-ball viscometer, for finding liquid levels in high-pressure vessels or possibly even furnaces, and for many other applications.

Even when the aim of the experiment is more complicated than merely the location of the traced material, the procedure may be simple. When, for example, Voice[7] wished to study the rate of refractory attack in blast furnaces it was perfectly satisfactory to use radio-cobalt, a cheap and convenient gamma emitter, in pellets embedded at different points and depths. The stated conditions only required that the cobalt should remain in place as long as the surrounding refractory was intact and that this surrounding refractory should be typical and unaffected by the radioactive material. The radioactivity where it can be observed from outside falls virtually to nothing as soon as the liquid metal penetrates to the location, and in consequence the iron itself will then show a sudden, measurable increase in activity.

Air-ventilation tests in confined spaces is another example of the uses of physical indicators.[7] The planning of such experiments is not easy when vapours are used. Even radioactive isotopes of the inert gases will not behave exactly like ordinary air. After release of the radioactive vapour or gas, the experimenter must know to what extent he is justified in considering it evenly admixed with the air throughout the volume under investigation and if the egress of the radioactive constituent typifies that of air.

† Wyatt gives an excellent general survey of the application of tracers [11].

In some of the seemingly simple applications for physical tracers it is almost impossible to satisfy the conditions that have been discussed. When trying to trace dust, one is in great danger of testing merely the progress of the radioactive dust added artificially, without this typifying the prevailing dust. This is one of the chief reasons why the problem of silicosis does not readily yield to tracer methods. It is indeed quite a triumph that experimenters in this field are obtaining data of limited but proved significance by the use of radio-tantalum[13].

Another group of experiments in this class deals with difficult determinations of liquid volumes, be it of blood in a body, water in a lake, or steel in a furnace. Experimental significance is achieved only if the radioactive material is not absorbed by the containing walls and is evenly divided in the volume of the liquid. Salt, for example, may dissolve quickly and evenly in a glass of water, but as soon as the dimensions of the volume studied become large compared with linear diffusion rates, even mixing cannot be assumed to have occurred even after some time lapse.

(2) Indicators of Chemical Traces

In the second class of experiments, use is made of the astonishing sensitivity with which radioactive isotopes can be detected. Exact figures depend to a tremendous extent on the elements concerned and the material in which they are to be detected. A chemist will not in general feel insulted if you tell him he can detect concentrations of elements under favourable conditions to one part in a million; but you run some risk of insulting a nuclear physicist by saying that he can detect elements at no less than a millionth of the concentration needed by the chemist. That statement is remarkable enough and in consequence you will appreciate that a new field has been opened to the chemist particularly. It is necessary only to add a radioactive isotope in concentrations of one per million and to allow it to attain equilibrium with the corresponding inactive element in a system in order to be able to detect its presence after dilution to one part per thousand million.

Applications of this class of tracer experiment are numerous and varied, but one example suggests itself for mention in this lecture, for the steelmaker has not been slow in using this technique for his problems[14]. All theories of desulphurization of iron by slags are based on the idea that the sulphur finally becomes fixed in the slag as sulphide of calcium or sodium; but how this is brought about is not fully understood. One question is: could the sulphide be formed by reaction inside the metal? As this would involve calcium entering the metal, detection of that element in the bulk metal would afford a clue. Chemical or spectrographic estimations are insufficiently delicate to detect its presence at concentrations less than about one part in ten thousand. Small melts of iron at about 1,600 deg. C. were therefore made in a graphite crucible under slags in which a portion of the lime content contained radiactive calcium. Philbrook and his

collaborators failed to detect the presence of any calcium in the metal, at any rate to an amount of more than 0.6 parts per million which was the approximate, and perhaps not very impressive sensitivity achieved. From this the experimenters concluded that the sulphide reaction had not occurred to any significant extent.

Attention is drawn to a specific feature of the radioactive method of determining chemical traces, which is well illustrated by the previous example. Conventional chemical methods are limited in accuracy attainable because the bulk metal must be dissolved in reagents which themselves are inevitably contaminated with traces of calcium. It is true the chemist manages to eliminate part of the error so introduced by blank analyses, but how much more fortunate is the nuclear physicist who does not care how serious is the contamination with inactive calcium ?

(3) Chemical Indicators

Radioactive isotopes in the third type of investigation are used to trace the course and locate chemical elements, radicals or compounds throughout systems in which chemical reactions occur. For the purpose of this discussion, metallurgical alloying may be regarded as a chemical reaction.

In this field many striking experiments on auto-diffusion in metals have been reported.[15] Auto-diffusion is the process by which metal atoms move through a matrix of chemically identical atoms. It can be studied only by tracer techniques. Radioactive-isotope material is placed on or sandwiched between layers of inactive metal by rolling, pressing or electro-plating. The depth of penetration of the active into the inactive material is measured after known periods of time under carefully-controlled physical conditions. Diffusion has been shown to proceed fastest along the grain boundaries owing to the atomic disorder which, however, is directly influenced by radioactivity itself. It is not surprising, therefore, that some experiments in which the radioactivity is induced on one side of the specimen by neutron bombardment have been shown to be subject to an appreciable experimental error.

The results of these experiments may not directly affect the foundryman, but they give new data for just the sort of theoretical considerations as are needed for progress in knowledge on metals and alloys. Who can doubt that ultimately every foundry will benefit from such advances in knowledge?

To return, however, to more immediately useful applications of tracers; in the steel industry the problem of " tracing " steel through casting, heat-treatment and other processes may arise. The question, for instance, where does the liquid steel go to that is poured into the tops of heads of castings and ingots, if it could be answered, would help to solve many problems of practical importance.

It is instructive to cast our minds back to the days when Sir Robert Hadfield grappled with the self-same problem with the less powerful scientific tools which were then at his command. The reader is referred to the colour prints[16] published in 1912 showing sections of ingots whose heads were topped up with molten copper. Sir Robert was well aware that the fluidity, the density and the other properties of copper differed too much from those of steel to place the results beyond suspicion; but what else could he have done in those days? Besides, his results were successful, for they did indicate strongly that feed metal penetrated deeply into ingots.

We are repeating these and similar experiments now we can make small additions of radioactive elements to steel. Partly because other investigators

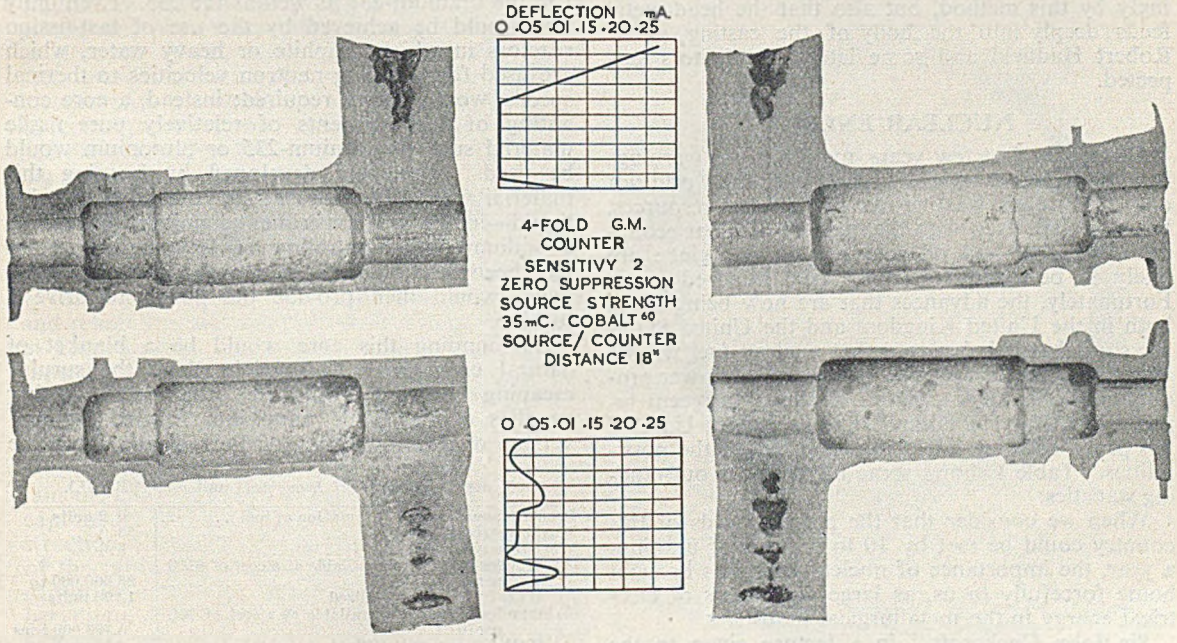


FIG. 6.—*Geiger-Müller Counter Scan of two Feeder Heads.*

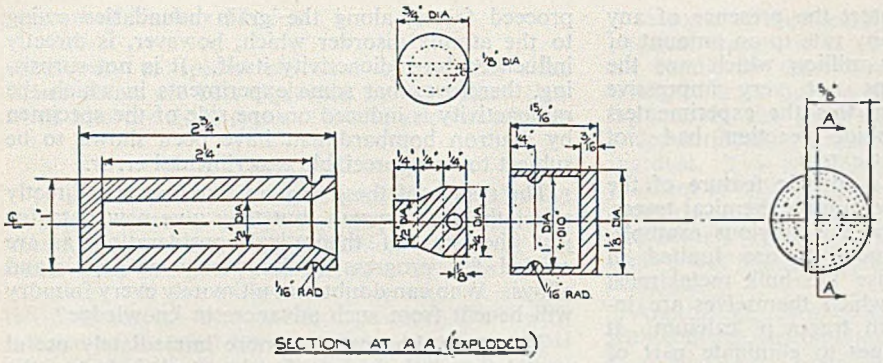


FIG. 7.—*Carbon-14 Diffusion Capsule.*

are already experimenting with radioactive iron and cobalt in steel and partly because of the inherent advantages of radio-carbon—that is its long half-life and the purity and shortness of range of its radioactive emanations—the lecturer has chosen the seemingly more difficult course of using radioactive carbon and employing a modification of a technique originated by Stanley.[17] In the mild-steel capsule (Fig. 7) used by the lecturer, a radioactive carburizing charge consisting of barium carbonate containing carbon-14 and inactive graphite is sealed. Heat-treatment follows for 8 hrs. at 900 deg. C. in an atmosphere of nitrogen. The extent of carburization achieved is shown on the auto-radiograph after sectioning the container perpendicularly to the cylinder axis (Fig. 8). This auto-radiograph also illustrates the decrease of the case-hardening effect with increasing distance from the inner cylinder surface.

The radioactive steel so obtained can be remelted and run into the heads of castings, which are subsequently sectioned for preparation of auto-radiographs. The results already obtained prove not only that carbon segregation can be shown up strikingly by this method, but also that the head-metal feeds deeply into the body of the casting, as Sir Robert Hadfield and some later investigators suspected.

NUCLEAR ENERGY

During the last few years, many serious warnings have been issued by scientists all over the world not only that we are wasting our present fuel resources, but also that, even with the exercise of great economies, the coal and oil resources of our globe are likely to be exhausted in the next hundred years. Fortunately, the advances that are now being made both in the United Kingdom and the United States are such that it is believed that nuclear fuel will be able to replace coal and oil as a means of power production within such a period of time. A recent report of the Material Policy Committee of the U.S.A.[18] has provided some intriguing estimates of the possibilities. Table I shows some of the more outstanding statistics.

When we consider that the present needs of this country could be met by 10 to 15 tons of uranium a year, the importance of nuclear energy is brought home forcefully to us, as large consumers of electrical energy in the metallurgical industries.

Sir John Cockcroft,[19] in a lecture given to the Institution of Electrical Engineers in January of this year on the subject of "Nuclear Reactors and their Applications," has provided the most up-to-date picture of progress in this field. He discussed in some detail reactors for power production and explained that in the next stage of development it would be possible to use normal natural-uranium power reactors rather similar to those already in operation at Harwell and Chalk River. By use of a pressurized external envelope, either gas or water could be employed to absorb the heat from the reactor, and by means of a heat-exchange system steam could be produced and used in the conventional power-station turbines. The fuel elements would have to operate at 350 to 450 deg. C. to ensure reasonable thermo-dynamic efficiency. The size of such a unit would be comparable with that of the present British Electricity Authority set.

