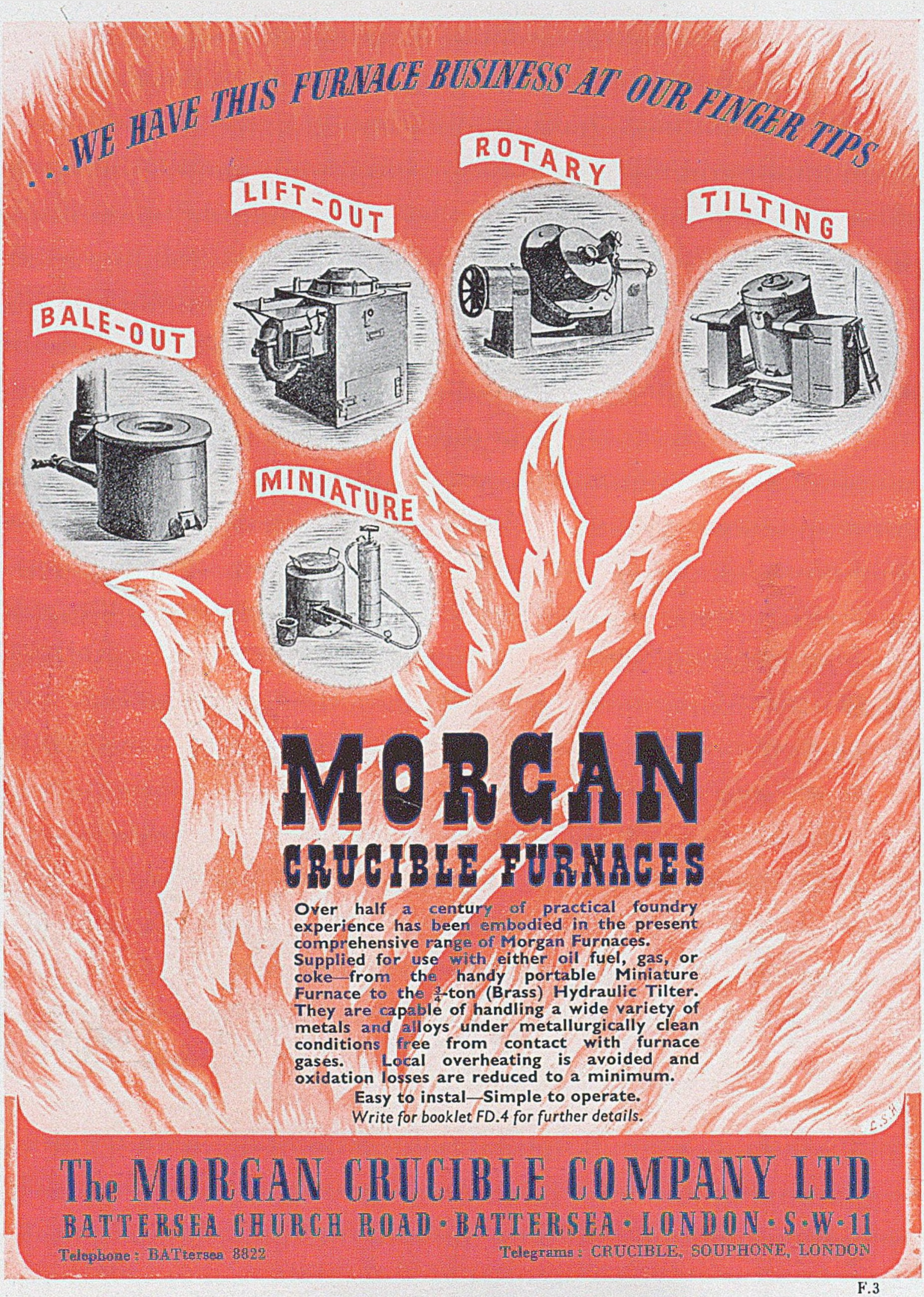
FOUNDRY TRADE JOURNAL

EST. 1902

VOL. 90 No. 1796
Registered at the G.P.O. as a Newspaper

WITH WHICH IS INCORPORATED THE IRON AND STEEL TRADES JOURNAL
FEBRUARY 1, 1951
Offices: 49, Wellington Street, Strand, London, W.C.2

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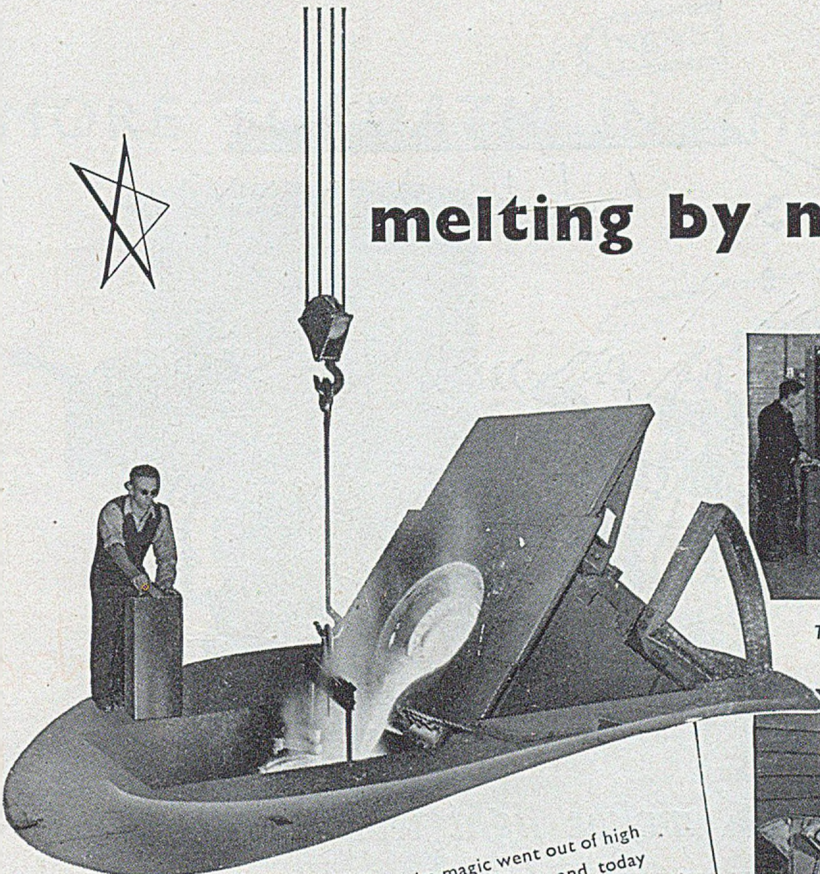

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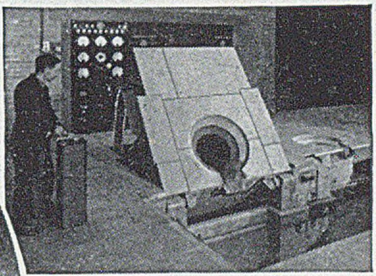

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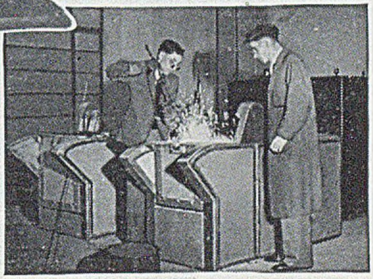

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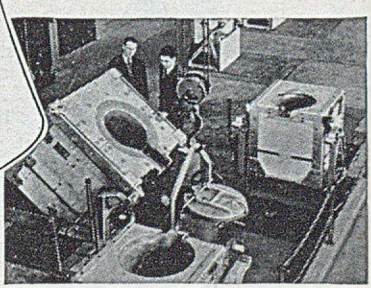

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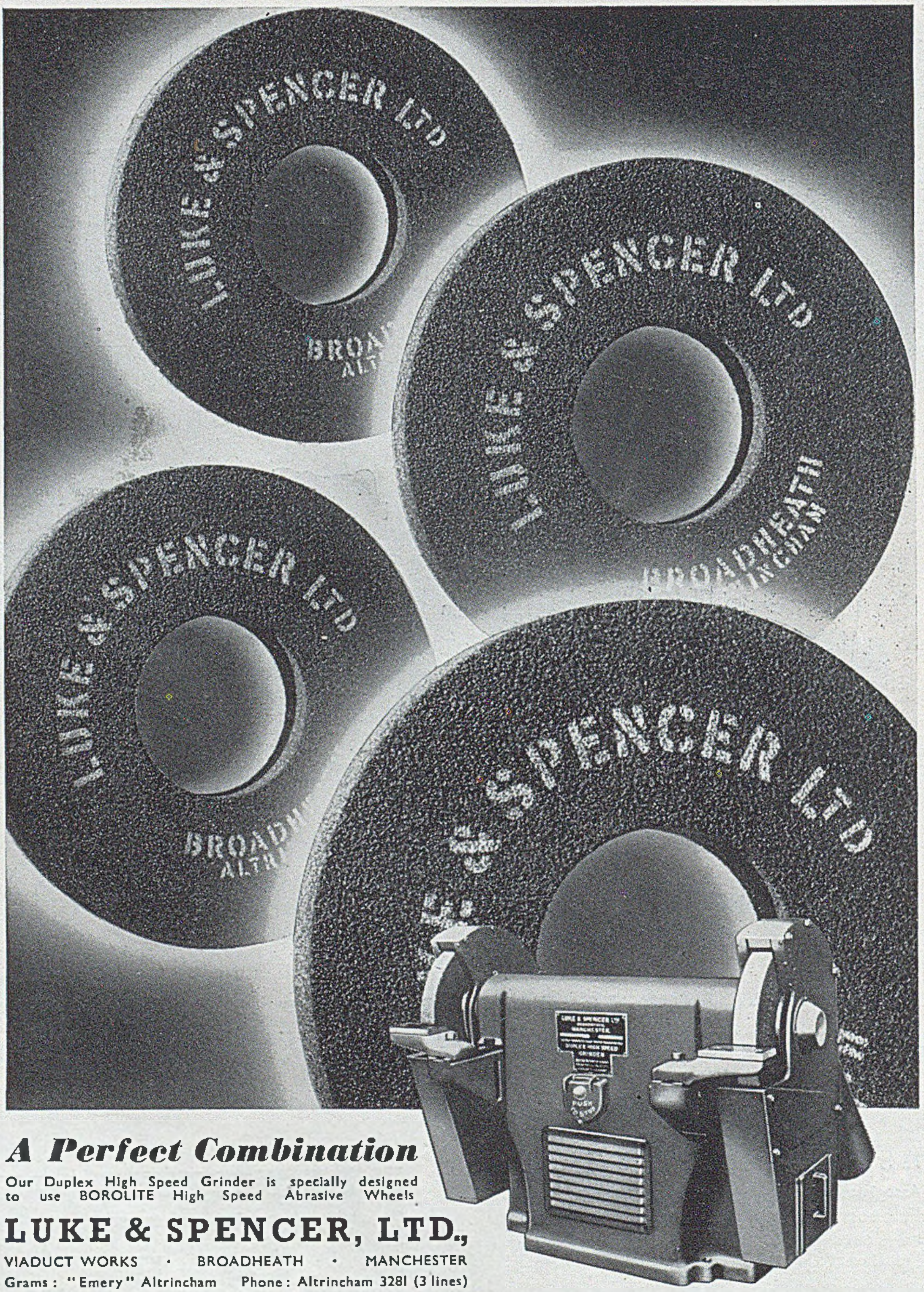
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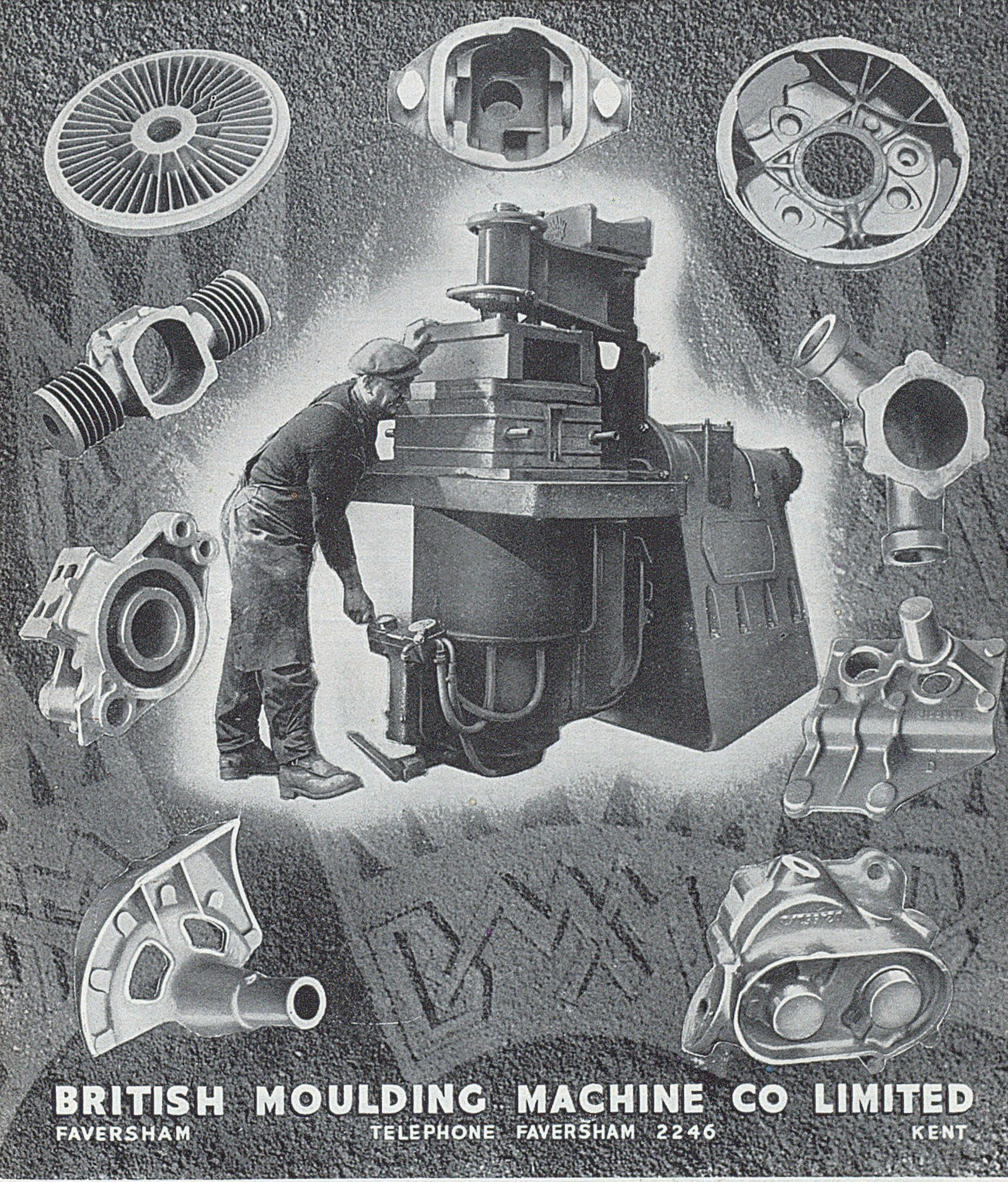