Practical Sequence

Ultimately the aim must be to "burn" all or at least a very high percentage of the nuclear fuel, *i.e.*, the uranium-238 as well as the 235. Eventually this would be achieved by the use of fast-fission reactors in which graphite or heavy water, which are used for reducing neutron velocities to thermal speeds, would not be required; instead, a core consisting of fuel elements of relatively pure fissile material such as uranium-235 or plutonium would be used. The heat developed by burning this material would be removed by use of a suitable liquid—in the first experimental unit in the U.S.A. a sodium/potassium alloy of low melting point has been used. In a heat-exchanger the liquid metal would then provide the power to drive a turbine.

Surrounding this core would be a blanket of natural uranium (or thorium) in which the surplus escaping neutrons would be caught and further supplies of the fissile plutonium formed by conversion of the uranium-238. Periodically, both the

TABLE I.—*World Fuel Reources* (1 unit = 10^{16} B.T.U.).

Present annual world consumption of fuel	0.2 units
World reserves of coal	33.0 ,,
World reserves of oil	5.6 ,,
(*a*) Supplies of uranium available at a cost of $100 per lb.	25,000,000 to
If (*a*) 100 per cent. utilized	1,700 units
(*b*) Supplies of uranium available at a cost of $50 per lb.	3,700,000 tons
If (*b*) 100 per cent. utilized	250 units

fuel elements in the core and the uranium in the outer blanket would have to be taken out for chemical processing. Plutonium would be extracted from the blanket; this could then be used for making up new cores. The old core would be regenerated by removing fission products and adding some primary fuel.

Convey[20] in a recent paper to the Canadian Institute of Mining and Metallurgy has covered rather similar ground. In addition, he has given some interesting figures relating to present-day estimates of the cost of power-producing reactors which show a great reduction on earlier and more pessimistic estimates. For example, it is now thought that a small reactor capable of producing useful power for an undeveloped area could be built for approximately £2,000,000.

MATERIALS FOR THE ATOMIC PILE

It will be seen that there are many very difficult metallurgical and engineering problems to be solved before the final large-scale power producing unit is evolved. Some of these difficulties will now be considered. Whilst the next part of this lecture will probably be of more interest to the metallurgist than the foundryman, it may well be that the latter may in the foreseeable future be asked to cast shapes in some of the newer metals and alloys that up to now have been looked upon as metallurgical rarities. So far one of the most important considerations in choosing an alloy for a particular purpose has been that of ease of casting. The foundryman of the future may well find himself in the position of being asked to cast alloys that are not of his own selection and which will involve the development of new techniques to obtain the required soundness.

Nuclear-energy plants, whether they be primary-graphite or heavy-water piles for the production of plutonium, or whether they be reactors designed to produce energy from the burning of nuclear fuel, present a number of novel problems to the metallurgist, the designer, and the manufacturer. In conventional power stations or chemical-engineering plants, the failure of a blade or the cracking of a weld may cause a temporary shut-down, but in a plant burning or processing radioactive materials the consequences are infinitely more serious since the intense radioactivity makes maintenance, as ordinarily understood by the engineer, virtually impossible. The standards of soundness and reliability, and the inspection requirements are, in consequence, much more rigid. These aspects have been dealt with by Sir Christopher Hinton[21] in his recent "May Lecture" to the Institute of Metals.

In atomic piles, everything depends on ensuring that the best use is made of the neutrons which sustain the chain reaction; these must not be wasted in capture by foreign atoms in the materials of construction. Certain elements such as boron and some of the rare-earth metals have a strong capacity for capturing neutrons, whereas light metals such as beryllium, magnesium, zirconium and aluminium are relatively transparent to neutrons; this latter group is thus particularly attractive for materials for sheathing the nuclear fuel elements. Similar considerations apply to the uranium rods and the graphite moderator when it is necessary to ensure that poisoning elements such as boron, cadmium and some of the rare-earth elements are present only to the extent of a few parts per million. Yet these elements have their uses as control rods or shields where neutron capture is essential for keeping the chain reaction under control or for preventing damaging radiation from escaping to the atmosphere.

Nature certainly provides us with some strange partners. A good example is zirconium, a metal that is becoming increasingly important because of its very low capacity for capturing neutrons. Associated in nature with zirconium is found hafnium, which has a very high capacity for absorbing neutrons. Complete, or nearly complete, chemical separation of the two is not easy. Whilst boron or cadmium are normally used in control rods to-day, the use of hafnium or one of its alloys for the same purpose in the future is a real possibility.

Published Work

A number of important papers on materials of construction for atomic plants have been published during the past year. The summary provided by Burke[22] when discussing the problems facing the metallurgist in the selection of materials for reactor cores, provides a comprehensive picture of the various factors involved. His list is as follows:—

(*a*) Corrosion and erosion problems.
(*b*) Thermal stresses and fatigue.
(*c*) Diffusion between nuclear fuel and its protective cladding (the so-called "can").
(*d*) Radiation effects.

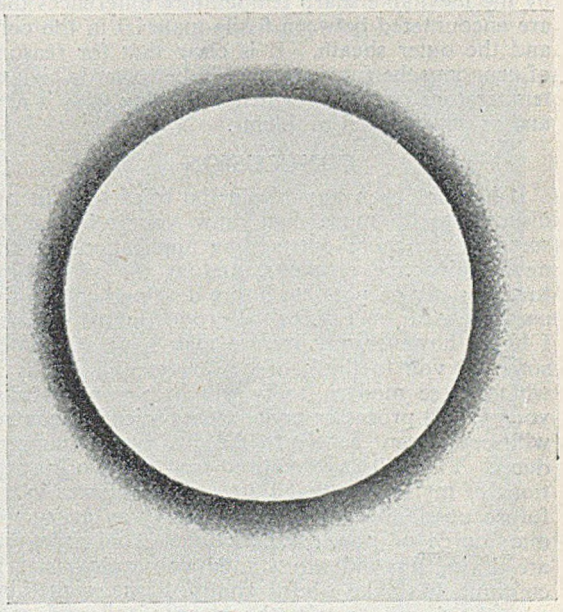


FIG. 8.—*Auto-radiograph of Section through Carburized Steel Container.*

(*e*) Changes in composition as a result of fission.

(*f*) Recovery and chemical processing of the nuclear fuel.

To these he might well have added: the choice of material for the initial extraction and purification plants used in the production of high-purity uranium. Here, traces of impurities which are not permissible in the final product may arise as a result of corrosion or even of the use of chemicals below the required standard of purity.

The intense neutron bombardment to which materials may be subjected in the heart of a reactor can actually alter atomic arrangement and bring about changes in mechanical and physical properties. Billington[23] has indicated that annealed metals may increase in hardness, an ordered arrangement of atoms as in a gold/copper alloy may become disordered and even transformation can occur from one metal to another element. For example, copper can be transformed to zinc by collision and neutron capture.

Hafstad[24] when addressing the conference held in New York last October to discuss "Atomic Energy in Industry" made reference to the special difficulties that are being encountered in transferring heat from the reactor to the conventional type of power-producing plant. He explained the peculiar advantages to be obtained from the use of liquid metals in this connection. Promising results are being obtained with sodium and sodium/potassium alloys as heat-transfer fluids. He warned his audience of difficulties that arose in handling these metallic fluids at red heat; possibly we may guess that they may be due to stress/corrosion effects accentuated by the inevitable sharp temperature differences that are encountered between fissile material in the core and the outer sheath. It is clear that for reasons of economy the future trend will be towards higher-temperature operation which will bring with it new and as yet unstated problems.

CONCLUSION

It has not been possible in the brief time at my disposal to do more than draw your attention to some of the more outstanding applications of the new radioactive elements, and at the same time touch briefly on possible future developments in the use of nuclear energy for the production of power.[25] I hope, however, my lecture may have stimulated some of you to think of new ways and means in which these modern tools will help you to bring your varied processes under closer scientific control with consequent benefit to the quality of your products. You will have realized from the closing sections of my lecture that I am a firm believer in the future possibilities of nuclear energy as an economic source of power production. Coal resources are drying up, and whilst wind, sun and water will continue to make useful contributions, something must be found to take the place of oil and coal. I believe nuclear energy will do this for us. Thus I close on the note on which I started in expressing my lively faith that the good which will arise from these new scientific developments will far outweigh the evils that could arise if they were used for purposes of destruction.

The lecturer wishes to acknowledge the help that he has received from many of his colleagues at Hadfields in the preparation of this lecture. In particular his best thanks are due to Dr. S. A. Main and Mr. H. S. Peiser for a careful survey of the literature and help in the preparation of the manuscript.

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SHORT BROS. & HARLAND, LIMITED, aeronautical engineers, of Belfast, is opening a London design office at Ozonair House, Longmoore Street, Victoria, S.W.1

JAPAN AND WEST GERMANY last week signed a trade agreement, effective from July 1, 1953, to June 30, 1954, to expand their mutual trade from $30,000,000 each way to $45,000,000. Japan's exports will include chemicals and non-ferrous metals, and West Germany will export machinery, cars, electrical equipment, precision tools and other products.

Staveley Foundry Training Centre

Apprentice moulders and coremakers have now occupied the new Foundry Training Centre of the Staveley Iron & Chemical Company, Limited, at Hollingwood, near Chesterfield. The Centre, shown in Fig. 1, is a light, lofty building with a working floorspace of 3,500 sq. ft., ample room for coremaking and floor and bench moulding. It becomes the apprentices' "home" throughout the training period, the scheme replacing a previous one under which potential apprentices had six months' training in foundry practice in a separate section of the main foundry, followed, on successful completion of the initial period by a transfer to working with skilled moulders on general production jobs.

Under the old scheme it was found that progress was retarded because of pieceworking, and that apprentices did not have the chance to acquire confidence in themselves, being apt to rely too much on the man with whom they were working. The new Centre was therefore designed, and in it the lads receive sound all-round training, with production constantly kept to the forefront of their minds. They are supervised by instructors, themselves skilled craftsmen of many years' experience. The senior instructor, Mr. Reg. Thorpe, has been with the company for over 40 yrs. At the moment, 35 apprentice moulders and coremakers, and four apprentice fettlers, are in training.

New Building

The new Centre is equipped with a five-ton crane and core-drying stoves of the most modern design. Iron is supplied from cupolas which are conveniently close. Adjoining the main workshop is a lecture room where half-hour talks and general discussions are held regularly, and where the apprentices see the latest sound films and film strips pertaining to their industry. Boys are not permitted to have their main meal in the building but are advised to use the canteen facilities provided. A break of ten minutes at a fixed time during morning and afternoon sessions is allowed. Also at their disposal—and obviously appreciated—is an ablution room equipped with showers, washbowls and clothes lockers.

The Course

On engagement, all boys attend a three-day induction course. Subjects include works organization, layout, products, wage structure, income tax, savings opportunities, the National Health Service, accident prevention, welfare facilities, health and hygiene, further education and evening classes. Visits are arranged to other departments of the works, so that, by the time boys allocated to the Foundry Training Centre move to their section, they already have a general impression of the layout of the plant and the operations that go on.

In the Centre they learn the fundamentals of foundry practice on a progressive scale. The syllabus is flexible, so as to give each trainee the opportunity to develop his skill to the full, but the whole training programme is based on established general principles. During the first 12 months potential apprentices learn the use of tools, patterns, coremaking, ramming, venting, forming runners and risers, etc., and throughout the training period they assist on production work,

(*Continued on page* 714)

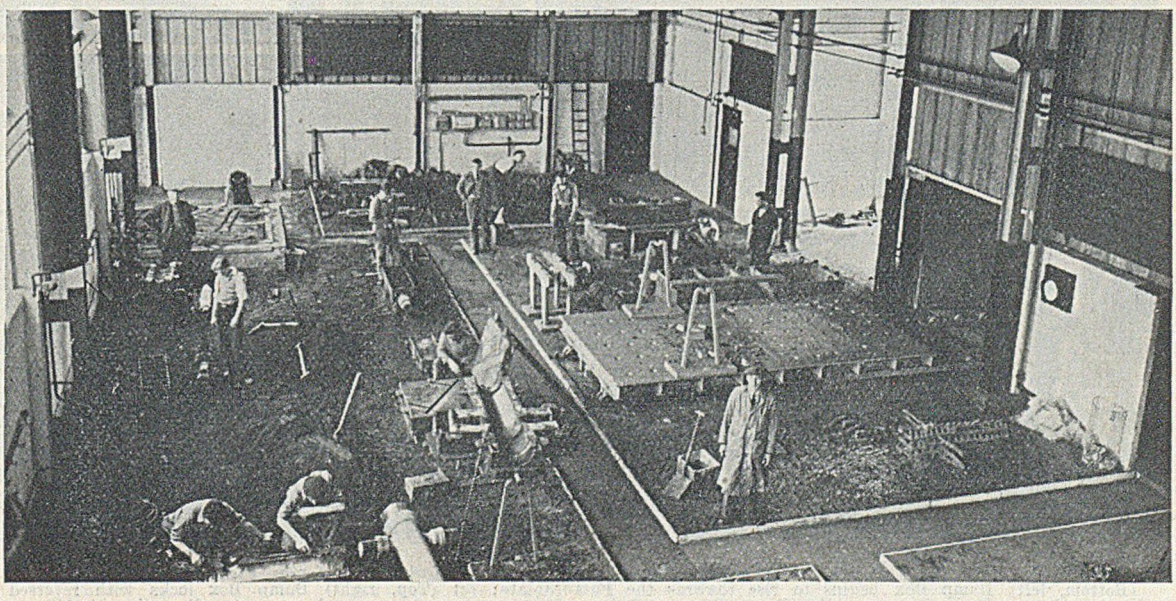
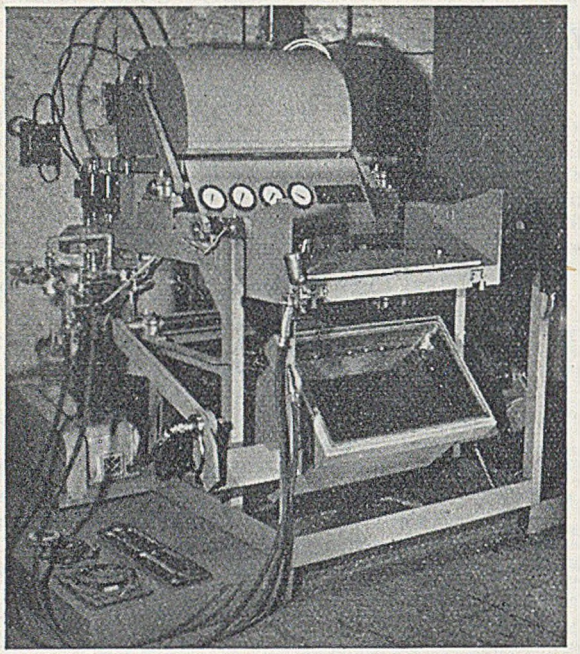


FIG. 1.—*General View of the New Training Centre at the Foundries of Staveley Iron & Chemical Company.*



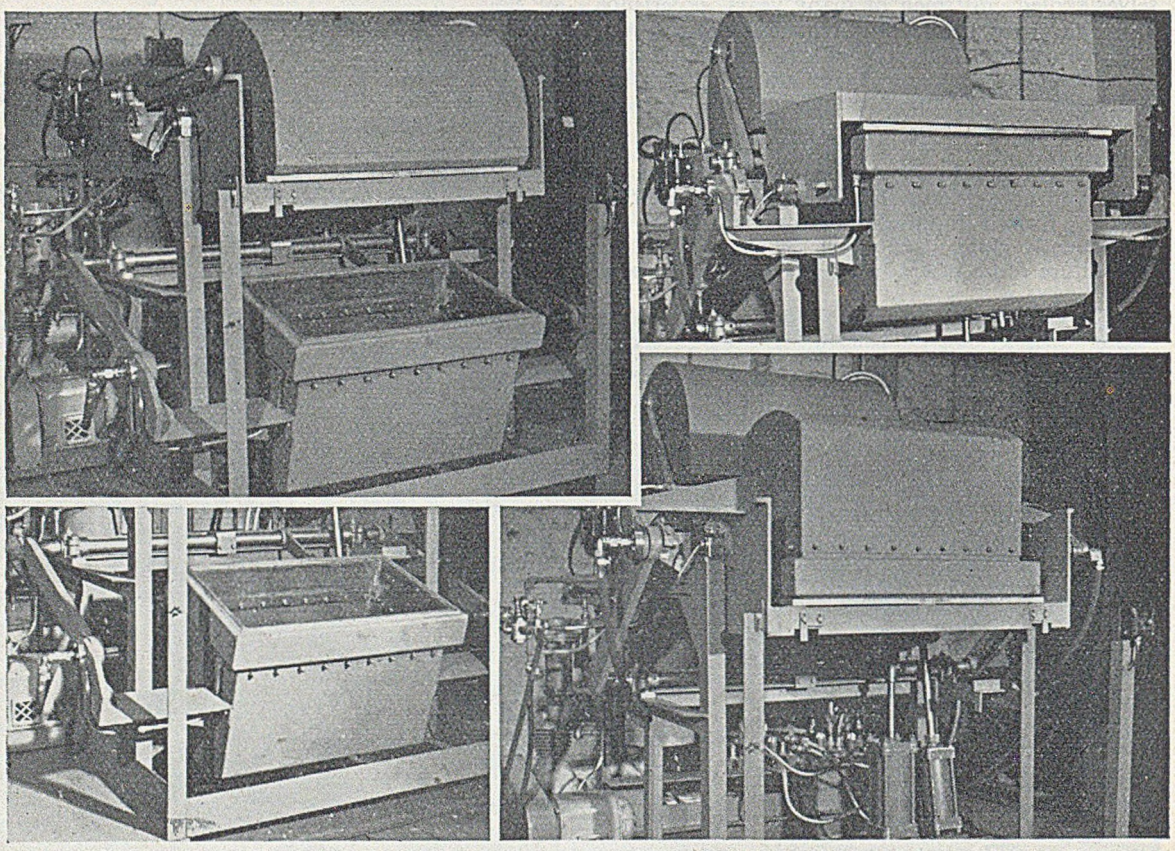
Shell-moulding Machine

Our representative recently had the opportunity of examining the new shell-moulding machine being marketed by Clino Foundry Supplies, Limited, of 25, Clyde Vale, Dartmouth Road, London, S.E.23. A description of the machine was given in the JOURNAL of May 28, page 600, to which reference should be made and read in conjunction with the illustrations now printed. The machine was demonstrated going through all the motions, but was not actually making shells.

Features of the machine not included in the earlier account are: (1) the positioning and angle of the dump box is handy for filling, whilst a proposed modification should make it easy for emptying; (2) the dump box is so constructed that it can be water-cooled as it was thought (but, so far, not experienced) that the sand/resin mixture might stick to its upper edges; (3) conveniently placed are the sprays for dressing the pattern. The prototype machine examined seemed to be thoroughly practical, soundly constructed, and easily accessible for maintenance.

FIG. 1 (left).—*Prototype "Autoclino" Shell-moulding Machine.*

FIG. 2 (below).—*Stages in the operation of the Autoclino Machine.*



(*a*) (Middle, left) Hood swings over the Patternplate and applies Infra-red Heat for a Predetermined Period; (*b*) (Bottom, left) Dump Box begins to rise towards the Patternplate; (*c*) (Top, right) Dump Box locks with reversed Patternplate and (*d*) (Bottom, right) Dump Box and Patternplate are turned completely over to allow the Sand/Resin Mixture to invest the Pattern.

Institute of British Foundrymen

ANNUAL REPORT

May 1, 1952 to April 30, 1953

This report traverses the field of the activities of the Institute of British Foundrymen during the twelve months ended April 30, 1953. It should not be regarded as other than a brief account of the year's work, giving prominence to the leading events and assuming a knowledge of the mass of activity which comprises the vigorous life of the Institute's branches. Nevertheless, reflecting as it does the place and prestige which the Institute has attained at the close of almost half a century of steady advance—the Jubilee of the founding of the Institute occurs in April, 1954—it may not be inopportune to conjecture whether the progress achieved matches the high hopes aroused in the minds of the enthusiasts who were responsible for the Institute's formation in those far-off days of 1904. Nor may it be complacent to believe that, although much remains to be done and all requires to be maintained, a full narrative of the Institute's work, which it is hoped to publish in Jubilee year, will show the aims of those pioneers to have been preserved and their hopes not unsatisfactorily fulfilled.

Finance

The income and expenditure account for the year ended December 31, 1952, and the balance sheet as at that date again show a satisfactory credit balance, the increase in administrative and other expenditure having largely been offset by increased income, attributable to an increase in membership.

Membership

Tables I and II show the aggregate membership at April 20, 1953, to be 5,017, as compared with a total of 4,917 at the same date last year. That the membership roll now numbers more than 5,000 is an achievement which affords much satisfaction. Nevertheless, it is felt that a still greater proportion of foundrymen should be associated with the work of the Institute, and the Council wishes again to urge the importance of members endeavouring to induce all appropriately-qualified foundrymen to apply for membership.

Obituary

Among the deeply-regretted losses by death sustained during the past twelve months are the following members who have been active in the work of the Institute:

Mr. Charles Cleaver (member), one of the oldest members of the London branch, with the work of which he was actively associated for many years.

Colonel W. C. Devereux (member), who had successfully built up interests in light-alloy founding and its associated industries.

Mr. Ellis Flower (member), who was a well-known member of the Lancashire branch, of which he was a past-president.

TABLE I.—*Changes in I.B.F. Membership*, 1952-1953.

	Subscribing firms.	Members.	Associate members.	Associates.	Totals.
At April 10, 1952	232	1,798	2,181	706	4,917
Additions and transfers from other grades	14	107	199	192	512
	246	1,905	2,380	898	5,429
Losses and transfers to other grades	8	111	186	107	412
At April 20, 1953	238	1,794	2,194	791	5,017

TABLE II.—*Analysis of I.B.F. Membership at April 20, 1953.*

Branch.	Subscribing firms.	Members.	Associate members.	Associates.	Totals.
Birmingham	22 (21)	278 (271)	335 (333)	177 (146)	812 (771)
Bristol	3 (4)	68 (73)	67 (69)	13 (10)	151 (156)
East Midlands	11 (9)	104 (97)	194 (185)	85 (60)	394 (351)
Lancashire	34 (35)	214 (220)	337 (342)	76 (72)	661 (669)
Lincolnshire	1 (1)	17 (19)	55 (54)	13 (15)	86 (89)
London	36 (30)	399 (395)	313 (285)	84 (68)	832 (778)
Tees-side	6 (3)	48 (50)	75 (83)	48 (60)	177 (196)
Newcastle	22 (24)	50 (51)	76 (79)	66 (64)	214 (218)
Scottish	26 (25)	162 (166)	249 (252)	63 (61)	500 (504)
Sheffield	9 (9)	124 (120)	111 (104)	46 (15)	290 (248)
Wales and Monmouth	7 (7)	67 (60)	79 (81)	22 (27)	175 (174)
W.R. of Yorks	11 (11)	85 (94)	160 (158)	46 (47)	302 (310)
South African	44 (46)	105 (109)	94 (110)	34 (38)	277 (303)
General	6 (7)	73 (73)	49 (46)	18 (24)	146 (150)
Totals	238 (232)	1,794 (1,798)	2,194 (2,181)	791 (706)	5,017 (4,917)

Figures in brackets are totals at April 10, 1952.

I.B.F. Annual Report

Sir William Griffiths, D.SC. (member), a member of the London branch who was also well-known internationally, and who was a past-president of the Institute of Metals. Sir William was responsible for establishing the Mond Nickel Fellowships in the administering of which the Institute participates.

Mr. A. G. Guy (member), who was a past-president of the South African branch and a well-known industrialist in South Africa.

Mr. Douglas Jepson, M.SC., F.I.M. (member), who was head of the Department of Metallurgy in the College of Technology, Birmingham, and had previously held a similar post in Bradford. He had rendered considerable help to the Institute in connection with its educational activities.

Mr. Arthur Henry Moore (member), who was the Institute's honorary corresponding member in South Africa for many years.

Mr. W. Redmayne (member), who was a past-president of the Newcastle branch.

Mr. Ian Ross (member), who was one of the founders and an early president of the Slough section of the London branch.

Mr. Jacques Varlet (honorary member), one of the best-known foundrymen in Belgium, who was the author of a paper given to the Institute as long ago as 1922.