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FOUNDRY TRADE JOURNAL
Established 1902
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PUBLISHED WEEKLY: Single Copy, 9d. By Post 11d. Annual Subscription, Home 40s., Abroad 45s. (Prepaid).

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

"Own Use" Foundries

The man—usually a foreman—who operates a foundry attached to an engineering works usually has a worrying job. Though he may make castings for only a limited range, he is constantly worried as to whether they could be bought more cheaply from outside sources. This makes him more conscious of costs than his counterpart in concerns working for general industry. The latter have an appreciation of what they are doing by the reports from the salesmen, but the former just hears gossip about much lower prices than he imagines he is getting. We are uncertain whether these foundry departments have to carry much higher overheads than the purely foundry concerns, but we should imagine they do. When these executives enter foundry circles they try to compare costs, but except for standard lines, this cannot be done. Until foremen are familiar with broken-down costs—that is, the cost of the liquid metal; of handling raw materials to the cupola; of core-making; of sand preparation; these discussions will be futile.

Another factor in the life of the foreman in the attached foundry is that his immediate chiefs are engineers who possess a mental make up quite different from the individual foundry owner. The engineer is not so appreciative of the multitude of variables entering into foundry practice as those whose sole business it is to manufacture castings. Many dislike the notion of the daily creation and destruction of sand moulds and one at least has made a real good job of making simple grey-iron castings in iron dies. We counsel these engineers who have an iron foundry as a department under their charge to enter into this question of variables as an aid to balanced judgment. Let them compare the material lying in the scrap yard with the orderly consignments of components entering the machine or the erecting shops. Let them examine a little more closely the contents of the sand bins. To them the material is just sand, but to foundrymen it is a complex mass of variables.

To the engineer, the attached foundry is a convenience. It can be relied on to feed the machine shops with a minimum of delay. There is less fuss when some minor modification in design is required or some experimental work has to be done. It should be realised that for these special facilities adequate payment should be accorded as they interfere with the foundry's programme. Thus when assessing the relative costs of the castings on the open market and those made in one's own department, a plus factor should be added to the home-made article purely for "convenience." Obviously, the above remarks do not apply to the very large foundries attached to engineering works, but to those border-line cases where there are periodic discussions as to whether or not it would pay the firm better to buy the whole of their castings requirements from outside sources.

Midland Enamellers' Dinner

Successful Function at Birmingham

On Friday last, the annual (men only) dinner of the Midland section of the Institute of Vitreous Enamellers was held at the Imperial Hotel, Birmingham. Over 90 members and guests participated.

Mr. W. Todd acted as toast-master and, following the Loyal toast, proposed by Mr. A. K. Williams, chairman of the Section, Mr. A. E. Boulton, vice-chairman of the Midland section of the Society of Glass Technology, proposed the toast of the Institute of Vitreous Enamellers. He developed the theme that more "tub thumping" was required from institutes to emphasise the good they were doing for industry to-day. The reply was by the National president of the Institute, Dr. J. E. Hurst, J.P., who dwelt briefly of the shadow which rearmament was casting on the enamelling industry, but felt that, as before, the Institute would flourish in adversity. Next, the chairman proposed a toast to the visitors, stressing the value of free interchange of discussion at meetings which was often stimulated by visitors from an outside organisation. Invitations were issued to glass-technology members and other kindred bodies to participate in Institute affairs. In his reply, Mr. W. E. Cook (also of the Society of Glass Technology) accepted the compliment implied by the invitations and said how true it was that a point of view changed with the environment. A visit to a sphere outside one's own immediate interests provided also an impetus to profitable self-examination. The proceedings were concluded by entertainment, warm thanks being expressed to the dinner sub-committee and the honorary secretary, Mr. D. Sleath, for having organised so successful a function.

Forty Years Ago

In the February, 1911, issue of the FOUNDRY TRADE JOURNAL the Editor slipped up rather badly in lending his support to a lecturer on the futility of adding steel to cupola charges. He should have taken cognisance that these were the views of a man selling special iron, which was possibly compounded from a steel-mix. Even in those days, foundrymen were worrying about fumes, and the firm of William Ross & Sons, of Glasgow, in an article describe the steps they had taken in their brassfoundry. A sheet-metal hood had been constructed for ventilating the skimming area and special crucible lids designed for use during pouring. Brightside Foundry & Engineering Company, Limited, are reported to have received orders to make some very heavy castings for H.M.S. "Dreadnought." Belgium was reported to be exporting steel castings to this country at £16 a ton, less 5 per cent. for cash. The Sheffield price was stated to be £23. Amongst new companies registered was the Carborundum Company, Limited.

Board Changes

AJAX MACHINE TOOL COMPANY, LIMITED—Mr. Norman Garside, general manager, has been elected a director.

SETTLE, SPEAKMAN & COMPANY, LIMITED—Mr. John Black, for many years secretary, has been elected a director of the company.

J. J. SAVILLE & COMPANY, LIMITED, and WILLIAM JESSOP & SONS, LIMITED—Mr. D. A. Oliver, research director of the BSA group, has resigned his local directorship because of pressure of work, and Mr. G. T. Harris, research manager of the companies, succeeds him.

Personal

MR. W. M. LLOYD ROBERTS has been appointed chief engineer of the Metropolitan Water Board.

MR. R. L. ROGERSON, for many years chairman of Yorkshire Range Company, Limited, of Shipley, Yorks., has retired and a new board has been formed.

MR. F. J. PASCOE, managing director of British Timken, Limited, engineers and bearing manufacturers, of Northampton, is on a three weeks' business visit to Canada.

MR. H. W. VAUGHAN, who is a chartered accountant, has been appointed to succeed the late Mr. J. D. D. Davis as secretary of the South Wales and Monmouthshire Association of Iron, Steel, Tinplate, Metal Scrap Merchants.

MR. H. HOPWOOD, secretary of the Teesside Industrial Development Board, Middlesbrough, for five years until he took up an appointment with Ashmore, Benson, Pease & Company, Limited, Stockton-on-Tees, has received a presentation from the board.

LORD MCGOWAN, honorary president of Imperial Chemical Industries, Limited, has accepted the offer of the freedom of the City of Glasgow made to him by Glasgow Corporation. A similar offer made to Mr. Hector McNeil, M.P., Secretary of State for Scotland, has been declined.

MR. HUGH PURSLOVE BARKER, managing director of Parkinson & Cowan, Limited, which holds the share capital of Parkinson & Cowan (Gas Meters), Limited, and other companies, has accepted the invitation of the Minister of Transport to become a part-time member of the British Transport Commission.

MR. J. CAMPBELL, foundry foreman with Hurst, Nelson & Company, Limited, Motherwell, attained his golden jubilee as an employee of the firm on January 19. This brings the total number of employees who have given a minimum of 50 years' service to just over 12—quite a record when it is remembered that the firm is only 67 years old. Mr. Campbell is retiring at the end of this month.

LORD MILVERTON, who resigned from the Labour Party in 1949 in protest against the nationalisation of the iron and steel industry, and joined the Liberal Party, has now joined the National Liberal Party. In a statement last Saturday, in which he reiterated his belief in Liberal principles, Lord Milverton said that during the past nine months the deleterious effect of Socialist policy upon the national life, and indeed upon the national character, had become increasingly obvious. The only hope of preventing a further and final period of Socialist rule lay in the Conservative Party being returned to power at the next election.

Wills

HARTLEY, GEORGE, late of Hartley & Aspinall, Limited, heating engineers, of Hyde	£3,905
WALLER, FRANK, managing director of Peacock & Waller, Limited, mechanical engineers, of Hinckley	£8,618
STEAD, W. A., founder and chairman of W. A. Stead & Company, Limited, textile-machinery manufacturers, of Leeds	£7,792
SENIOR, GEORGE, a director of General Refractories, Limited, Sheffield, and Meltham Silica Fire Brick Company, Limited, Huddersfield	£39,989
NEWEY, J. G., chairman and managing director of Newey & Tayler, Limited, manufacturers of metal smallwares and iron, steel, and brass wire ...	£68,139

MR. G. C. TAITE, M.I.MECH.E., has died after a long illness. He was a director of Follsain Wycliffe Foundries, Limited, and formerly chairman and managing director of the Wycliffe Foundry & Engineering Company, Limited.