The complete list of members who have died during the year is as follows:

Name.	Grade.	Branch.	Date joined.
Ball, C. E.	M.	Lancashire	1950
Barlow, E. P.	A.M.	Sheffield	1947
Benn, A. E.	M.	General	1946
Bill, A. B.	M.	South African	1935
Burn, A. J. H.	M.	Wales and Monmouth	1922
Cartwright, Wm.	A.M.	East Midlands	1945
Cleaver, Chas.	M.	London	1917
Copleton, Robert	M.	Scottish	1944
Daniels, J. S.	M.	Bristol	1943
Davies, J. F.	A.	Wales and Monmouth	1920
Devereux, Col. W. C.	M.	London	1943
Dobson, Wm. E.	M.	London	1914
Driver, J. F.	M.	East Midlands	1920
Flower, E.	M.	Lancashire	1923
Freeman, P. G. M.	M.	Lincolnshire	1949
Frost, C. R. M.	A.M.	Bristol	1944
Gearing, H. C.	M.	South African	1944
Guy, A. H.	M.	South African	1932
Griffiths, Sir Wm. T., D.Sc.	M.	London	1930
Haines, A. D.	M.	Wales and Monmouth	1924
Haigh, H. T.	A.M.	West Riding of Yorks	1950
Hazelhurst, H.	A.M.	Lancashire	1946
Ison, R.	A.M.	Lancashire	1944
Jepson, D., M.Sc., F.I.M.	M.	Birmingham	1940
Kenyon, W. I.	A.M.	Sheffield	1946
Lewis, D. O.	A.M.	Wales and Monmouth	1944
McCulloch, Wm.	A.M.	Scottish	1925
Mather, D. G.	M.	London	1911
Moir, J. D.	A.M.	Scottish	1916
Moore, A. H.	M.	South African	1925
Redmayne, W.	M.	Newcastle	1931
Ross, I.	M.	London	1943
Sillivan, J.	M.	Lancashire	1933
Skidmore, B.	A.	London	1925
Varlet, Jacques	Hon.M.	General	1922
Warner, T. W.	A.M.	Bristol	1949

Honours Conferred Upon Members

The Council offers congratulations to the following members who have been honoured during the year:

Dr. C. J. Dadswell (president) has been elected Commodore of the West Riding Sailing Club.

Mr. S. Domville (member) has been appointed a Member of the Order of the British Empire.

Mr. J. Goffart (member) has been elected president of *l'Association Technique de Fonderie de Belgique.*

Mr. S. Kay (member) has been appointed a Member of the Order of the British Empire.

Mr. P. B. Lake (member) has been appointed a Justice of the Peace.

Mr. D. Lion-Catchet (member), a past-president of the South African branch, has been elected president of the United Steel and Engineering Industries Federation of South Africa.

Mr. E. A. Phillips (member) has been elected president of the Grimsby Institution of Engineers and Shipbuilders.

Mr. F. Shepherd (member) has been appointed a Justice of the Peace.

Mr. G. Thompson (member) has been elected an honorary life fellow of the Victorian division of the Institute of Australian Foundrymen.

Awards

The following awards were presented at the annual general meeting held in June, 1952:

E. J. Fox Medal: To Mr. A. E. Peace in recognition of the work which he has done for many years in improving foundry technique, particularly in the malleable-iron foundry industry, and especially for his distinguished work as chairman of the Technical Council and leader, therefore, of the Institute's technical investigation work.

Oliver Stubbs Medal: To Mr. H. G. Hall in recognition of his "services by imparting knowledge to his fellow members of the practice and theory of founding" in a series of papers extending over the period 1930 to 1949, and of his contributions to the technique of the malleable industry.

British Foundry Medal and Award: To Mr. K. H. Wright in recognition of the excellence of his paper on "Chilled-roll Manufacture" published in vol. XLIV of the *Proceedings* of the Institute.

Meritorious Services Medal: To Mr. John Jackson in appreciation of the devoted service he has rendered to the Institute in general, and to many individual members in particular, over a period of thirty years.

Diplomas: Diplomas were awarded to the following members for papers presented at the branches or conference named below:

Mr. E. J. Brown	Sheffield branch
Mr. S. L. Finch	Tees-side branch
Mr. J. Gorman	Scottish branch
Mr. D. T. Kershaw, B.SC.	Newcastle conference
Mr. G. W. Nicholls	Newcastle conference
Mr. D. F. B. Tedds	Birmingham branch

Edward Williams Lecture

Professor R. J. Sarjant, O.B.E., D.SC., delivered the 1952 Edward Williams Lecture at the annual general meeting held at Buxton on June 11, 1952, the title being "Fuel and Metal." The 1953 Edward Williams Lecture will be delivered at the Blackpool conference by Mr. E. W. Colbeck, M.A., F.I.M., under the title "Aspects of Nuclear Fission of interest to Foundrymen and Metallurgists."

National Works Visits Day

The third National Works Visits day was organized by the Wales and Monmouth branch. It was held in South Wales on October 24 and attracted the participation of 155 members in visits to five groups of foundries. These visits are intended to supplement the arrangements made at annual conferences for members to take part in annual national gatherings, and the success of the three annual events held to date has been such that this development can now be regarded as one of the permanent activities of the Institute. The Council wishes to be associated with the warm tribute for the excellent organization and arrangements paid to Mr. A. S. Wall, the Wales and Monmouth branch secretary, at a dinner and entertainment which was held at the Sea Bank Hotel, Porthcawl, on the evening of the day of the visits.

Branch Activities

The Council wishes to take this opportunity of tendering its grateful thanks for the enthusiastic work of the presidents, honorary secretaries and other officers of the branches, which has again ensured a year of conspicuously successful activity in all branch areas. Full syllabuses of meetings, works visits and social functions have been arranged, and from reports received at the Institute's headquarters, it is evident that highly-satisfactory attendances have been a feature of the past winter session.

It its June meeting, the Council, on the recommendation of the London branch, authorized the formation of a section at Southampton. A belief that the high expectations from this development will be attained was encouraged by an attendance of eighty-four members and visitors at the opening meeting. The Council is following with close interest the efforts which the East Midlands branch is making to develop interest in the work of the Institute in the Northampton area, where eventually it is hoped to form a section.

Technical Development and Education

During the year, the Department of Scientific and Industrial Research has recognized the work of the Technical Council and its sub-committees as research work in connection with certain taxation requirements, and in accordance with the Income Tax Act of 1952, section 335. The Council records its gratitude to the Joint Iron Council for the renewal during 1953 of the grant which the Council makes to this Institute for research and development work.

Educational Activities

The Institute has continued to advise on the management of the City and Guilds of London Institute examinations in foundry practice and patternmaking. It is gratifying to report a further substantial increase in the number of candidates taking the examinations in 1952, the results of which are recorded below:

Patternmaking—Intermediate.

Number of candidates.	Pass 1st class.	Pass 2nd class.
306	48	152

Patternmaking—Final.

173	26	103

Foundry Practice—Intermediate.

239	35	102

Foundry Practice—Final.

107	7	77

The following prizes offered on behalf of the Institute were awarded to successful candidates:—

Foundry Practice. Final Grade: Buchanan Medal to Mr. T. C. Stamford, Wolverhampton; Buchanan Prizes to Mr. D. M. Hare, Manchester, and Mr. I. Strode, Llanelly.

Patternmaking. Final Grade: Buchanan Prizes to Mr. J. Hart, Dundee, and Mr. R. B. Swift, St. Helens.

Foundry Practice. Intermediate Grade: P. H. Wilson Prizes to Mr. H. Lister, London (first prize), and Mr. J. M. Sheardown, London (second prize).

Patternmaking. Intermediate Grade: P. H. Wilson Prizes to Mr. M. G. Hazelwood, Melbourne, Australia (first prize), and Mr. E. V. Doran, Romford (second prize).

There has been a steady demand from educationalists during the last twelve months for copies of the revised edition of the specimen notes for teachers entitled *Lectures in Foundry Practice*, based on the Foundry Practice Intermediate Examination syllabus of the City and Guilds of London Institute. Encouraging progress has been made in the work on the corresponding notes for the final examination and there is hope that publication of these will take place during the coming year.

Publications

In addition to the preprints of papers presented at the Buxton Conference, which were made available without charge to all members on request, the following publications have been issued during the past twelve months:—

Volume XLV of *Proceedings;* the *Journal* of the Institute, published at two-monthly intervals, the January issue of which included a summary of the report of sub-committee T.S.33 on "The Solidification Rate of Cast Iron"; the interim report of sub-committee T.S.32 on "Internal Stress in Castings" and the final report of sub-committee T.S.35 on "The Flow of Metal." The Institute's publication *Atlas of Defects in Castings* is now out of print, but in view of a continued demand for copies it has been decided to reprint it.

Foundry Foremen's Training Course

The fifth Foundry Foremen's Training Course was held at Ashorne Hill from April 23 to 25, 1953, and was as outstandingly successful as its four predecessors. The total number present was 175, which almost filled the residential accommodation at Ashorne Hill, though on this occasion it was not necessary to seek additional accommodation in various hotels in Leamington. A full account of the course will be published in the May issue of the *Journal*.

The indebtedness of the Council to the many past-presidents who attended must again be recorded; they were of inestimable assistance to the president in ensuring the success of the course.

Student's Grant

The Student's Grant for 1952, in the form of a course at the National Foundry College, was awarded on the recommendation of the assessors (Mr. L. W. Bolton, Dr. A. B. Everest, Mr. A. S. Worcester, and Mr. G. L. Harbach) to Mr. J. E. Loe, an apprentice patternmaker with Carbodies, Limited, of Coventry. Mr. Loe commenced his studies at the College in September. The Council is pleased to announce that Mr. G. Foster, who received the 1951 grant, was awarded a scholarship which has enabled him to spend a further year at the National Foundry College. In order to avoid involving the donors in certain taxation difficulties, it is possible that the grant may not be renewed in 1953.

International Co-operation

As reported in the July issue of the *Journal*, a party of members, including the secretary, attended the International Foundry Congress at Atlantic City, U.S.A., in May, 1952. The two official representatives of the Institute were Mr. N. P. Newman (past-president and honorary treasurer) and Mr. J. J. Sheehan (past-president).

The most cordial relations continue to be maintained with the American Foundrymen's Society and with the various Continental associations, and an official exchange of papers has again been effected with several of these overseas bodies.

Institute of Australian Foundrymen, *Victoria Division*

Considerable correspondence has taken place during the year with the Victoria division of the Institute of Australian Foundrymen who had expressed the desire for a closer relationship with this Institute. The negotiations which followed were on the lines of a possible amalgamation. A ballot of its members was conducted by the Australian Institute, and intimation has been received to the effect that this ballot was unanimously in favour of amalgamation of the Australian Institute with the Institute of British Foundrymen. In future the Victoria division of the Institute of Australian Foundrymen will be known as the Australian branch (Victoria) of the Institute of British Foundrymen.

Opportunity is taken to express on behalf of the Institute of British Foundrymen a sincere welcome to our Australian members whose organization has now become an integral part of this Institute. We are glad to know that they feel that membership of this Institute will be of benefit to them and to the industry in their country, and in turn this Institute is convinced that the increase in its strength from an already well-established organization will be to the good of the existing members and to the foundry industry generally.

Relations with Other Organizations

During the past year the Institute has again co-operated with a large number of outside organizations, including the Joint Committee on Metallurgical Education, the committee administering the Mond Nickel Fellowships, and many technical committees of the British Standards Institution. Reference to the report of the Technical Council,* shows that co-operation on technical matters has also been fostered with the British Cast Iron Research Association, the British Steel Castings Research Association, the British Non-Ferrous Metals Research Association, the Light Metal Founders' Association. the Association of Bronze and Brass Founders, and the technical committee of the Bronze and Brass Ingot Manufacturers' Association.

Annual Golf Meeting

The seventh annual meeting of the Institute's Golfing Society was held at Woodhall Spa on Saturday and Sunday, September 27 and 28, 1952. In addition to forty competitors, there were thirty wives and spectators in the party. Mr. R. B. Templeton, past-president, was re-elected president of the Society for the ensuing year, and Mr. F. Arnold Wilson, who was re-elected honorary secretary of the Golfing Society, was again responsible for the organization of the meeting.

Council and Committees

Four meetings of the Council have been held during the past twelve months. A similar number of meetings have been held by the Technical Council and the executive committee, and numerous meetings of the standing committees have been held. As will be noted from the report of the Technical Council, the work of the technical sub-committees has been at the same high level as prevailed during the preceding 12 months.

Of the members of the Council elected by ballot for two-year periods, five retire each year by rotation. Those who so retire at the annual general meeting in 1953 are: Mr. L. W. Bolton, Mr. N. C. Charlton, Mr. V. Delport, Mr. P. A. Russell and Mr. G. R. Shotton.

The Council takes this opportunity of paying tribute to the many members who have participated actively in the work of the Institute during the past year, and who have thus made contributions to the steady progress which has been maintained. In particular, the work of the honorary treasurer, Mr. Noel P. Newman, J.P., and of the chairman and vice-

* Shortly to be printed.

chairman of the Technical Council, Mr. A. E. Peace and Dr. A. B. Everest, has been of a character deserving special mention.

At the annual general meeting to be held at Blackpool on June 17, the Council will nominate the following officers for the year 1953-54: As *president,* Mr. E. Longden, M.I.MECH.E.; as *senior vice-president,* Mr. John Bell; and as *junior vice-president,* Dr. A. B. Everest.