Experimental Work on Oil-sand Practice*

By D. T Kershaw, B.Sc.

THIS PAPER attempts to illustrate the results of some of the tests carried out with the object of determining the basic properties of the corebinders used in the foundry, and applying the knowledge to help in the production of castings free from the type of defect usually associated with faulty oil sand. At the same time it was realised that as well as improving the quality of the castings, a controlled oil sand would also reduce the costs of the coremaking department by utilising the corebinders to their best advantage.

The foundry (Modern Foundries, Limited) where the work in connection with this Paper was carried out is a grey-iron foundry engaged in the manufacture of castings (up to 25 tons in weight) for the machine-tool industry. These tests were, therefore, carried out with this factor in mind, but since the corebinding materials used in the tests are also used in all types of foundries—ferrous, non-ferrous, or light alloy, it is only in the interpretation of the results that any differences are likely to occur.

When contemplating the materials to be used for the oil sand, first of all consideration must be given to the base sand. This forms the basis of all the oil sand produced in the foundry, and so it is essential that a sand with uniform properties be obtained. In the north of England, the foundries are fortunate in having available large quantities of Southport sand, which is extremely consistent in its properties and consists of nearly pure round-grained silica, having all the attributes conducive to good foundry practice. One important property is its good refractoriness, which indicates its ability to withstand the high temperature of the molten metal without the tendency to fuse and so cause burning on to the skin of the casting with the subsequent increase in the costs of the fettling department. Furthermore, the majority of the sand grains are of the same size (60 to 100 mesh). Although this uniformity of grain produces greater dry strength when bonded with oil than does a non-uniform grain distribution, it has the attendant disadvantage that when rammed there is no room for expansion between the individual sand grains, causing expansion cracks to occur when the core is subjected to the temperature of the molten metal, and fins on the resultant casting where the metal has penetrated into these cracks. This disadvantage can, however, be overcome by the addition of a fine material, such as silica flour, to the base sand. This appears to allow the expansion to take place in stages, and so have a cushioning effect on the expansion of the large sand grains.

The addition of silica flour also reduces the possibility of metal penetration by filling the intergranular spaces in the rammed core, although this has an adverse effect on the permeability.

* A Paper read before the Slough section of the London branch of the Institute of British Foundrymen, Mr. R. B. Templeton presiding.

Core Binders

The two main requirements of an oil sand are that the sand should have sufficient green strength to permit the making and transportation of the green core, and that the baked core should possess adequate dry strength to allow for its handling after baking, and the pressure to which it is subjected in the mould during the casting operation.

Green Strength

The most widely used addition for obtaining green bond in a core-sand mixture is some form of cereal binder. These compounds will not function properly unless moisture is present in the mixture. Water reacts physically with the starch or dextrin in a cereal binder, causing it to swell and become sticky, and it is this stickiness which holds the sand grains together.

The amount of moisture to be added to a silica sand/cereal mixture to obtain the maximum strength depends on the amount of binder present, and whether the cereal has a starch or dextrin base. Fig. 1 shows the results obtained by mixing a constant proportion of five different binders with Southport sea sand at various moisture contents. As will be seen, the maximum green bond occurs in each case with a low (1 to 2 per cent.) moisture content, and falls off rapidly as the moisture is increased.

As the name " oil core sand " implies, most core sands contain a proportion of a drying oil such as linseed in addition to cereal binder. This oil forms a film round the sand grains, thereby lubricating them and allowing greater movement under a sudden impact such as ramming. It is, therefore, to be expected that the addition of oil to a silica sand/cereal mixture will reduce the effect of the cereal in producing a green bond in the mixture. This is borne out in the results plotted in Fig. 2, which shows that the maximum strength occurs with no oil added. As the amount of oil is increased, the green bond produced at a constant moisture content is reduced; this reduction being most noticeable with the lower moistures.

The actual moisture content at which to mix cereal-bonded sand in the foundry for optimum green strength depends on the amount of moisture which evaporates from the sand after mixing and before using. This in turn depends on the time elapsing between mixing and using the sand, and the temperature and humidity of the core shop. The amount of moisture lost in this way can be reduced by covering the mixed sand with a damp sack, by storing the sand in a special container so that it is not exposed to the atmospheric conditions, or by reducing the vapour pressure of the liquid in the sand by the addition of a non-volatile solute. A suitable substance to add for this purpose is ammonium nitrate since this decomposes at the temperature at which the core is baked.

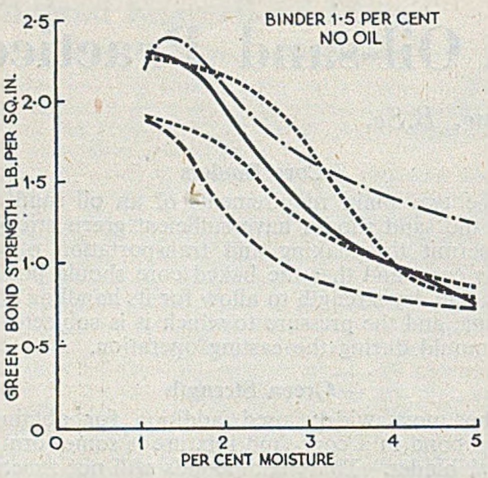


Fig. 1.—*Effect of Moisture on Five Proprietary Cereal Compounds.*

Clay Bond

Another material frequently added to an oil-bonded sand in order to increase the green strength is some form of clay bond. This addition may take the form of bentonite, Fulbond, etc., or simply a naturally-bonded moulding sand. Fig. 3 shows the effect of substituting increasing amounts of a naturally-bonded red sand, containing approximately 6 per cent. clay, and with a grain distribution similar to Southport sand, for silica sand, in a core mixture containing cereal binder and linseed oil. This illustrates that the addition of clay bond, whilst increasing the green strength of a silica sand core, and incidentally, reducing the tendency to finning and metal penetration, also reduces the permeability. Furthermore, the dry strength and the moisture resistance of the baked core are reduced for a given proportion of oil, as is the refractoriness of the sand.

The reduction of the baked strength by the addition of a naturally-bonded sand is caused by the oil spreading itself over the much greater surface area of the clay and silt contained in these sands, and so reducing the amount available to coat the larger sand grains. From Fig. 4, which shows the effect of replacing sea sand with up to 100 per cent. of naturally bonded sand it will be seen that not only is the baked strength of the mixture reduced by the addition of clay-bonded sand, but also that the period of time over which the mixture displays maximum strength is reduced, indicating that the baking of the mixture becomes more critical as the clay content is increased. The addition of clay also causes the time taken to reach the maximum strength to be reduced, *i.e.*, it promotes quicker baking.

Hot Strength

Subjecting a core mixture to high temperatures causes the organic binders near the surface to burn out more or less completely so that the only strength possessed by the surface of a core after being maintained at these temperatures for any length of time. is that of the base mixture. The presence of clay bond increases the retained strength of the base mixture, and therefore reduces the rate at which the resultant cores collapse. This is a disadvantage with thin-sectioned casting where the metal sets almost immediately upon entering the mould, since a slow collapsibility results in the strength of the core resisting the contraction of the metal whilst it is still in the pasty stage, thereby causing hot-tears to occur in the casting. With heavy castings of thick section, however, it is essential that the casting should be competely solidified before the cores begin to collapse, in order to prevent the metal from penetrating into the interior of the core. In this case, delayed collapse of the core is an advantage.

Drying Oils

A core oil is added to a core sand primarily for dry strength, and secondarily for flowability. The core oil is usually added to the sand mixture as the last ingredient in order to allow the cereal binder present to develop the green strength of the sand before the grains of cereal become coated with oil and so prevent the water present having its full effect.

In order to develop the optimum properties of an oil-bonded sand, the conditions of time and temperature under which it is baked are of vital importance. Fig. 5 shows the results obtained by baking a core mixture bonded with linseed oil and a cereal binder for varying times at different temperatures. This shows that at 180 deg. C. the strength of the cores is still increasing after 3 hours, whilst at 200 deg. C. the curve shows a maximum after about 2 hours baking, this maximum being of the same order as the strength obtained after 3 hours at 180 deg. C. At 230 deg. C., however, the

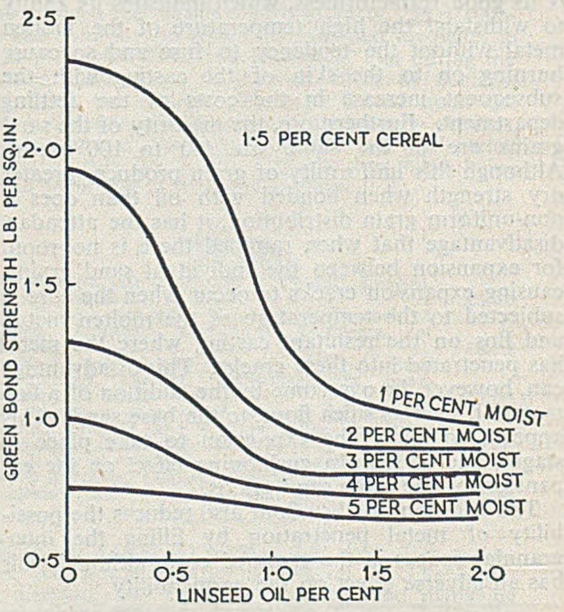


Fig. 2.—*Diagram showing effect of Linseed Oil on the Green Bond Strength produced by a Cereal Binder.*

maximum strength is produced after one hour's baking, and is appreciably lower than that obtained at 200 deg. C. Furthermore, the baking time becomes more critical as the temperature is increased, as is shown by the rapidly decreasing strength after baking for over one hour at 230 deg. C. This illustrates that the maximum strength may be obtained from a linseed-bonded core mixture only if the cores are baked for the correct time at the correct temperature.

The substitution of up to 40 per cent. of the linseed oil by certain aromatic extracts permits of greater flexibility of the baking time at the higher baking temperatures without materially affecting the maximum strength obtainable. This reduction in the tendency to overbaking is a very useful property, particularly in the baking of large cores where one of the chief difficulties is that at normal baking temperatures, by the time the interior of the core reaches the condition of maximum strength, the outer surface is considerably overbaked with a consequent loss of strength. The only way to obtain a satisfactorily baked core of this type when using linseed oil alone as the bonding agent, is to bake the core for a long period of time at a temperature below that at which overbaking commences.

By substituting some of the linseed with petroleum extract, however, the cores can be baked at a higher temperature and so cause the interior to be more nearly baked before the surface loses its strength through over-baking, resulting in a reduced baking period and thereby assisting in the elimination of any bottleneck which may be caused in the foundry through lack of drying space.

Another property which is affected by the time-temperature relationship on the baking of oil sand, is the gas content. Fig. 6 shows how the gas content of a core mixture is reduced by increasing the baking temperature. In practice, therefore, where it is desirable to reduce the amount of gas liberated from a core when surrounded by molten metal, because of both the casting quality and the

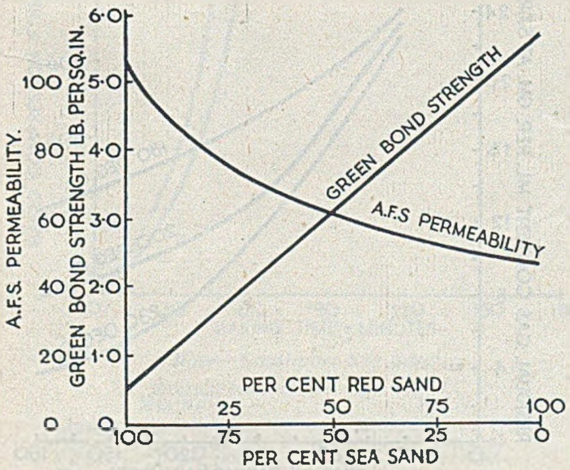
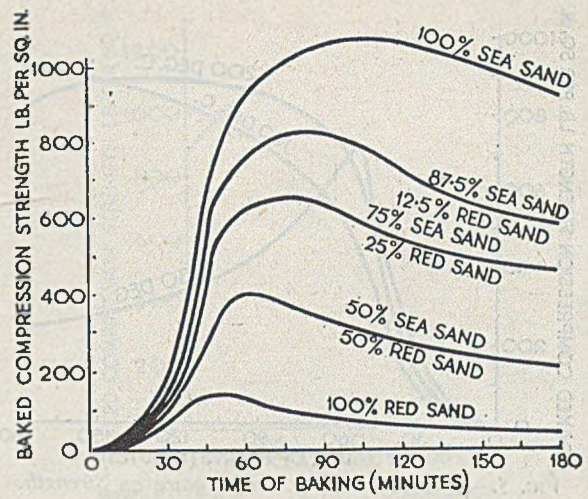


FIG. 3.—*Effect of substituting Naturally-bonded Red Sand for Sea Sand in a Standard Core Mixture.*



Linseed oil, 1.7 per cent.
Cereal, 0.9 per cent.
Moisture, 4.0 per cent.
Baking temperature, 220 deg. C.

FIG. 4.—*Effect of replacing Sea Sand with up to 100 per cent. Naturally-bonded Sand.*

contamination of the foundry atmosphere, it is usual to slightly over-bake the core, thus reducing the gas formed during and after casting at the expense of the baked strength.

The baking of a drying oil such as linseed is primarily an oxidation process whereby oxygen is taken up by molecules of unsaturated fatty acids contained in the oil, followed by the polymerisation of the oxidised molecules. Therefore, in order to produce the optimum properties from an oil-sand mixture, it is necessary for the sand to have free access to oxygen during the baking operation. The only way in which air or oxygen can come into contact with the interior of a core is by permeating in between the sand grains. It is, therefore, apparent that a sand mixture made with a uniform large-grained sand will produce stronger cores than one made with either a uniform close-grained sand or a non-uniform sand where the small sand grains can fit into the interstices formed between the larger grains. This was effectively demonstrated by H. W. Dietert when he plotted the tensile strength obtained on a core mixture against the surface area of the sand grains in 1 gm. of rammed sand. Furthermore, the baking time necessary to produce the maximum strength of a sand mixture is reduced as the sand becomes coarser, showing that with the coarser sand oxygen penetrates more quickly to the interior of the core, and so promotes quicker drying. This emphasises the necessity for providing as many holes as possible in the core-drying plates used in the foundry so that the air can come into contact with sand lying against the core plate, this sand being the most difficult part of any core to bake.

Preventing Drying-out

The use of ammonium nitrate in a core sand mixture was mentioned earlier as a method of

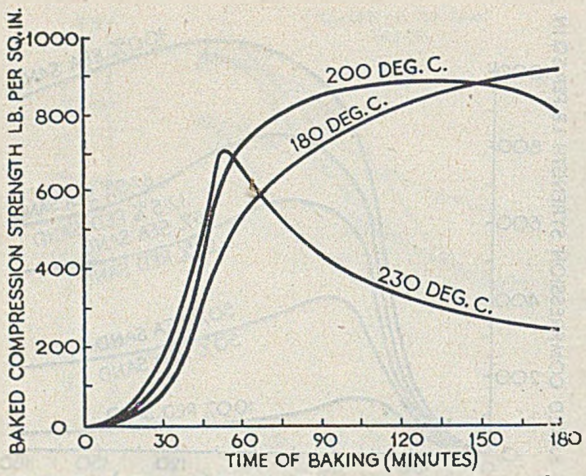


FIG. 5.—*Effect of Baking Temperature on Strength.*

increasing the bench life of a sand by reducing the amount of moisture lost by evaporation. The effect of this material on the baked strength is very interesting. Fig. 7 shows the results obtained on baking two sand mixtures for varying times at 220 deg. C.; one mixture containing 1 per cent. ammonium nitrate, and the other none, the mixtures being otherwise identical. It will be seen that the sand containing the nitrate addition develops considerably more strength than the other one, and that the time taken to reach maximum strength is noticeably reduced. This speeding up of the baking rate is probably caused by the dissociation of the ammonium nitrate at the temperature baking, with the liberation of a certain amount of oxygen within the core itself. If this is so, the oxygen is produced at the place where it is most needed, *i.e.*, between the sand grains themselves, causing the centre of the core to bake at approximately the same rate as the surface, thereby producing a stronger core by reason of the more uniform baking.

This can be very useful when both large and small cores have to be baked together in a batch-type core oven. If the large cores are made with a sand containing ammonium nitrate and the small cores in a straight oil sand, the rate of baking of the large cores will be increased, and so reduce the risk of burning the small cores before the large cores are dry.

The effect of varying percentages of ammonium nitrate on the strength of a sand containing 10 per cent. red sand; 1.7 per cent. linseed oil, 0.9 per cent. cereal and 4 per cent. water, is shown in Fig. 8; all cores being baked for 2 hours at 200 deg. C. By increasing the ammonium nitrate, the strength rises to a maximum with just over 1 per cent.; greater additions causing a slight loss of strength until with 2 per cent. the strength is the same as that obtained with a 0.6 per cent. addition. This is probably because the rate of baking is so increased by a 2 per cent. addition that baking for 2 hours at 200 deg. C. causes overbaking with a resultant loss in strength. The increase in the rate of baking is further shown by the colour of the baked sand, this being much darker than that of a straight oil-bonded sand baked under the same conditions and also by the reduction of the residual gas content of the sand when ammonium nitrate is used.

Effect of Cereal Content on Baked Strength

Although cereal binders are added to a core sand primarily to produce green strength, they also generate dry strength, especially when used in conjunction with oil. The lower curve of Fig. 9 shows how the strength of a sand mixture containing sea sand and water 4 per cent. is increased, by increasing the cereal content, whilst the upper curve represents the strength obtained when 0.75 per cent. linseed oil is added to the mixture, all the cores being baked for 2 hours at 200 deg. C. This shows that the cereal binder by itself does not develop great strength when baked under these conditions, but when used in conjunction with a moderate amount of linseed oil, the baked strength increases rapidly with increasing amount of cereal and is greater than the sum of the strengths of the two binders when used alone. Since the cost of cereal binders is less than half that of linseed oil, this is an important point to bear in mind when considering the economics of the core shop.

There are, however, two disadvantages to take into account when using a sand bonded with high-cereal and low-oil contents, *viz*:—

(1) Reducing the amount of oil in a mixture reduces the moisture resistance of the baked sand, so that if a core has to stand for any length of time in the damp foundry atmosphere, it will soften due to the moisture absorbed. It is then necessary to warm the core up before use so as to drive off this absorbed moisture.

(2) The soluble portion of cereal binders has a tendency to be carried to the surface of the core as the moisture present is converted into vapour during the baking process, thereby producing a core with a hard surface and a soft interior. If this hard outer skin is punctured by rubbing or filing, the weak interior is exposed to the washing action of the metal during casting.

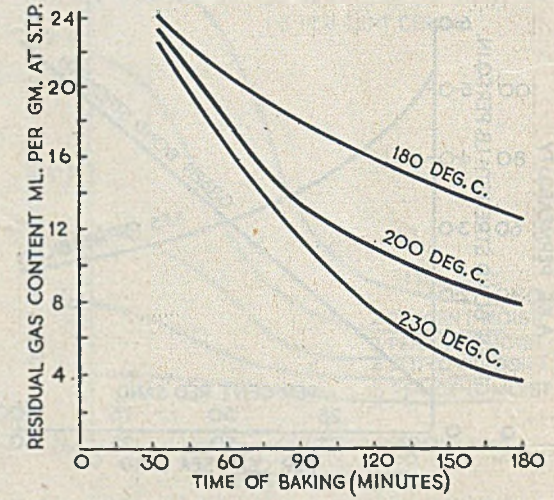


FIG. 6.—*Residual Gas Content as affected by Baking Temperature.*

Also, cereal binders rapidly burn out during the pouring operation causing quicker core collapse. This can be either an advantage or a disadvantage, depending on the type of casting being produced.

Another factor which affects the resultant strength of an oil sand is the original moisture content of the sand. By increasing the moisture from 1 per cent. to 4 per cent., the strength of the sand depicted in Fig. 10 is more than doubled after baking for 2 hours at 200 deg. C. Further water additions, however, cause the strength to be reduced, and at the same time trouble is experienced due to the sticking of the sand to the core boxes. Since all moisture has to be removed from a sand during baking, it is necessary to increase the baking time with the higher moisture contents.

The baked strength can also be increased by treating the core with water prior to baking. Fig. 11 shows the percentage change in strength produced by (*a*) spraying, (*b*) swabbing, and (*c*) soaking the green core with water. It will be seen that both spraying and swabbing cause an increase in the baked strength of the core.

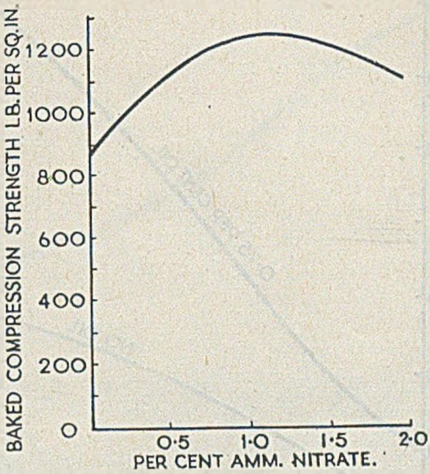
Use of Recovered Sand

During the pouring and subsequent cooling of a casting, the binder in the oil sand cores is partially or wholly decomposed by the heat of the metal. Consequently, core sand recovered from the knock out still contains much of the partially burnt binder adhering firmly to the sand grains, in addition to ash from the burnt materials. (Fig. 12.) It is also contaminated with clay-bonded sand, fines and metal shot due to the impossibility of securing 100 per cent. separation of burnt oil sand from burnt moulding sand.

The use of recovered core sand, therefore, unless processed by one of the forms of cleaning, in the preparation of new core sand will result in:—(1) Lower permeability due to the increase in fines; (2) increased gas content, due to the unburnt binder clinging to the used sand grains, and (3) reduced baked strength, due to the increase in fines and clay.

Results obtained with mixtures containing varying proportions of used core sand to new sea sand are illustrated in Fig. 13. This shows that as the percentage of used core sand in the mixture is increased to 100, the residual gas content is more than doubled and the baked strength reduced to one-third; the rate of change of the strength being greatest with small quantities of the used sand. In order to obtain the same dry strength when using recovered sand as when using all new sand, therefore, it is necessary to increase the proportion of binder in the mixture, using a further increase in the gas content. This condition of increased gas content with a reduced permeability is liable to cause blown castings unless extra care is taken in the venting of the cores. Thus the obvious economies to be gained by using recovered core sand, namely a reduction in both the amount of new sand consumed and the transport and disposal costs, may be more than offset by the increase in the amount of binder required to produce as good a core as when using all new sand, and by the increased risk of producing a defective casting.