1952 Conference

The Council wishes to express special appreciation of the work of the conference committee, the conference treasurer, and all others who were responsible for the arrangements for the highly-successful conference held at Buxton and Sheffield in June, 1952.

The fiftieth annual conference, organized by the Lancashire branch, will be held at Blackpool from June 16 to 19, 1953, inclusive.

The report is signed by Dr. C. J. Dadswell, president, and Mr. T. Makemson, secretary.

T.U.C. and the Steel Board

Criticism of trade-union leaders who have joined the newly-appointed Iron and Steel Board has been widespread. Scottish and South Wales miners have protested against the acceptance of these positions by Sir Lincoln Evans, Mr. James Owen, and Mr. Andrew Naesmith, who received a knighthood in the recent Honours List. The Association of Supervisory Staffs, Executives, and Technicians at its recent annual conference at Clacton repudiated their actions and the Amalgamated Engineering Union's monthly journal contains an editorial, certainly on more temperate lines, which foresees "grave difficulties" ahead for the T.U.C. movement through them. Many critics demand the removal from the general council of the T.U.C. of those who have joined the Steel Board.

When the Minister of Supply announced Sir Lincoln's appointment as vice-chairman of the Board, it was stated that he had arranged to resign his general secretaryship of the Iron and Steel Trades Confederation, and it is presumed that he will give up his position on the T.U.C. general council in the near future. Mr. Naesmith, who is general secretary of the Amalgamated Weavers' Union, lays down that office on reaching the age of 65 at the end of July. He made a personal statement about his acceptance of the appointment last week which, he said afterwards, was neither condemned nor applauded.

Mr. Owen, who is general secretary of the National Union of Blastfurnacemen, and was authorized by his union to join the Board in a part-time capacity provided it did not conflict with the policy of the T.U.C. and the Labour Party, decided last week to resign the secretaryship of his union. He has also asked that his nomination for next year's T.U.C. general council should be withdrawn.

A FURTHER FALL in the number of unemployed in the Midlands was announced on June 9 by the Regional Office of the Ministry of Labour in Birmingham. The rate of unemployment for the Midland Region is now 1.2 per cent. of the working population, the average percentage for Great Britain being 1.6. Two-thirds of the 900 employees at the Smethwick works of Guest Keen & Nettlefolds, Limited, who were placed on short time last January, have returned to full-time working.

Record May Steel Output

Steel output in May, which was affected by the Whitsun holiday, reached the highest rate ever recorded in May, at 350,700 tons a week, which compared with 312,400 tons a week in May last year. Pig-iron output, which averaged 214,700 tons a week compared with 201,100 tons a week in May, 1952, was also at a record rate.

The annual rate of steel production in May was nearly 2,000,000 tons greater than in May, 1952, at 18,236,000 tons compared with 16,245,000 tons, while pig-iron production was at an annual rate of 11,165,000 tons compared with 10,456,000 tons in May last year.

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

	Pig-iron.		Steel ingots and castings.	
	Weekly average.	Annual rate.	Weekly average.	Annual rate.
1953—1st quarter ..	214,500	11,152,000	350,100	18,207,000
April	212,800	11,063,000	348,500	18,124,000
May	214,700	11,165,000	350,700	18,236,000
1952—1st quarter ..	199,100	10,355,000	307,500	15,991,000
April	201,400	10,472,000	305,100	15,866,000
May	201,100	10,456,000	312,400	16,245,000

British Columbian Ore Project

An estimated initial production of 25,000 tons of ferro-alloys yearly, in addition to pig-iron, alumina, and base-metals, is announced by Quebec Metallurgical Industries, associated with Ventures, Limited, from a project to bring ore from all parts of the world for refining in Northern British Columbia and the Southern Yukon.

The first stage in the development is due for completion by 1955 and two new companies, North West Power Corporation and Yukon Metallurgical Industries, have been formed to handle the operation of the project. It is expected that the second company will be able to treat low-grade bauxite ore to produce refined alumina with ferro-silicon as a by-product.

Trade at South Wales Ports

In the period up to May 17 this year the principal gain in imports into the South Wales ports of Cardiff, Swansea, Newport, Barry, Port Talbot, Penarth, and Briton Ferry was in iron ore, which increased from 692,522 tons in the same period of 1952 to 908,177 tons. Pitwood arrivals fell from 153,230 tons to 68,016 tons.

Exports of tinplate to foreign destinations rose from 99,449 tons in the same period last year to 101,541 tons up to May 17 this year, and iron and steel manufactures from 88,579 tons to 95,319 tons.

Coastwise shipments of coal and coke fell from 1,626,587 tons last year to 1,286,839 tons, but foreign shipments rose from 1,272,025 tons to 1,436,816 tons. Exports of patent fuel fell heavily from 157,016 tons to 60,147 tons—more than 60 per cent.

DURING THE WEEK ended May 30, 215,539 tons of iron and steel was conveyed from the principal steelworks and 318,500 tons of iron ore was carried by rail.

Steel Realization Agency Appointed

Sir John Morison, a partner in Thomas McLintock & Company, chartered accountants, of London, E.C.4, is to become chairman of the Iron and Steel Holding and Realization Agency, which has been appointed by the Chancellor of the Exchequer in accordance with the provisions of the Iron and Steel Act, 1953, to take over and dispose of all securities held by the State when the appointed day is fixed. His salary will be £6,000 a year. Sir John Green, now chairman of the Iron and Steel Corporation of Great Britain, is to serve as a member of the agency at a salary of £3,500.

Making this announcement in a Parliamentary answer in the House of Commons last week, Mr. R. A. Butler stated that the Act prescribed that in addition to the chairman the agency should be composed of not less than three nor more than six members. For the moment he had appointed five in addition to the chairman.

Sir John Morison was surrendering those of his directorships which could conflict with his duties as chairman of the agency. Sir John Green would devote the greater part of his time to the business of the agency.

Chairman and Members

SIR JOHN MORISON has been acting as adviser to the Chancellor on this matter since January. Besides being a partner in Thomas McLintock & Company, he is a director of Guest, Keen & Nettlefolds, Limited, the Finance Corporation for Industry, Limited, and Grange Trust, Limited. From 1942-45 he was Director-General (Finance and Contracts), Ministry of Supply. In 1936 he served as a member of the McGowan Committee on Electricity. He was also a member of the committee set up under the General Claims Tribunal Compensation (Defence) Act, 1939-42, and was a member of the War Damage Commission from 1941-48. He is 60.

SIR JOHN GREEN succeeded Mr. Steven Hardie as chairman of the Iron and Steel Corporation of Great Britain on Mr. Hardie's resignation in February last year. Until then he had been deputy chairman of the Corporation, which was set up in 1950. When he joined the Corporation, Sir John was a director of Thos. Firth & John Brown, Limited, Firth Brown Tools, Limited, Hack Saws, Limited, Iron Trades Employers' Insurance Association, Limited, and Iron Trades Mutual Insurance Company, Limited. He was also chairman of the Central Conference of the Engineering and Allied Employers' National Federation, a director of the East Midlands Gas Board—a position he still retains—and vice-chairman of the East and West Ridings Regional Board for Industry. He was knighted in 1949.

The other four members, who will each receive a salary of £1,000 a year are:—

MR. A. C. BULL, who was principal of the Discount Office of the Bank of England from 1936 to 1950, when he retired.

SIR THOMAS CHADWICK, accountant of the Treasury until May 31 this year.

SIR OLIVER FRANKS, late United Kingdom Ambassador in Washington. Sir Oliver was Permanent Secretary to the Ministry of Supply from 1945-46.

MR. C. P. L. WISHAW, a solicitor and partner in the firm of Freshfields.

NEW PLANT being put into operation at Donawitz, Austria, this month will increase crude steel production capacity by 150,000 tons to 660,000 tons a year.

Essential Qualifications

Five "necessary foundations" for industry were defined by Sir Arthur Smout when he spoke at Dudley Rotary Club on June 8. In addition to the human factor, he said, it was essential to have a skilled, foresighted and enlightened management, not afraid to assert its leadership; a market for the goods provided; willing customers; satisfactory relations with the community in which industry is located and taking thought for the social consequences of operating in those areas; and shareholders, who, by loaning their savings, provide the means of production.

The ultimate aim of those entrusted with the responsibility of management in industry must be to develop people to the point at which as much self-government as possible could be devolved upon them, said Sir Arthur. Management of industry was raised to a higher order of power with each advance towards self-responsibility of those below it.

Staveley Foundry Training Centre

(*Continued from page* 707)

with tools supplied by the Company. Films, lectures and wall charts supplement the practical lessons, and trainees are encouraged to attend the local college of technology for the City and Guilds course on foundry practice. They also have lectures on accident prevention and visits to the laboratories, pattern-shop and other sections of the works.

Apprenticeships

Those who successfully complete the pre-apprenticeship course go forward to more advanced work on their own initiative, under their instructors' supervision, and are expected to sign an apprenticeship agreement when they are about 16 yrs. of age. Those who do not reach the required standard are offered semi-skilled work. During the pre-apprenticeship time, trainees are paid on a day-work basis, but when an apprenticeship agreement has been signed, a merit-bonus scheme becomes operative. This is based on: workmanship and progress, keenness and perseverance, co-operation and general attitude, conduct and appearance, respect for elders, time-keeping and attendance, further education and attendance at technical college.

Military Training

Fit apprentices must, of course, undergo National Service, but they may, if they wish, seek deferment from call-up to enable them to complete their apprenticeship at 21. If the apprentice elects to carry out his National Service obligations at 18, thereby breaking his training, he can complete his course under the Interrupted Apprenticeship Scheme as agreed between the Federation of Employers and the Confederation of Shipbuilding and Engineering Unions. On re-instatement at the completion of National Service, a refresher course in the Training Centre brings the former apprentice "into the picture" once more. At the moment, eight apprentices and two fettlers are undergoing National Service training.

News in Brief

NEWMAN INDUSTRIES, LIMITED, announce their new London office address at Terminal House, Grosvenor Gardens, London, S.W.1 Tel.: SLOane 8206.

AT THE ANNUAL DINNER of the Institution of Production Engineers at Harrogate on June 25, the guest of honour is to be Viscount Swinton, Secretary for Commonwealth Relations.

AN "OPEN DAY" was recently held at the Diesel-engine works of W. H. Dorman & Company, Limited, Stafford, and visitors were able to see the various processes of manufacture.

THE LIFTING OF THE BAN on exports of scrap iron from Ceylon, which was imposed six years ago, has been recommended by the economic planning committee of the Ceylon Cabinet.

FIELDEN (ELECTRONICS), LIMITED, were the only exhibitors from Great Britain in the section devoted to electronic instruments and control apparatus at the Liège International Trade Fair.

UNDER THE AUSPICES of the Combustion Engineering Association a "Fuel Efficiency in Industry and Home Exhibition" is to be held at City Hall, Deansgate, Manchester, from November 18-28.

"A BRIEF HISTORY OF CAST IRON," by Mr. M. Martin (Markham & Company, Limited), was one of the papers read at the "Foremen's Night" at a recent meeting of the Chesterfield and District Foremen's Association.

A COMPACT power-feed attachment for the "Metalclad" fusion cutter has been developed by George Cohen, Sons & Company, Limited, world distributors of this machine, which is designed to cut and profile tough materials at high speeds.

THE DIRECTORS of H. W. Lindop & Sons, Limited, malleable ironfounders, of Walsall (Staffs), announce that the company has purchased the whole of the issued capital of T. C. Neville & Sons, Limited, engineers, ironfounders, of Walsall, for £50,000.

IN EIGHT YEARS ended April, 1953, Richardsons Westgarth & Company, Limited, and its associated companies have supplied and effected complete propelling machinery installations in 240 vessels of all types, with a total dw. capacity of 1,758,549 tons.

THE FUEL TECHNOLOGY DEPARTMENT of Sheffield University is to issue a report to Sheffield, Rotherham and District Smoke Abatement Committee and to the Fuel Research Board, which have subsidized research over the past four years on a virtually smokeless mechanical coal burner that will heat steel from cold.

AN APPLICATION by the Irish Engineering and Foundry Workers' Union regarding wages and conditions of some of its members, who are employed by J. J. Conway & Sons, foundry proprietors, Jamestown Road, Dublin, was heard in the Eire Labour Court in Dublin on Thursday last. No representative of the employers attended the hearing. The Court will make its recommendations later.

MR. BASIL RAWSON, assistant branch manager of the heating and air-treatment division of the Brightside Foundry & Engineering Company, Limited, Sheffield, attended the U.N.E.S.C.O. working party conference in France over the weekend. The subjects of discussion were the problems of young people in recently industrialized areas and active methods and techniques of education for apprentices.

THE HEAVY ENGINEERING SIDE of the company is assured of a steady load for the next two or three years, but incoming business for its smaller trade lines of pumps has eased in recent months, largely due to import restrictions abroad, particularly in India, says Sir Samuel R. Beale, chairman of Worthington-Simpson, Limited, Newark-on-Trent, in his statement accompanying the annual report and accounts for 1952.

THERE HAS BEEN placed on exhibition in the Marine Engineering Collections at the Science Museum, South Kensington, London, S.W.7, by courtesy of the Anglo-Saxon Petroleum Company, Limited, a sectioned model (scale 1:8) of the 1,200-b.h.p. gas-turbine installation fitted in 1951 in their 12,250 tons m.s. Auris. The museum is open on weekdays 10 a.m. to 6 p.m.; Sundays 2.30 p.m. to 6 p.m.; admission is free.

VARLEY PUMPS & ENGINEERING, LIMITED, Brentford (Middx), which was acquired recently by the Food Machinery & Chemical Corporation of America, is arranging to produce in this country the "Peerless" range of deep-well vertical turbine pumps and the "John Bean" range of agricultural spraying equipment, food processing and canning machinery, and packaging equipment, and to extend its present range of pumps and structural products.

A CLARIFICATION of individual responsibilities of the directors of the West Bromwich firm of Geo. Salter & Company, Limited, manufacturers of springs and roller bearings, is announced. Under the general direction of Mr. R. P. S. Bache, managing director, specific functions are now distributed as follow:—Sales, Mr. R. S. Bache; technical, Mr. J. K. Bache; commercial, Mr. N. R. Reaney; production, Mr. P. F. C. Drabble.

BIRMINGHAM PUBLIC WORKS DEPARTMENT which, last January, accepted a challenge from the Iron and Steel Federation to lift 6,000 tons of tramlines by September 30 and so obtain a special price for scrap metal offered by the Federation, will complete the task by the end of June, three months ahead of schedule. The Federation laid down that if 6,000 tons of steel could be recovered by the end of September, Birmingham, should be paid £12 a ton for it, double the price for scrap steel when the offer was made. Already 5,600 tons have been recovered and delivered to steel works.

THE LOCOMOTIVE MANUFACTURERS' ASSOCIATION OF GREAT BRITAIN are assisting the Government of India in the development of the Chittaranjan locomotive works in West Bengal, one of the projects of the India 5-year Plan. The agreement provides for technical advice on the most efficient and most economical methods of providing locomotives and boilers at Chittaranjan; and includes the provision by the L.M.A. of skilled supervising and production staff for the works, and of facilities for the training of Indians in the workshops of U.K. manufacturers who are members of the L.M.A.; and the supply of equipment and components as required until the Chittaranjan works are in full operation.

TRIPLEX FOUNDRY, LIMITED, in their preliminary statement of results for the year ended March 31, disclose a contraction of earnings, not unexpected in view of the fact that, because of a slackening of orders for their normal products early in 1952, the firm took an increased amount of rearmament work, from which profit margins are lower, in order to maintain a satisfactory level of output. On the trading account there is a surplus of £26,190, which compares with £37,799 for the previous period, while net revenue, after taxation, has fallen from £13,700 to £9,240. In consequence, shareholders who last year had their dividend raised from 7½ to 10 per cent. are this year to receive 9 per cent.

Personal

MR. W. RALPH BLAKEBOROUGH, a director of J. Blakeborough & Sons, Limited, of Brighouse, has been made a Justice of the Peace.

MR. LESLIE GAMAGE, vice-chairman of the General Electric Company, Limited, London, W.C.2, has been re-elected president of the Institute of Export for the 11th successive year.

DR. R. BELCHER, senior lecturer in the Department of Analytical Chemistry of Birmingham University, has been invited to be a guest lecturer at the 26th International Congress of Industrial Chemistry in Paris on June 22.

SIR JOHN COCKCROFT, director of the Atomic Energy Research Establishment, Ministry of Supply, and Scientific Adviser to the Minister of Defence, had conferred upon him the degree of Doctor of Science at Cambridge on June 4.

SIR CLAUDE GIBB, chairman and managing director of C. A. Parsons & Company, Limited, engineers, turbine makers, etc., of Newcastle-upon-Tyne is reported to be making good progress in hospital after treatment for a heart ailment.

CAPT. J. MACLEOD CAREY, MR. SIDNEY B. HASLAM, and MAJOR E. MONTGOMERY SWAN have completed 50 years' membership of the South Wales Institute of Engineers. They were presented with certificates of life membership at the last meeting of the institute.

TO MARK their retirement, two directors of Aveling-Barford, Limited, earth-moving equipment manufacturers, of Grantham, MR. E. R. HOWLETT, works manager, and MR. C. J. RITCHIE, sales manager, have received presentations; they are succeeded by MR. N. C. EARL and MR. J. L. RITCHIE respectively.

TWO MEMBERS of the Standard Motor Company, Coventry, have arrived in Manila, the Philippines, to discuss plans to assemble cars in the Philippines for local distribution. They are Mr. George Wallis, an overseas production executive, and Mr. John Christensen, an export commercial manager.

THE VISCO ENGINEERING COMPANY, LIMITED, Croydon, announce that the founder and chairman, Mr. F. Curt Smith, after thirty-two years with the company, has now retired from active participation. Col. G. Mallett, M.C., T.D., has been elected to the chairmanship in succession to Mr. F. Curt Smith. Mr. Fred C. Smith will continue as managing director.

FOR THE FIRST TIME in its 70 years' history, the New Conveyor Company, Smethwick, have presented long-service awards to employees. Twenty-two workers each with 25 years' service or more received gold watches from Mrs. W. Ralph Purnell, the managing director's wife. The presentations were made at the firm's Coronation party, which included a dance attended by some 600 guests.

MR. AND MRS. G. R. WEBSTER, of Biddenham, Bedford, who are at present in Southern Rhodesia, have been honoured by an invitation from His Excellency, the Governor of Southern Rhodesia, Major-General Sir John Noble Kennedy, K.C.M.G., K.C.V.O., K.B.E., C.B., M.C., and Lady Kennedy to meet Her Majesty Queen Elizabeth, the Queen Mother and Her Royal Highness, Princess Margaret, at Government House, Bulawayo, on July 3. Mr. Webster is a past-president of the London branch of the Institute of British Foundrymen.

Steelworks' Effluent in the Dee

Mr. Justice Dannckwerts in the Chancery Division has fixed for July 13 the hearing of an action brought against John Summers & Sons, Limited, Hawarden Bridge Steelworks, Shotton, Chester, by owners of fishing rights on the River Dee, who allege that pollution of the estuary by an effluent containing cyanide from a steelworks has killed large numbers of salmon. Sir Hartley Shawcross, Q.C., for the defendants, asked for the hearing to be deferred until October. He said his clients did not admit liability, but, immediately on receiving the complaint took steps which they believed had completely decontaminated their effluent, and now piped the effluent into the sea. Tests were being made and he hoped to produce evidence to show that no further damage was to be anticipated. Mr. Justice Danckwerts has given the defendants liberty to apply for a different date if they can produce evidence suggesting that no harm could result if the case were not heard until October.

Clyde Order Cancelled

Two 10,000-ton cargo motorships ordered from Lithgows, Limited, Port Glasgow, by the Anchor Line, have been cancelled. In a statement to stockholders, Sir F. Michael K. Kielberg, chairman of United Molasses Company, Limited, which owns the Anchor Line, said: "Last year's imposition of the excess profits levy increased the company's tax liabilities by £825,000 for 1952, and made our total tax burden so crushing that your directors, in order not to run the risk of impairing the company's position, thought it prudent to cancel two of the eight vessels for which the group had placed orders in 1951 and early in 1952."

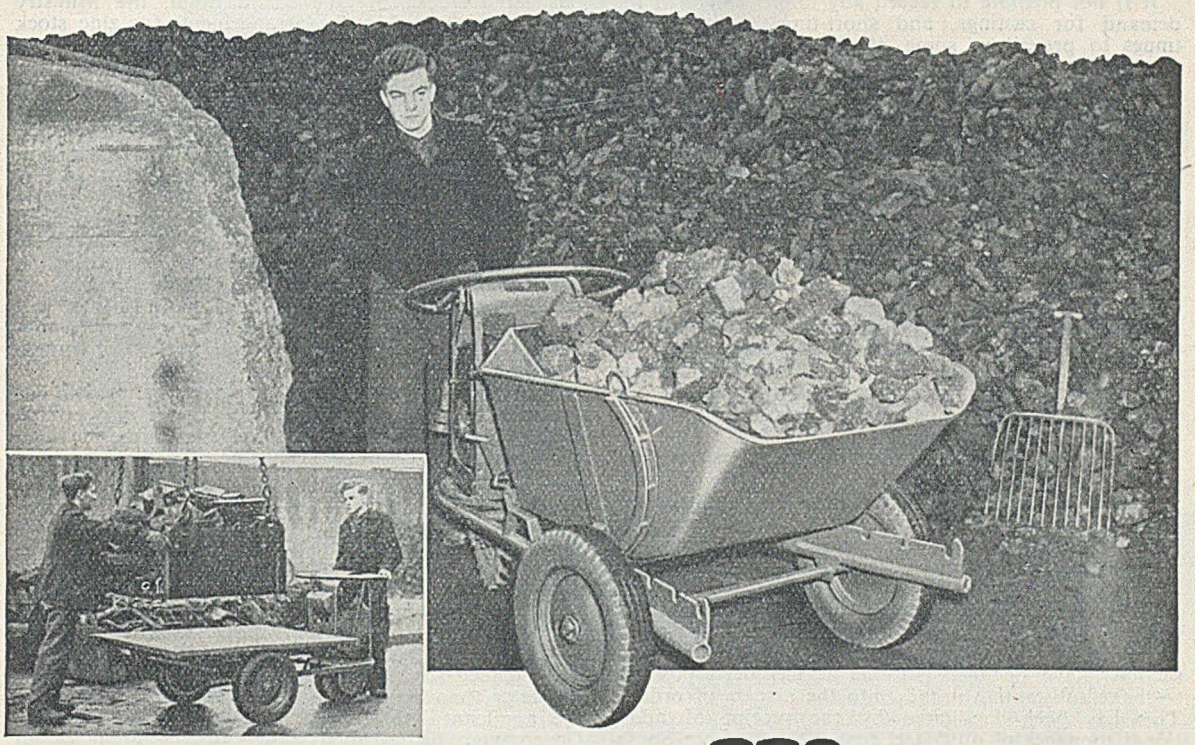
GOODWIN BARSBY & COMPANY, LIMITED, iron founders and engineers, Watling Street, Leicester, are completely reorganizing their foundry and are installing a new type of air-conditioning plant introduced from Sweden. New machinery is being installed, together with washrooms.

THE UNITED STATES DEPARTMENT OF COMMERCE has extended the validity period for current export licences covering steel, copper, and aluminium controlled materials to September 30. The extension only applies to licences issued against second quarter, 1953, allotments which would have expired on June 30.

A. S. SMITH & SONS, of Charles Street, Walsall, played a small but important part in equipping the British expedition to Everest. The expedition faced the difficulty of lacing and unlacing boots in temperatures below zero and with fingers muffled by thick gloves. The Walsall firm carried out experiments and designed a brass buckle which was accepted as meeting the requirements of the expedition, and which was therefore incorporated in their equipment.

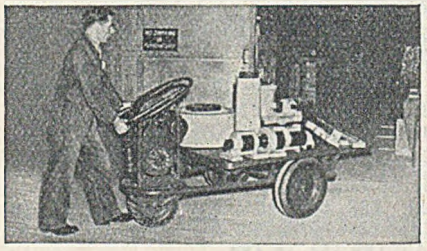
BIRMINGHAM UNIVERSITY'S Institute for Engineering Production—an extension of the Department of Engineering Production—is to be opened on July 16. The establishment of this new centre for continued studies in engineering production, was made possible by a gift of £57,400 under a seven-year covenant, from Joseph Lucas & Company, Limited, whose original endowment led to the founding of the department. The University has acquired and equipped a house in Norfolk Road, Edgbaston, for the centre. The aim of the Institute is to develop a series of short residential courses in engineering production and management subjects for executives in industry. Prof. T. U. Matthew is to direct the activities.

We've proved it pays!