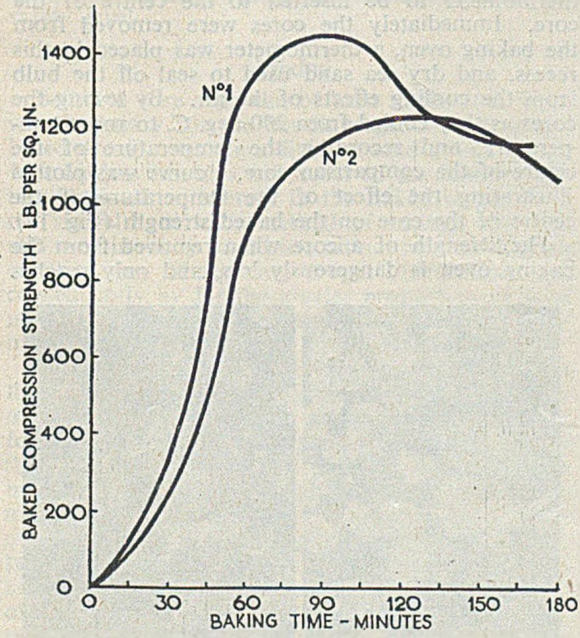
By using clay and cereal as the bonding agent,



Base Mixture.	*Additions.*
Sea sand, 90 per cent.	Linseed, 1.7 per cent.
Red sand, 10 per cent.	Cereal, 0.9 per cent.
	Water, 4.0 per cent.

Cores baked, 2 hrs. at 200 deg. C.

FIG. 8.—*Diagram showing effect of Varying Percentage of Ammonium Nitrate on Oil Sand.*



Base—Southport Sea Sand.

Baking temperature, 220 deg. C.

Mix No. 1.	*Mix No. 2.*
Linseed, 1.75 per cent.	Linseed, 1.75 per cent.
Cereal, 1.0 per cent.	Cereal, 1.0 per cent.
NH_4NO_3, 1.0 per cent.	Moist, 4.0 per cent.
Moist, 4.0 per cent.	

FIG. 7.—*Effect of Ammonium Nitrate on Oil/Cereal Bonded Sand.*

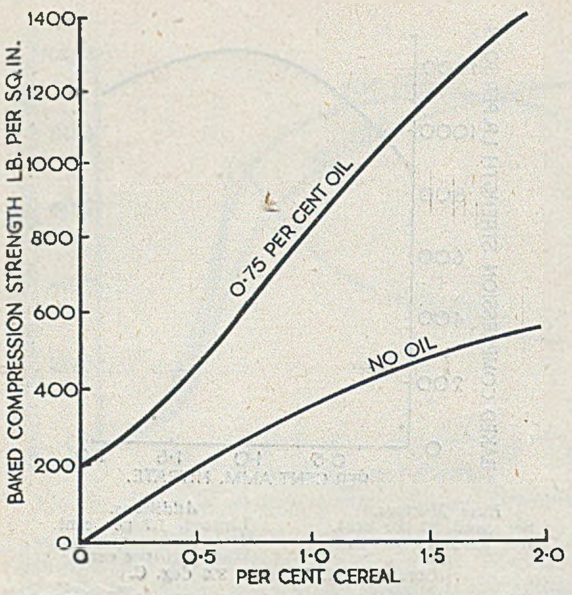


FIG. 9.—*Effect of Cereal Binder on Baked Compression Strength. Original Moisture 4 per cent.*

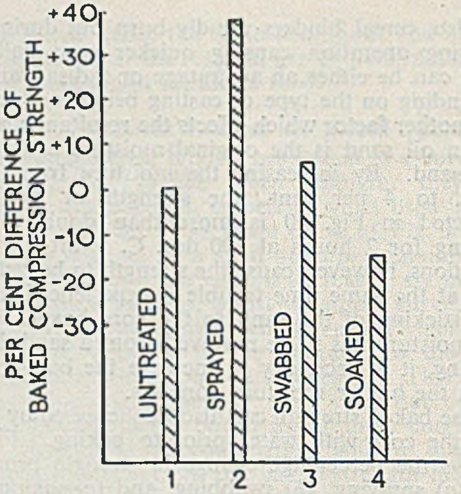
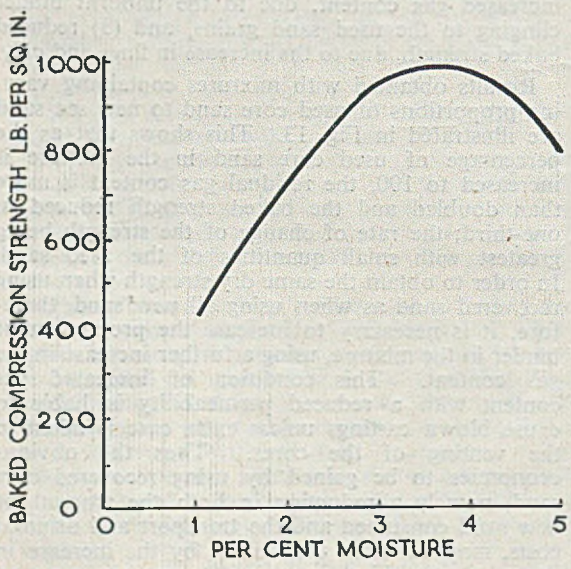


FIG. 11.—*Effect on the Baked Strength of Oil Sand of Applying Water by Various Methods. Cores Baked at 230 deg. C.*

and eliminating core oil, strong cores can be obtained from a mixture incorporating recovered oil sand, but it must be remembered that the retained strength is increased and the permeability decreased by these additions. If, however, such mixtures are made into cores for jobs where these factors are relatively unimportant, such as cover cores where the metal only comes into contact with one face of the core, burned sand can be, and is being used economically.



Linseed oil, 0.75 per cent. Cereal binder, 1.5 per cent. Cores baked, 2 hrs. at 200 deg. C.

FIG. 10.—*Baked Compression Strength showing Effect of Moisture.*

Effect of Temperature on Strength

Another aspect relating to the strength of an oil-sand core is the effect of the temperature of the core. In order to determine the nature of this effect, a number of A.F.S. Standard test cores were baked for 2 hours at 200 deg. C., one of these cores containing a recess just large enough to allow a thermometer to be inserted to the centre of the core. Immediately the cores were removed from the baking oven, a thermometer was placed in this recess, and dry sea sand used to seal off the bulb from the cooling effects of the air. By testing the cores as they cooled from 200 deg. C. to room temperature, and recording the temperature of the centre of the comparison core, a curve was plotted illustrating the effect of the temperature of the centre of the core on the baked strength (Fig. 14).

The strength of a core when removed from the baking oven is dangerously low, and only reaches

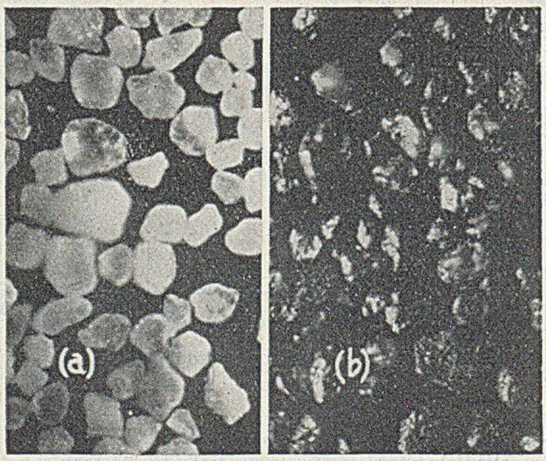
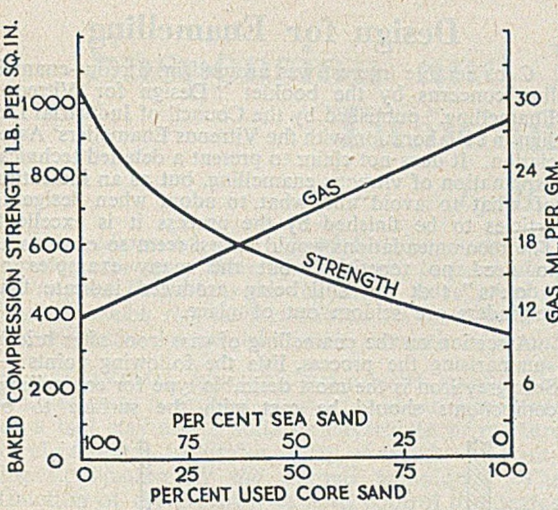


FIG. 12.—*Comparison between Unused Sand Grains (a) and Used Grains (b).*



Linseed, 1.7 per cent.
Cereal, 0.9 per cent.
Moist, 4.0 per cent.

FIG. 13.—*Effect of Used Core Sand on a Straight Silica Sand Mixture.*

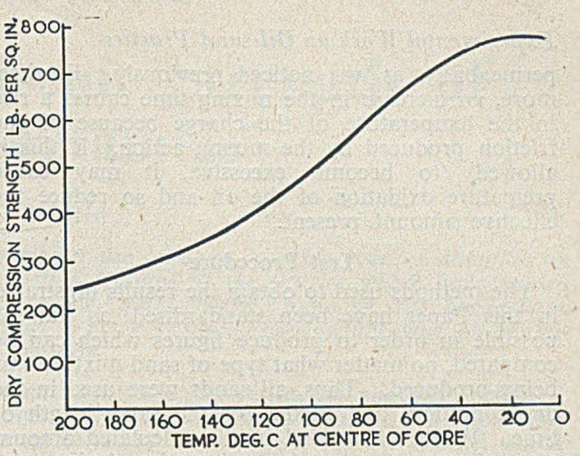


FIG. 14.—*Determination of Baked Strength of Oil Sand on Cooling from Baking to Room Temperature. Baking Temperature 200 deg. C. for 2 hrs.*

the maximum after the temperature had fallen to about 20 deg. C. It is, therefore, necessary to handle hot cores with the greatest possible care in order to minimise the risk of damage. Furthermore, cores should not be used until they have cooled sufficiently to allow the strength to reach the safety level.

Mixing

Before a core sand can be used in the core shop, it is necessary for the bonding agents to be distributed evenly over the individual sand grains, otherwise endless troubles will occur in the foundry due to a lack of uniformity in the baked cores. The old shovel and riddle method of mixing, although still used in many foundries, cannot be classed as an effective way of securing proper distribution, and consequently by far the greater proportion of sand is prepared to-day in one of the many types of mixing plant available.

The principle used in these mixers is to cause the sand grains to rub together by the application of pressure, either by the action of heavy rollers, followed by ploughs, scrapers, etc., to ensure that the sand is turned in the path of the rollers, or by forcing the sand through a narrow opening by means of rotating arms or blades. Tests carried out to determine the mixing efficiency of two roller-type mills are shown in Fig. 15. The large mill contains one roller and an aerator, and mixes 7½ cwt. of sand, whilst the small (laboratory) mixer contains two rollers and has a 5 kg. charge; the mix in each case containing 10 per cent. red sand.