Loading scrap metal for cupola

Sand from stock-pile to mixer



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does a wonderful job for the famous Winget Meehanite Foundry.

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

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Tilt the wheel—it starts. Release—it stops.
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Raw Material Markets

Iron and Steel

It is not possible to record any improvement in the demand for castings, and short-time working continues to prevail at some of the ironfoundries. In fact, there is redundancy of labour in some quarters. Every effort is being made to gain fresh business, but the task is far from being an easy one. Loss of export markets has had severe repercussions on order-books, home requirements being insufficient to make good the deficit. The light foundries, together with some of the jobbing foundrymen, are feeling the effects of the recession in overseas trade, with the result that the call for high-phosphorus pig-iron has declined. The most active foundries continue to be those catering for the needs of the steelmakers, collieries, and machine-tool makers.

Even with the present reduced demand, current production of foundry pig-iron only just covers requirements, any surplus being quite small. There is little incentive for consumers to buy supplies for stocking purposes, so that current business is largely confined to immediate needs.

Supplies of scrap are reaching foundries satisfactorily, on the whole, while there is also little difficulty in obtaining the desired quantities of foundry coke, ganister, limestone, and firebricks. In the case of coke, it would certainly be advisable for consumers to take up their allocation, because there is pressure abroad for our hard coke.

The past few weeks have witnessed a considerable change in the position of the re-rollers. Orders from home sources for basis sizes of small steel bars and sections have declined, so that it has been possible to make substantial inroads into the arrears of orders. This has been facilitated by the receipt of additional tonnages of mild-steel semis, chiefly from South Wales and by way of imports, the latter being confined almost entirely to ordinary mild steel. Sheet re-rollers are actively engaged on the thicker sheets; orders for thin sheets, however, are scarce. Oversea competition for black and galvanized sheets is becoming more intensive.

Non-ferrous Metals

It is some weeks now since serious comment and complaint began in the United States about the price levels in London of zinc and lead. The latter has recently improved in value in London, while in the United States the quotation moved up to 13½ cents, the highest level seen for some time past. But zinc remains at 11 cents and friends of this metal cannot fail to comment adversely on the comparative values of the two metals, which have reversed their positions on a valuation basis since before the war. To sell lead and buy zinc is still thought in some directions to be a wise thing to do for the long term. In the U.S.A., usage of zinc has been running at a record high level, but supplies seem to be ample, even though some marginal properties are reported to have closed down. In the U.K., consumption of zinc keeps up fairly well and it is not much below the level at this time last year, although usage in connection with brass has suffered through fears of what the copper price will do between now and the autumn. Although there is no difficulty in securing G.O.B. brands here, there seems to be something of a squeeze for high-grade, at any rate for prompt delivery. Lead is certainly in short supply, and on the London market last week the premium for June over September widened to £5 10s.

Trading in Whittington Avenue has not been quite so brisk and the turnovers have been hardly up to the average.

In view of reports that the Ministry of Materials has large stocks of zinc for disposal, the Ministry announces that when the arrangements for zinc stock disposal published on December 15 last come to an end next July and after transfers to strategic reserves, its stocks remaining for sale will be limited to about 70,000 tons. As hitherto, it is proposed to sell these limited quantities gradually over a period, and the Ministry is satisfied that, with world production running at an annual rate of around 2,000,000 tons, the effect on the balance of supply and demand will be insignificant. There will be early discussions with the trade on disposal arrangements, and the actual rate of sale will be decided in the light of these talks. A further announcement will be made in due course. In addition to disposals from stock, the Ministry will continue to sell zinc bought from current production under contracts made during the period of public trading.

The Ministry of Supply has noted a revival of demand for unwrought brass and copper alloys from certain oversea markets. At the same time, demand in this country remains stagnant pending the reopening of free trading in copper. In order to enable holders of export quotas to take advantage of the good prices available for export, the Ministry will exclude exports to Canada or the United States from the quota already announced for the current quarter, provided the price is satisfactory. For other destinations the Ministry is prepared to deal *ad hoc* with applications above the quota on condition that:—(i) the price is really good; (ii) the metal is for consumption by the buyer and not intended for refining; (iii) the metal is for delivery not later than August; (iv) evidence is produced that the applicant has a firm order from his customer. Orders may be accepted subject to the grant of an export licence, but holders of export quotas are advised to make application for licences as soon as they accept the order. These concessions are liable to be withdrawn if it appears that the home demand for ingots is reviving or if it appears that the prices obtainable abroad have fallen.

The following official tin quotations were recorded:—

Cash—June 11, £700 to £702 10s.; June 12, £700 to £702 10s.; June 15, £690 to £692 10s.; June 16, £677 10s. to £680; June 17, £672 10s. to £675.

Three Months—June 11, £700 to £702 10s.; June 12, £700 to £702 10s.; June 15, £690 to £692 10s.; June 16, £677 10s. to £680; June 17, £672 10s. to £675.

Official zinc prices were as follow:—

June—June 11, £70 to £70 10s.; June 12, £70 5s. to £70 7s. 6d.; June 15, £70 2s. 6d. to £70 5s.; June 16, £69 17s. 6d. to £70; June 17, £69 17s. 6d. to £70.

September—June 11, £70 to £70 5s.; June 12, £70 5s. to £70 7s. 6d.; June 15, £69 15s. to £69 17s. 6d.; June 16, £69 12s. 6d. to £69 15s.; June 17, £69 12s. 6d. to £69 15s.

Official prices of refined pig-lead were:—

June—June 11, £88 to £88 10s.; June 12, £90 to £90 10s.; June 15, £89 5s. to £89 10s.; June 16, £88 to £88 10s.; June 17, £88 15s. to £89.

September—June 11, £83 5s. to £83 10s.; June 12, £84 15s. to £85; June 15, £83 10s. to £84; June 16, £83 to £83 5s.; June 17, £83 10s. to £83 15s.

THE UPPER HOUSE of the Western German Government has approved the common Customs regulations of the six countries of the European Coal and Steel Pool.

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

(Delivered unless otherwise stated)

June 17, 1953

PIG-IRON

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

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

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

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

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

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

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

FERRO-ALLOYS

(Per ton unless otherwise stated, delivered).

Ferro-silicon (6-ton lots).—40/55 per cent., £57 10s., basis 45 per cent. Si, scale 21s. 6d. per unit; 70/84 per cent., £86, basis 75 per cent. Si, scale 23s. per unit.

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

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

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

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

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

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

Cobalt.—98/99 per cent., 20s. per lb.

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

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

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

SEMI-FINISHED STEEL

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

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

Sheet and Tinplate Bars.—£25 11s. 6d.

FINISHED STEEL

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

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

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

Tinplates.—57s. 9d. per basis box.

NON-FERROUS METALS

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

Tin.—Cash, £672 to £675; three months, £672 10s. to £675; settlement, £675.

Zinc.—June, £88 15s. to £89; September, £83 10s. to £83 15s.

Refined Pig-lead—June, £69 17s. 6d. to £70; September, £69 12s. 6d. to £69 15s.

Zinc Sheets, etc.—Sheets, 15 g. and thicker, all English destinations, £98 15s.; rolled zinc (boiler plates), all English destinations, £96 15s.; zinc oxide (Red Seal), d/d buyers' premises, £90.

Other Metals.—Aluminium, ingots, £161; magnesium, ingots, 2s. 10½d. per lb.; antimony, English, 99 per cent., £225; quicksilver, ex warehouse, £70 5s. to £70 10s. (nom.); nickel, £483.

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

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

Gunmetal.—Ingots to BS. 1400—LG2—1 (85/5/5/5), £160 to £218; BS. 1400—LG3—1 (86/7/5/2), £172 to £238; BS. 1400—G1—1 (88/10/2), £254 to £275; Admiralty GM (88/10/2), virgin quality, £254 to £300 per ton, delivered.

Phosphor-bronze Ingots.—P.Bl, £275 to £305; L.P.Bl, £215 to £275 per ton.

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

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

Obituary

MR. REGINALD MILLS, of Evesham, for 36 years technical representative for Guest Keen & Nettlefolds, Limited, Birmingham, has died aged 60.

MR. J. A. W. SCHOFIELD, a director and secretary of Oldfield & Schofield Company, Limited, machine-tool makers, of Halifax, died on June 1 at the age of 80.

DR. GEORGE LEWI, vice-chairman of Minworth Metals, Limited, Birmingham, and a director of Peerless & Ericsson, Limited, food preparing machinery manufacturers, of Coventry, and of several other companies, died recently.

MR. JAMES MONTGOMERIE, a director of H. M. Hobson, Limited, aircraft engine component manufacturers, of Wolverhampton, from 1935 until his retirement in 1948, after 36 years' association with the firm, died recently at the age of 73.

LT.-COL. HENRY LEATHER GRYLLS, who has died at the age of 49, was managing director of William Bywater, Limited, textile machinery manufacturers, of Leeds, and a director of P. & C. Garnett, textile engineers, ironfounders, etc., of Cleckheaton (Yorks).

MR. JAMES HENRY WOOD died on June 4 at the age of 66. An underwriter, he was previously secretary and a director of Short Bros. (Rochester & Bedford), Limited, and a director of its subsidiary companies, which included Short & Harland, Limited, aeronautical engineers, of Belfast, and Kent Alloys, Limited, Rochester. These directorships terminated in 1943 when the Government took control of the parent concern.

DR. DANIEL HANSON, D.SC., Professor of Metallurgy and Director of the Department of Metallurgy in the University of Birmingham, died at his home near Alcester on June 12, at the age of 61. He was educated at Wallasey Grammar School and Liverpool University, and then for a time was a member of the research department of Woolwich Arsenal. Later he went to the National Physical Laboratory at Teddington, where he was principal assistant to the late Dr. Walter Rosenhain and principal scientific officer in the department of metallurgy. He went to Birmingham University in 1926 as head of the department of metallurgy, and during his long tenure of the post achieved an international reputation. He lectured in many parts of the world, including the United States, Canada, Australia, and New Zealand, and in 1950 he was a member of the delegation of British scientists which discussed the release of information on atomic research with scientists from the United States and Canada.

THE SPORTS GROUND of Crofts (Engineers), Limited, Bradford, in Lower Rushton Road, Thornbury, Bradford, was opened by the Lord Mayor of Bradford, Coun. Angus Crowther, on Saturday, June 6.

THE MINISTRY OF SUPPLY has announced the following appointments to the advisory council on scientific research and technical development:—Prof. H. W. M. Mason, professor of chemistry at Birmingham University; Prof. J. L. M. Morrison, professor of mechanical engineering at Bristol University; Prof. L. Rosenhead, professor of applied mathematics at Liverpool University; Prof. I. N. Sneddon, professor of mathematics at the University College of North Staffordshire; and Prof. A. R. Todd, professor of organic chemistry at Cambridge University. The Council, under the chairmanship of Prof. Sir Eric Rideal, advises upon the scientific and technical problems with which the Ministry is concerned.

CLASSIFIED ADVERTISEMENTS

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

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

SITUATIONS WANTED

NON-FERROUS Foundry FOREMAN, A.M.I.B.F., desires change. Experienced machine, plate, floor, jobbing and repetition. Used to full control.—Box 3553, FOUNDRY TRADE JOURNAL.

DIRECTOR of Small Iron Foundry in North-Western Area would like to represent Malleable (Blackheart and Whiteheart) Iron Foundry in this area on Agency or Representative basis.—Box 3525, FOUNDRY TRADE JOURNAL.

GENERAL / FOUNDRY MANAGER (37), Grey Iron Foundry, seeks similar position in Midland area. Lifetime experience in production of repetition and general castings. Accustomed full responsibility all foundry departments, laboratory, pattern layout, estimating, ratefixing and sales. Good connections in automobile and allied trades.—Box 3532. 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.

EXPERIENCED FOUNDRY FOREMAN required for Whiteheart and Blackheart Malleable and Grey Iron Foundry in Midlands. Must be experienced with Jobbing, Oddside and Machine Moulding Practices.—Apply, stating full details of experience, salary required, together with references, to Box 3535, FOUNDRY TRADE JOURNAL.

MELTING SUPERINTENDENT required for Melting and Casting Shops at Metal Works near London. Sound engineering knowledge a condition, previous experience an asset.—Write Box B.827, WILLING'S, 362, Grays Inn Road, London, W.C.1.

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

VITREOUS ENAMELLING.—SUPERVISOR required to take control of plant engaged in the enamelling of steel and cast iron. Applicant should have wide and complete experience of all processes, and should be able to take complete control. Continuous furnace experience useful, but not essential. Salary for right man, £800 per annum. Present staff aware of this advertisement. All replies received in confidence.—Box 3531, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT—*Contd.*

SKILLED JOBBING AND MACHINE MOULDERS required; top rates of pay.—SLOUGH FOUNDRIES, LTD., Trading Estate, Slough.

EXPERIENCED ENAMELLER required for Cast Iron Vitreous Enamelling Plant in South Africa.—Box 3539, FOUNDRY TRADE JOURNAL.

EXPERIENCED WORKING FOREMAN required for Aluminium Gravity Diecastings Department, Lancashire.—RANGEMASTER (BLACKBURN) Co., Blakewater Street, Blackburn, Lancs.

FOUNDRY DRAUGHTSMAN required with machine shop experience. Knowledge of Centrifugal Castings desirable but not essential. The job is in Sheffield district. Only applicants of experience need apply, giving details of experience and qualifications to Box 3541, FOUNDRY TRADE JOURNAL.

MOULDING SHOP FOREMAN for Alloy Steel Foundry, Sheffield district. Man accustomed to high quality product. Knowledge of Centrifugal Castings an advantage but not essential. Able to work on own initiative. Good disciplinarian. Age 35 years. Good progressive future for suitable applicant.—Write stating age and qualifications to Box 3540, FOUNDRY TRADE JOURNAL.

NON-FERROUS firm of founders require representative with established connection already calling on engineering and allied trades to introduce their castings, as an additional line, and obtain business on a commission basis only. A representative already handling cast iron and steel castings would suit. Full particulars, size of area covered and other lines already carried.—Box 3505, FOUNDRY TRADE JOURNAL.

WANTED, for Manchester Area, FOREMAN, to take charge of modern Vitreous Enamelling Plant (including Milling, Pickling, Sand-blasting, etc.). Applicant must be fully experienced in enamelling sheet and cast-iron, must also be an efficient organiser and strict disciplinarian. Applications must be made in writing, stating experience and salary required. All communications will be regarded as strictly confidential.—Box 3534, FOUNDRY TRADE JOURNAL.

CHIEF EXECUTIVE required to head Steel Foundry Division of large and old-established Engineering Works. The post is an important one, carrying high responsibility and high salary. Applications are invited from men with excellent production and administrative experience and a good educational and technical background, and will be treated in strict confidence at this juncture.—Fullest details, together with salary expected, should be sent to THE MANAGING DIRECTOR, K. & L. Steelfounders & Engineers, Ltd., Letchworth, Herts.

SITUATIONS VACANT—*Contd.*

PATTERN MAKER : Man experienced on motor or aircraft metal pattern work required for checking duties in Metal Department. Small flat available to suitable applicant.—G. PERRY & SONS, Hall Lane, Leicester.

REPRESENTATIVE wanted by established Foundry Suppliers. Applicants should state age, experience, and salary expected. Must be able to drive car.—Box 3526, FOUNDRY TRADE JOURNAL.

YOUNG Man required, with Foundry and Metallurgical experience, to train as JUNIOR REPRESENTATIVE. State age, experience, and salary required. —Box 3527, FOUNDRY TRADE JOURNAL.

EXPERIENCED TECHNICAL SALES REPRESENTATIVE required for Aluminium Sand and Gravity Die Casting Company, South East London.—Write stating qualifications and salary required to Box 3538, FOUNDRY TRADE JOURNAL.

PATTERNSHOP FOREMAN for Steel Foundry in Scotland (12 Patternmakers). Estimating experience essential. Applicant must have initiative and ability to organise for mechanised production. House available. Send fullest details of experience, age, and salary required to Box 3546, FOUNDRY TRADE JOURNAL.

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

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

SALES REPRESENTATIVE required for shell mould jobbing foundry of important engineering group. Valuable opportunity for man resident in the Midlands with good connections amongst buyers of castings. Own car necessary. Good salary, commission and expenses. Full details in confidence to CHISWICK FOUNDRIES, LIMITED, Terminal House, Victoria, London, S.W.1.

SITUATIONS VACANT—*Contd.*

MIDLANDS Foundry require REPRESENTATIVE (part-time) with contacts in engineering trades, preferably for South and West Country.—Box 3536, FOUNDRY TRADE JOURNAL.

BATH ENAMELLER required, Australia. Should have first dusting experience. Apply, giving full details experience, strict confidence. Free passages applicant and family.—Box 3549, FOUNDRY TRADE JOURNAL.

MANAGER, with practical experience and knowledge of costing, wanted for Iron and Brass Foundry.—State experience and salary expected to Box 3548, FOUNDRY TRADE JOURNAL.

MALLEABLE Iron Foundry (West Midlands) requires experienced and capable WORKS MANAGER.—Full particulars and salary required to Box 3547, FOUNDRY TRADE JOURNAL.

JUNIOR REPRESENTATIVES required for South of England by large Ferrous and Non-Ferrous Foundry to call on Works, Councils and Builders' Merchants, etc. Must have proven sales record and able to drive. State salary, commission and expenses required.—Box 3551, FOUNDRY TRADE JOURNAL.

PATTERNMAKER (First Class), Wood and Metal. Conversant with Design and Construction of high production patterns for motor trade. Able to take control of small pattern shop, West Bromwich. Tool Room knowledge an advantage. Applicant must have held similar position.—Full particulars, including salary required, in confidence, to Box 3550, FOUNDRY TRADE JOURNAL.

NON-FERROUS METAL REFINERS, Birmingham district require Assistant to Chief Chemist. Minimum age 22. Must be fully acquainted with all Non-ferrous alloys, residues, etc. Knowledge of Spectrographic analysis and physical testing preferred but not essential. Present employees aware of this vacancy. Full details, age, experience, etc.—Box 3544, FOUNDRY TRADE JOURNAL.

AGENCY

GREY Iron Foundry in Midlands require AGENT for Northern Counties. Foundry produces repetition quality castings for Electrical Switchgear, small tool and similar purposes. State territory and some details concerning contacts.—Apply Box 3537, FOUNDRY TRADE JOURNAL.

PATENTS

THE proprietors of British Patent No. 633986 are prepared to sell the patent or to licence British manufacturers to work thereunder. It relates to "Improved Method of Making Rotors for Electric Motors." Address: BOULT WADE & TENNANT, 112, Hatton Garden, London, E.C.1.

THE Proprietor of Patent No. 546104 for "Process and Apparatus for Reducing Divided Material such as Ores containing Solid Oxides with Reducing Gas" desires to secure commercial exploitation by Licence or otherwise in the United Kingdom.—Replies to HASELTINE LAKE & Co., 28, Southampton Buildings, Chancery Lane, London, W.C.2.

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FOUNDRY FOR SALE; Yorkshire; Freehold; 2 ton per hour Cupola, etc. —Box 3542, FOUNDRY TRADE JOURNAL.

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PNEULEC ROYER; 1 cwt. Core Sand Mixer; 2 BMM.HPL.1 Machines or similar; Bench Type Core Blower; Drawer Type Core Oven (Coke or Gas). Must be in good condition.—Box 3522, FOUNDRY TRADE JOURNAL.

SCRAP Baling Press required. Mechanically or hydraulically operated.—Send fullest particulars, including drawings, etc., to Box 3533, FOUNDRY TRADE JOURNAL.

WANTED.—6 ft.-8 ft. Grinding Mill, with rack and pinion. Bottom discharge door.—JOSEPH HARPER, LTD., Upper Gornal, near Dudley.

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

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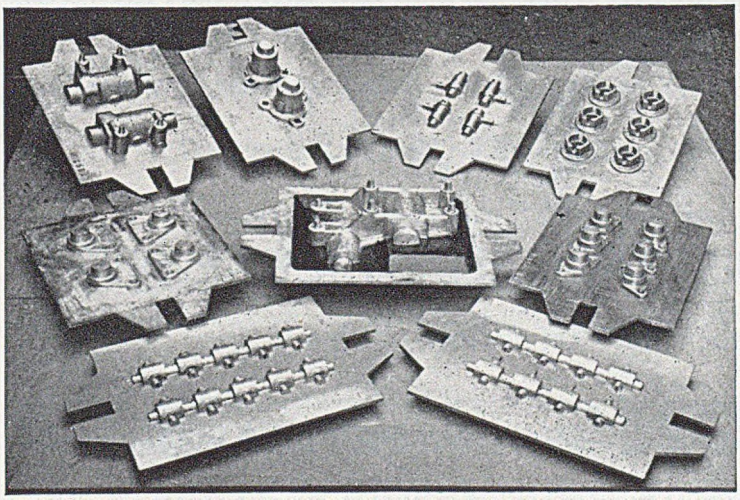

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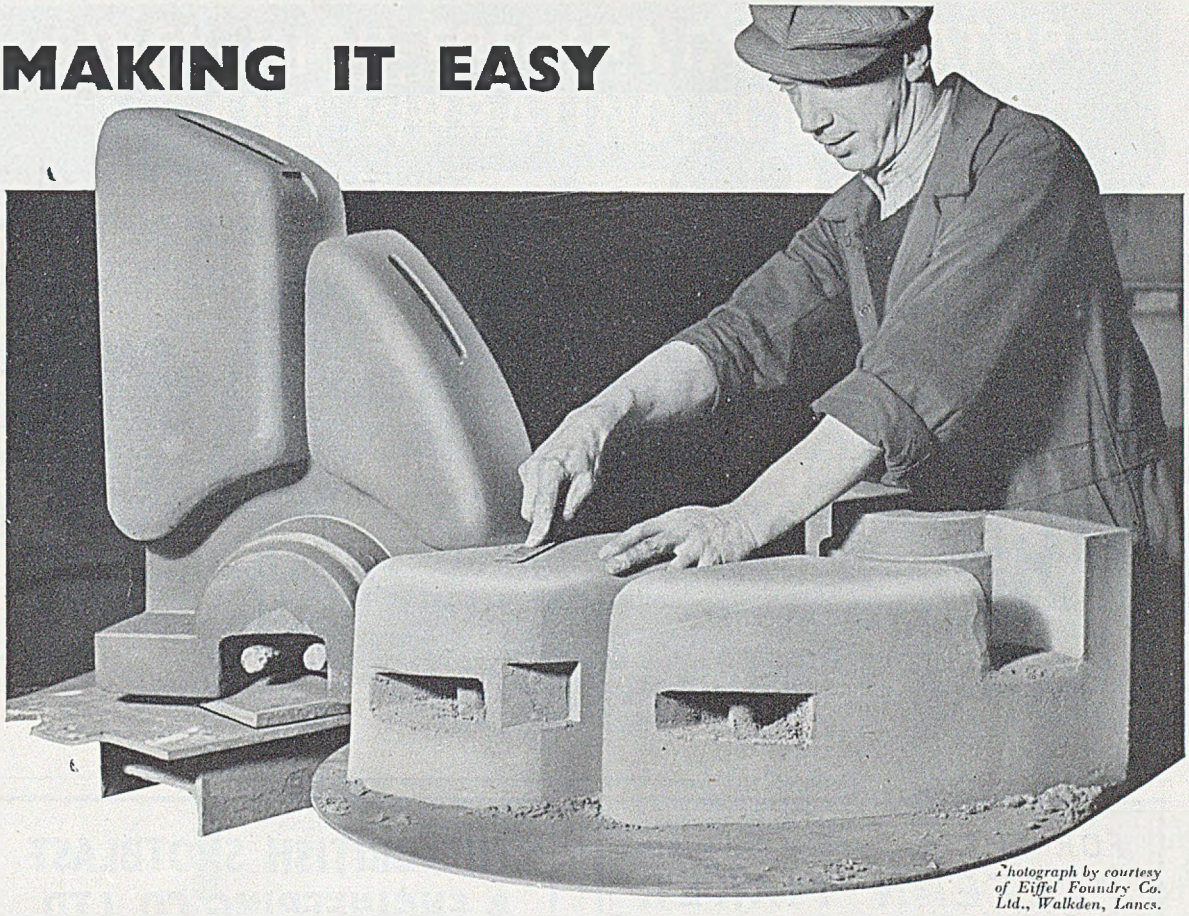

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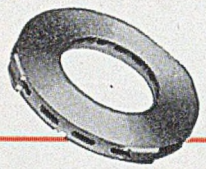
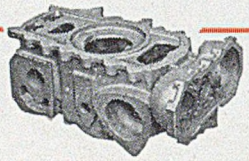


Clutch plate of the main transmission drive in the Centurion tank, cast in Meehanite Metal for Messrs. Borg and Beck Ltd.



Wheel casing of the Centurion tank, cast in Meehanite Metal for the Rover Co. Ltd.

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