As indicated in the graphs, the green-bond strength increases rapidly in the first few minutes and continues to show a slight upward trend even after 20 minutes' mixing. This is probably caused by the combined effects of the clay bond in the sand being developed, and by the loss of moisture during mixing. The reduction in the baked strength and the permeability is brought about by the fact that the red sand, which is present in the mixture, is supplied in the unmilled form and contains hard lumps of clay which are not broken down until after several minutes' mixing. It appears, therefore, that the sand grains are completely covered with oil after 2 minutes, and that further mixing succeeds in breaking down the hard lumps and distributing the clay throughout the mixture with the consequent reduction in the baked strength and the

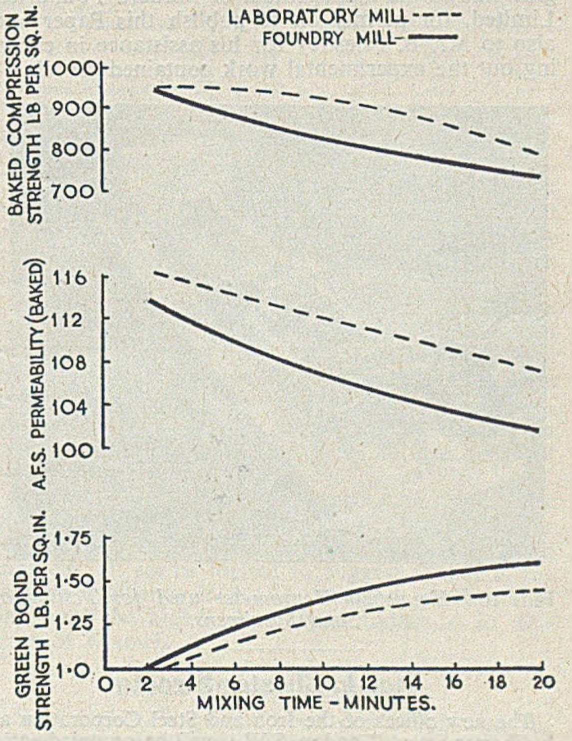


FIG. 15.—*Comparative Mixing Efficiency of Laboratory and Foundry Mills.*

Experimental Work on Oil-sand Practice

permeability, as was noticed previously. Furthermore, an increase in the mixing time causes a rise in the temperature of the charge because of the friction produced by the mixing action. If this is allowed to become excessive, it may cause premature oxidation of the oil and so reduce the effective amount present.

Test Procedure

The methods used to obtain the results illustrated in this Paper have been standardised as far as possible in order to produce figures which can be compared, no matter what type of sand mixture was being produced. Thus, all sands were used in the dry condition, and mixed for the same length of time. Water was added in the calculated amount after allowing for loss by evaporation during mixing, and the actual moisture content checked by the "Speedy" moisture tester. Test cores were produced according to A.F.S. standards, and the sand rammer and green bond and permeability apparatus also conformed to the standards of this society. The same number of cores was always baked in the laboratory oven so that the heating was uniform, and results for the baked compression strength were obtained using a Hounsfield tensometer (Fig. 16) with a special attachment to enable it to be applied to the testing of sand specimens.

Acknowledgments

To conclude, the Author wishes to express his gratitude to the management of Modern Foundries, Limited, for permission to publish this Paper and also to Mr. B. Priestley for his assistance in carrying out the experimental work contained therein.

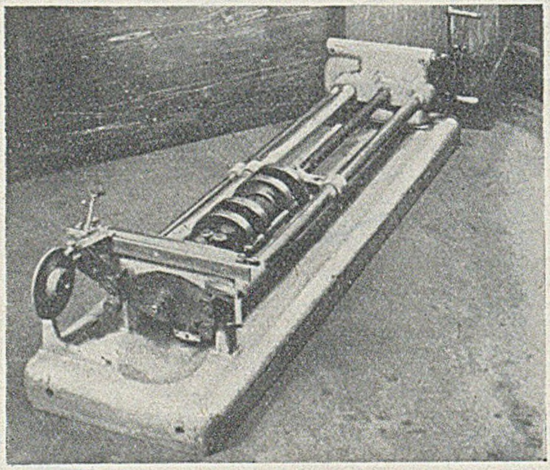


FIG. 16.—*Hounsfield Tensometer used for Testing of Sand Specimens.*

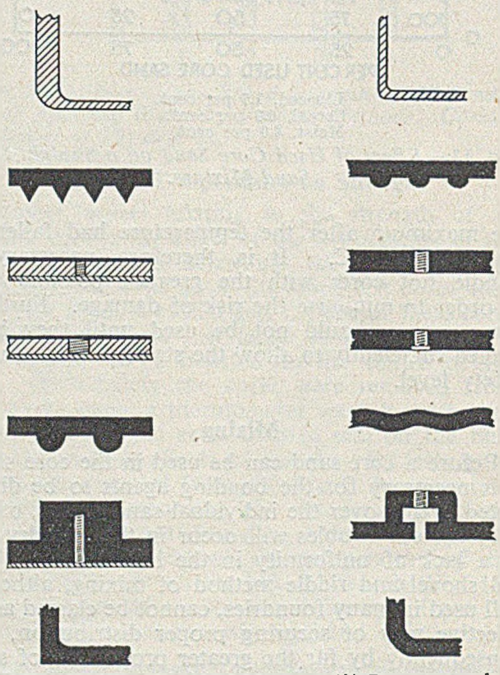
No. 1, Chester Street

The new offices of the Iron and Steel Corporation at 1, Chester Street, London, S.W.1, will be occupied early this month. Other offices in the building are occupied by a Government department.

Design for Enamelling

Considerable interest was aroused in vitreous-enamelling concerns by the booklet "Design for Vitreous Enamelling," published by the Council of Industrial Design in collaboration with the Vitreous Enamellers' Association. It does not claim to present a detailed technical explanation of vitreous enamelling, but as an indication of what to avoid and what to adopt when designing articles to be finished by the process it is excellent. The recommendations would at first seem so obvious as to need no repetition, but the many examples of "don'ts" that are still being produced indicate that reminders are seldom out of place.

A section on the enamelling of cast iron, after briefly summarising the process, lists the following points:—Soft grey iron is the most desirable type for enamelling; components should be cast with the surface to be



(*a*) *Not Favoured.* (*b*) *Recommended*

enamelled face downwards in the mould; as the slag rises to the top, the resulting imperfections will form on the back of the casting. Uniform sections and easy curves avoid the risk of "drawn" or porous areas at the junction of thick and thin sections. Allowance must be made for "growing" of the iron during enamelling. As enamel will flow off a sharp edge or ridge during fusing, leaving a black line in the finished product, a radius edge and a rounded head should be aimed at. During assembly, where two enamelled surfaces meet or rest on one another a soft washer should be used between them as a cushion.

If lettering on castings must be used it should be bold, deep and large. Small, shallow letters tend to fill up with enamel and become illegible. Further recommendations are:—Allow for enamel thickness; do not attempt to enamel cracked castings or to fill up holes with enamel; tell the enameller for what purpose the enamelled casting is required, and remember that as castings have to be held in the furnace some marks are inevitable.

Suspension and Biscuit Strength of Titanium Enamels*

By H. Laithwaite

The widespread adoption of titanium-opacified enamels for use on sheet iron has focused attention on various aspects of these enamels and, in particular, on certain features of the slurries which have tended to impose limitations on the user. It is proposed to review, quite briefly, some of the background against which this subject should be considered and then to describe some experimental work on quantitative measurements of biscuit strength of titanium enamels.

IN ALL NORMAL types of wet-process enamel the enamel glass is ground in water with an admixture of a ball clay and a suitable electrolyte or mixture of electrolytes, to yield a slurry of suitable viscosity for application by the normal techniques. The function of the electrolytes is to control the degree of flocculation of clay and this aspect of the subject has been reviewed recently by Webb.[1]

It is important to recognise at the outset that, apart from the clay and electrolytes added at the mill, any normal enamel on grinding in water loses certain soluble constituents which can, and do, affect the properties conferred by the added electrolytes. It is proposed in this Paper to ignore special cases such as those of boron-free enamels and confine the discussion to normal commercial types of vitreous enamels where the principle soluble materials extracted by water are soda (Na_2O) and boric oxide (B_2O_3). (It should be noted in passing that other constituents such as fluorides can also be leached out in the mill liquor, but in most cases the amounts involved are very small and are probably of only minor significance.[2]

The properties of an enamel slurry will, therefore, depend to some extent on the amounts of Na_2O and B_2O_3 extracted during milling, and it is interesting to recall that the introduction of acid-resisting enamels some years ago brought problems of "setting" which the practical enameller could not readily resolve, and it was some time before it was recognised that analysis of the mill liquor could give a clue to the solution of the difficulty. By determination of Na_2O and B_2O_3 concentrations it is often possible to adjust slurry properties by adding electrolytes of such types and in suitable quantities as will give the required concentrations and ratio one to the other.

Effect of Mill-liquor Composition on Viscosity

Experimental work on clay suspensions with various additions of Na_2O and B_2O_3 has been carried out and the results are summarised in Figs. 1 and 2. It will be seen from Fig. 1 that variation in the ratio Na_2O/B_2O_3 causes changes in the apparent viscosity of the slurry, whereas the effect of increasing the total concentration of Na_2O plus B_2O_3 is not the same in all cases. The curves (Fig. 2) suggest that with a Na_2O/B_2O_3 ration of approximately 0.7 to 0.9 the apparent viscosity remains quite constant over a range of total concentrations, whereas with higher ratios the viscosity increases. This may mean that ratios of 0.7 to 0.9 would give a stable slurry and the "set" of the enamel would not be generally affected on ageing. An enamel slurry is not in a state of equilibrium and continued solution of Na_2O and B_2O_3 from a slurry occurs on standing.

Table I gives a number of Na_2O and B_2O_3 concentrations which have been experimentally determined for different types of enamel. In each case the frit has been milled under standard conditions with water only and the liquor then filtered off under suction. The figures refer to concentrations in gm. per litre of liquor.

TABLE I.—*Mill-liquor Analyses.*

Type of enamel.	$Na_2O + B_2O_3$.	Na_2O.	B_2O_3.	Na_2O/B_2O_3.
Titanium white A ..	1.449	0.375	1.074	0.349
Titanium white B ..	1.403	0.395	1.008	0.392
Sheet-iron, ground coat (1)	0.797	0.352	0.445	0.792
(2)	1.298	0.616	0.682	0.903
(3)	2.819	1.231	1.588	0.775
(4)	2.217	0.797	1.42	0.561
Sheet-iron, antimony white	0.1773	0.734	1.039	0.706
Cast iron, A.R. white (1)	2.68	1.45	1.23	1.18
(2)	2.56	1.61	0.95	1.69
Cast iron, A.R. clear ..	0.782	0.537	0.245	2.19

The Na_2O/B_2O_3 ratios vary considerably and it would seem significant that the values for the soft (non-acid-resisting) enamels are all reasonably close to 0.7 to 0.9, the value previously indicated as yielding relatively stable slurries.

For clear acid-resisting enamels, containing titania and for white acid-resisting frits opacified with antimony oxide and fluorides, the Na_2O/B_2O_3 ratio increases substantially and in such frits it can happen that appreciable amounts of fluoride are extracted and it is thus no longer possible to make a simple comparison between frits on the basis of Na_2O/B_2O_3 alone.

The present Paper is concerned mainly with the titanium-opacified frits and here it is found that the Na_2O/B_2O_3 ratio is much lower than for any other enamels. It seems logical to suggest that it is the relative deficiency in Na_2O extracted which makes necessary the higher electrolyte additions in this class of enamels.

Biscuit Strength of Enamels

So far this Paper has been concerned with the apparent viscosity of enamel slurries, *i.e.* whether the enamels are satisfactorily suspended. This property of viscosity does not, however, bear any

* Paper presented to the 1950 Conference of the Institute of Vitreous Enamellers at Harrogate.

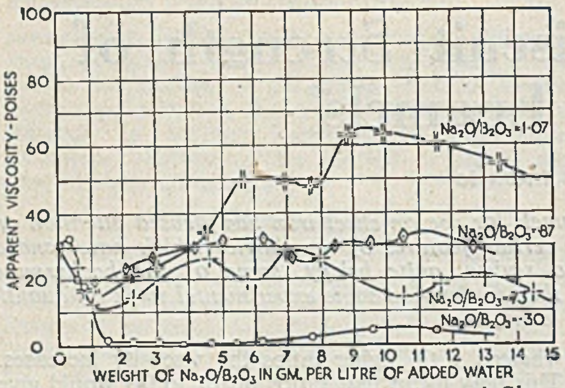


FIG. 1.—*Viscosity-concentration Relations of Clay Slurry for Four Na_2O/B_2O_3 Ratios.*

direct relation to the biscuit strength of an enamel layer after it has been applied to a surface and dried. The subject of biscuit strength is obviously of great importance to avoid damage to ware during handling before fusing the enamel. Unfortunately a number of special problems arise with titanium-opacified enamels: the colour, acid resistance and opacity are all susceptible to variation in differing degrees according to the mill additions used and thus the enameller must pick his way with care in meeting all the practical requirements. It is not proposed to discuss in detail other slurry properties although brief references will be made to points of special significance.

A search of existing literature suggested that very little experimental work on the biscuit strength of enamel layers had been carried out. Marbaker[3] in the United States carried out qualitative tests using a cross-bending technique, but to the present Author the validity of such a method for estimating biscuit strength seems to be open to question. After exploring various approaches to the problem, the apparatus shown diagrammatically in Fig. 3 was evolved.

Apparatus for Measuring Biscuit Strength

The essential features of the apparatus consisted of a brass disc and platform, both with ground faces to ensure good contact. The disc was suitably mounted at the end of a vertical rod and attached to a cord and container which could be weighted with mercury. The system was counter-balanced so that the disc just rested on the platform with zero force.

The principle of the test was to apply a layer of enamel on to the upper side of the platform and disc and then to measure the force required for breaking the dried enamel layer. It was found that considerable care was necessary to avoid damage to the enamel film prior to testing and a retaining screw and collar were provided for holding the disc rigidly against the platform during the application and drying of the enamel. The fixing devices were released prior to test.

Testing Procedure

In each case a layer of enamel was applied by spraying and the assembly was then dried at 100 deg. C. for 20 min. That length of time was chosen because after about ten minutes, generally speaking, the drying was complete and then the period was doubled to make sure that the biscuit was thoroughly dry, because the degree of drying is important. Any slight trace of moisture is enough to make a difference in the results. When cooled to room temperature the retaining screw was carefully removed and the enamel coating critically inspected for cracks or other blemishes in the coating; these, if present, caused rejection of the specimen. The assembly was then fitted on the stand and the counter-weight system was connected to the disc. The load was applied by running mercury from a burette at the rate of 19 gm. per sec. into the container until rupture of the enamel occurred.

Early work was carried out with a steel disc and a steel platform and was successful up to a point but there were certain practical experimental difficulties and brass was later used as being non-corrosive and non-rusting. It was found that the results with brass were precisely the same as with steel. It might seem odd that enamellers were concerned normally with steel and yet used brass for tests, but that was the reason.

It was found that the fracture took place round the circumference of the disc, provided excessive thicknesses of application were avoided and a thickness of 0.01 in. was regarded as ideal. The actual thicknesses of application were avoided and a thick-several points along the plane of the fracture and for each test described at least twelve determinations were made. The figures were re-calculated to a standard thickness of 0.01 in. and it was found that the method was capable of giving a result reproducible to ±30 gm.

Experimental Work

The slurry used as a basis for the tests was made up as follows:—

	Parts per weight.
Frit	100
Clay	5
Titania	1
Bentonite	$\frac{1}{4}$
Sodium Nitrite	$\frac{3}{16}$
Potassium Carbonate	$\frac{3}{8}$

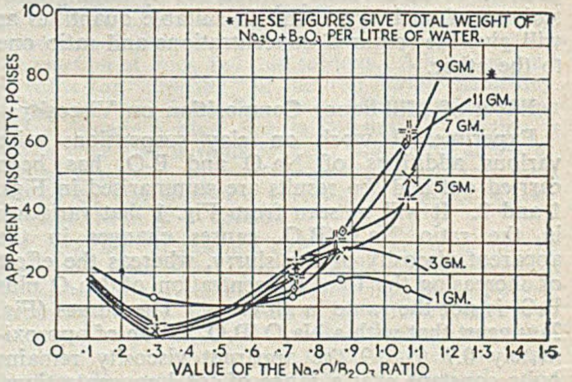


FIG. 2.—*Effect of Na_2O/B_2O_3 Ratio on Slurry Viscosities.*

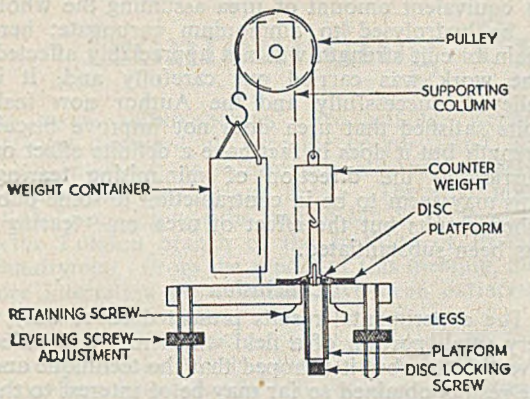


FIG. 3.—*Instrument devised for Slurry Testing.*

These additions have been published as suitable for titanium enamel. As a preliminary trial, two different titanium-opacified enamels, known to the Author, were tested for biscuit strength and the results were as follows:—

Frit A	566 gm.
Frit B	1,099 gm.

Both enamels have been widely used in production and practical experience has shown that the biscuit strength of the second enamel is much superior to that of the former. The test results confirmed this which was an encouragement to continue with the technique described. The measurements of biscuit strength were arranged in three series designed to show the influence of the following variables:—

Series 1 ..	Milling time.
Series 2 ..	Clay, bentonite and titania.
Series 3 ..	Electrolytes.

The results will be presented in turn.

Series 1—Milling Time

Experimental results are given in Table II and also shown graphically in Fig 4. The biscuit strength reaches a maximum after approximately 4½ hrs. milling. The normal milling time is 5hrs., corresponding to a fineness of 2 gm. an a 200-mesh screen from a 50-ml. sample slurry. This is interesting as practical considerations in production had determined the fineness limit which had in fact varied considerably at an earlier period both above and below the figure now used.

TABLE II.—*Effect of Milling Time on Biscuit Strength.*

Milling time.	Biscuit strength.
hr. min.	gm.
2 10	604
4 10	709
7 30	528
9 35	322
10 25	277
11 30	427

Series 2—Clay, Bentonite and Titania

(*a*) *Type of clay.*—Keeping the amount of clay added at the mill constant, tests were carried out with ball clays obtained from three different sources* and also with china clay. The results with the three ball clays, for practical purposes, gave the same biscuit strength but the china clay gave a much lower value.

(*b*) *Varying additions of clay.* Using the ball clay normally employed, the amount was varied between 3 and 7 per cent. and the biscuit strength increased steadily. In practice, large additions of clay would not normally be permissible owing to the danger of deterioration in acid resistance and the effect on the colour of the fused enamel.

(*c*) *Varying additions of bentonite.* The bentonite addition was varied between 0 and 1 per cent. and again the biscuit strength increased progressively. It is interesting to note that an addition of ½ per cent. bentonite, other things being equal, gives a greater increase in biscuit strength than an extra 2 per cent. of ball clay.

(*d*) *Varying additions of titania.* The titania added at the mill was varied between ½ and 2 per cent. but it is doubtful whether the relatively small variations recorded have any real significance. The experimental results for the four sets of tests described above are set out in Table III.

TABLE III.—*Effect of Variations in Mill Additions.*

—	Biscuit strength (gm.).
(*a*) *Type of clay*—	
Ball clays : A	291
B	302
C	291
China clay	107
(*b*) *Varying additions of clay*—	
3 per cent. ball clay A	229
5 „ „ „	291
7 „ „ „	405
(*c*) *Varying additions of bentonite*—	
No bentonite	231
¼ per cent. bentonite	291
½ „ „	318
1 „ „	535
(*d*) *Varying additions of titania*—	
½ per cent. titania	236
1 „ „	291
1½ „ „	251
2 „ „	239

* The Author here pointed out in reading that he had not had the opportunity so far of checking up whether in fact three different ball clays were used—that is to say whether they came from three different sources—or whether he had in fact carried out the three tests with three samples from a single source.

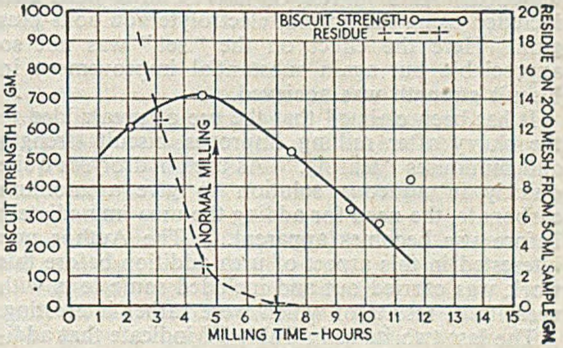


FIG. 4.—*Biscuit Strength of Enamel Slurries in relation to Milling.*

Suspension and Biscuit Strength of Titanium Enamel

Series 3—Electrolytes

Table IV summarises the results obtained and included are some qualitative comments on the condition of the slurry in which everything was maintained constant apart from the one variable under consideration. It is interesting to note that viscosity and biscuit strength are not necessarily related. Additions of sodium nitrite or sodium chloride give a biscuit strength almost identical with that for an addition of sodium carbonate or boric acid, but the viscosities of the slurries are very different. In the two former cases the slurry is suitable for use and in the latter two, the clay is deflocculated and is deficient in "set."

TABLE IV.—*Effect of Various Electrolytes.*

Addition.	Biscuit strength (gm.).	Slurry condition.
3/8 per cent K_2CO_3 with 1/16 per cent $NaNO_2$	307	
1/16 per cent of :—		
$NaNO_2$	537	Thick.
K_2CO_3	352	Thin.
NaCl	576	Thick.
$BaCl_2$	329	Very thick.
Na_2CO_3	539	Thin.
H_3BO_3	521	Thin—settles rapidly.
Borax	445	Thin—settles rapidly.
Sodium, alginate	1,200 +	Thin—settles rapidly.
Sodium, thiosulphate	322	Normal viscosity.
Sodium aluminate	380	Thin—settles slowly.
Calgon	614	Thin—settles rapidly.
Sodium silicate	466	Normal viscosity—settles rapidly.
$MgCO_3$	383	Normal viscosity.
3/8 per cent. K_2CO_3 with 1/16 per cent. $NaNO_2$ and 3/8 per cent. gum arabic	813	Normal viscosity.
3/8 per cent. K_2CO_3 with 1/16 per cent. $NaNO_2$ and 3/8 per cent. gum tragacanth	921	Normal viscosity.
3/8 per cent. K_2CO_3 with 1/16 per cent. $NaNO_2$ and 3/8 per cent. urea after milling	369	Normal viscosity.
3/8 per cent. K_2CO_3 with 1/16 per cent. $NaNO_2$ and 1/2 per cent. $(NH_4)_2CO_3$ after milling	312	Very thick.

Most enamellers at some time have used a gum or similar material for strengthening the biscuit where excessive brushing has to be done, as for example in sign work. It commonly occurs that such additions tend to destroy the "set" of the enamel and the results recorded for sodium alginate show this effect. Test on gum arabic and gum tragacanth are also included. As a matter of interest tests were also included using the normal electrolyte additions plus gum. Here the effect on the "set" was not so appreciable but again substantial improvement in biscuit strength was achieved.

It has been claimed that the use of urea added to the slurry after milling improves biscuit strength and minimises "tearing." As urea hydrolyses quite quickly in aqueous solution to give ammonium carbonate, the need for adding the urea immediately before use becomes apparent. The Author was interested in this aspect of urea addition before this work was carried out and included some tests with urea itself, results of which were rather interesting.

The last two items in Table IV indicate that additions of urea did not in fact give any improvement in biscuit strength. The last result represents an equivalent amount of urea assuming the whole to be hydrolysed to ammonium carbonate; here again biscuit strength was not appreciably affected. The work was carried out carefully and, it is believed, successfully and the Author now feels quite satisfied that urea does not improve biscuit strength but it does in fact have a definite effect on slurries in the direction of minimising tearing. This may seem to be in contradiction to some published results but the effect of urea on "tearing" has been substantiated.

Conclusion

The experimental results presented cover only a very small portion of a field which merits detailed investigation, but it is hoped that the technique and the results obtained so far may be of interest to the enamelling industry and stimulate further research in improving and widening our knowledge of slurry properties.

Acknowledgements are due to Mr. R. Banks who has carried out all the experimental work on biscuit strength, to Mr. P. D. Blake who contributed much of the work embodied in the first part of this paper and finally to the directors of Radiation, Limited, for permission to publish this work.

REFERENCES

[1] Webb, H. W. "Ball Clays: Some Aspects of their Use in the Suspension of Enamel Slip." *Proc. I.V.E.* Spring Meeting, 1950.

[2] King, B. W., Carter, H. D., and Draker, H. C. "Properties of Enamel Slips: (ii) Soluble Salts in Enamel Slips." *Jn. Amer. Ceram. Soc.*, 1947, 30, pp. 22-26.

[3] Marbaker, E. E. "Effects of Mill additions on the Properties of Titania—Opacified Cover Coat Enamels." 11th Annual P.E.I. Forum, 1949, pp. 79-95.

Obituary

SIR HARRY HARLEY

While on his way to Australia, where it was his intention to spend five months' convalescence, Sir Harry Harley, chairman of the Coventry Gauge & Tool Company, Limited, and a director of the Coventry Precision Engineering & Repetition Company, Limited, died recently aboard the P & O liner Dominion Monarch.

MR. GEORGE LAIRD, late of Geo. Laird & Son, furnace builders, of Glasgow, died on January 4.

MR. ROBERT McARTHUR, late of John Brown & Company, Limited, shipbuilders, of Clydebank, died on January 18.

MR. MATTHEW HAMILTON, late of the Glengarnock Steel Works of Colvilles, Limited, died on January 18.

MR. SAMUEL GORDON COADE, who died suddenly at the age of 38, was assistant works manager at the Redcar blast furnaces of Dorman, Long & Company, Limited, and formerly blast-furnace manager at Skinningrove.

MR. W. B. BAKER, joint secretary of Swinney Bros., Limited, ironfounders, Morpeth (Northumberland), died recently. He was 67, and before joining the firm in 1923 he was chief clerk with Smith's Dock Company, Limited, North Shields.

MR. W. V. MACKAY, who died on January 13, joined Daniel Doncaster & Sons, Limited, manufacturers of drop forgings, steel castings, etc., of Sheffield, as secretary in 1932. He retained his secretarial duties when he was elected to the board in 1943.

Ironfounding Productivity Report

THE GREY IRONFOUNDERS' Productivity Report has been discussed all over the country, and obviously much of the information elicited has been duplicated in the various areas. The first non-national occasion was the visit of Mr. S. H. Russell, to the London branch of the Institute of British Foundrymen. From the report of this meeting, the more interesting observations have been extracted in the following account.

MR. R. B. TEMPLETON (past-president of the Institute), said he felt that the Team had produced an excellent report, but he believed that more stress should be laid on profitable or economic productivity. There was no purpose, he said, in making adjustments just for the sake of making them; after all, everyone carried out his business with the ultimate aim of making profits. Turning to considerations of plant and mechanical aids, Mr. Templeton said that the immense variety of mechanical aids in existence was not only very desirable, but essential. He felt, however, that in this country the foundries were for the most part so old that it was impossible to adapt mechanical aids to any advantage. It was like putting new wine into old bottles. There was no objection to the use of mechanical aids but difficulties were experienced when adapting them to existing plant.

He described the Council of Ironfoundry Associations' costing system as admirable, but considered it to be over the head of the small jobbing ironfounder. It could be adapted to suit particular circumstances but, even so, there were difficulties which might make it uneconomical in the long run, particularly in the case of the smaller foundry, for which something on the lines of the American costing system was necessary.

Referring now to working conditions and amenities, Mr. Templeton said that he had recently attended a meeting where the subject had been discussed and the official implication seemed to have been that the conditions in the small jobbing foundry were greatly at fault. He himself believed, however, that conditions in the mechanised foundries were far worse; but it would seem that, whatever the situation, the Statutory Regulations which were shortly to be brought into effect should make allowances for differences in size of organisation.

DR. SKERL asked whether the wages paid to the foundry industry in the States were in the same ratio as those paid in this country by comparison with other forms of engineering.

MR. W. WILSON asked what proportion of foundries visited by the team were engaged entirely on jobbing work. Regarding the Report, he had noticed what appeared to be a bad point, insofar as this country was concerned, in that the floor space used per ton of castings per year in the U.S.A. was given as 9 sq. ft. against 17 sq. ft. in England, the highest figures recorded for America being 29 sq. ft. and for Great Britain 46 sq. ft., the lowest being 3 sq. ft. and 5 sq. ft. respectively. Production per worker per year for the whole industry, it was noted, was 46 tons in America and 24 tons in Great Britain.

MR. J. N. BURNS said that anyone who was familiar with modern foundry practice could not but agree with the findings of the Report. He believed that mechanically and technically there was not a great deal of difference between the methods of America and those of Great Britain, but the net result was that the Americans beat us at the tempo. The tempo of their lives, in any event, was much faster than ours and it would seem that ours, at the present time, was slowing down. However, one had to realise that the length of the American businessman's life was, on the average, ten years shorter than ours and Mr. Burns' personal view was that he would prefer a slower rate of progress and a longer time in which to make it.

Replies to Discussion

MR. RUSSELL replying to the discussion gave the following information:—

The size of orders was three times greater than in this country according to an official source.

The section of the Report which had dealt with melting practice and control had been specifically introduced to show that the problems on the other side of the Atlantic were parallel to those in this country.

There was a very considerable danger in the mechanisation of plant and the Americans appreciated it. Appendix 10 of the Report gave a summary of a lecture given to the Team, explaining methods of approach to the subject and the investigations which were carried out before any system of mechanisation was introduced.

The problems of finance were always under consideration and unless some change in policy took place he could not see how the foundries were going to find the money for all the things they would like to install.

The C.F.A. recommended costing system was the best thing yet, but unfortunately presented a little difficulty to the small founder. It was better, however, to have some sort of system rather than none at all !

Qualifications

In America, at least one-third of the men who entered the foundry industry possessed something in addition to school and workshop experience—university or high school training, for example. Promotion from the ranks, of course, was not uncommon.

Replying to Mr. Graham Bissett, Mr. Russell said that right from the inception of foundry work, the educated type of young man in America had plenty of opportunity to get things going. At all times there were many problems which arose, particularly as far as the bigger schemes were concerned —the tunnel-drying scheme for producing moulds, *Ironfounding Productivity Report*

for example—and it was the educated man who saw the possibilities and applied himself to taking charge in order to keep production moving. American industries in general set out to attract that kind of boy and it was the mechanised concerns which attracted most of them. What was required in this country was a sufficient amount of education to recognise the potentialities of operating plant to get the best out of it.

Answering Dr. Skerl, he said he was not sure about the ratio of the wage rates. The moulder earned a considerably higher rate than the average rate throughout the country, the figures being $1.60 and $1.43 per hour respectively and he felt that he could say no more than that.

In general education, Americans were woefully behind Great Britain as far as boys of similiar ages were concerned. General knowledge there was weak and was causing the educational authorities considerable concern. Vocational training, on the other hand, was very good and in most of these establishments it was quite common to find a foundry; the standard of technical equipment was marvellous. General education suffered, therefore, and that had to be remedied in the case of those students seeking to enter a university. The emphasis on vocational training certainly brought boys into the industry, but whether, in the long run, it would be of all-round advantage remained to be observed.

Work appeared to be done with fewer patterns, and production in small quantities was avoided, so that all unnecessary movement could be eliminated. It could be said that, as a general rule, the American foundryman never stopped working and never wasted a movement.

Replying to Mr. Burns, he said that the American lived at a far greater pace than the Englishman, and that the average business man in the States died when comparatively young. It was not surprising, because he did, in fact, work and play much harder than his British cousin.

Time Rates and Working Hours

A Report entitled "Times Rates of Wages and Hours of Labour, October 1, 1950," compiled by the Ministry of Labour and National Service, was published last week by H.M. Stationery Office. It costs 4s. 9d., post free.

This is the fifth annual edition of a volume which shows, for the more important industries and occupations, the minimum or standard time rates of wages of wage-earners as fixed by (*a*) voluntary agreements made between organisations of employers and workpeople, or (*b*) by Joint Industrial Councils and similar bodies, or (*c*) by Statutory Orders under the Wages Councils Act, the Agricultural Wages Acts and the Catering Wages Act.

In making use of this volume as a source of reference, it is important to bear in mind that the information it contains relates to the position as at October 1, 1950, and that changes in rates of wages and hours of labour by voluntary agreement or by statutory regulations are made in various industries and occupations from time to time. Particulars of such changes are published regularly month by month in the *Ministry of Labour Gazette*.

News in Brief

A NEW CANTEEN, catering for 800 at one sitting, has been opened at the works of Sheepbridge Engineering, Limited, Chesterfield.

THE DUKE OF EDINBURGH will open on October 23 a new engineering block erected at King's College, Newcastle-upon-Tyne. The block, which accommodates about 600 students, cost £250,000.

THE FIFTH HATFIELD MEMORIAL LECTURE will be delivered at 8.30 p.m. on February 20 in the Assembly Hall of the Royal Empire Society, Charing Cross, London, W.C.2, instead of Caxton Hall as previously notified.

MR. PETER MILLIGAN RITCHIE, managing director of William Dixon, Limited, pig-iron makers, of Coatbridge, chairman of the Scottish Ironmasters' Association, and representative of that body on the Clyde Navigation Trust, who died intestate, left personal estate in England and Scotland valued at £74,237.

WORK WHICH BEGAN two years ago on the £2,000,000 development scheme of the Skinningrove Iron Company, Limited, Saltburn-by-the-Sea (Yorks), is well advanced. Most of the alterations have been designed and made by the company itself, and the remainder by Head, Wrightson & Company, Limited, Thornaby-on-Tees.

THE BOARD OF TRADE has made an Order—the Ground Sulphur (Prices) (Amendment No. 4) Order (SI 1951, No. 85)—coming into effect on Monday next, permitting an increase of £3 1s. 6d. per ton on maximum prices of all grades of ground sulphur. This increase is due to increases in the world price of crude sulphur and the rise in freight rates.

NEWNHAM HENDER & COMPANY, LIMITED, Woodchester, Glos, have sent us a calendar carrying the picture of a very charming young girl. From RICHARDSON ENGINEERING (BIRMINGHAM), LIMITED, we have received an engagement desk pad and from the STANDARD BRASS, IRON & STEEL FOUNDRIES, LIMITED, of Benoni, a monthly tear-off calendar. To these three firms we extend our warm thanks.

A COMMITTEE HAS BEEN SET UP under the auspices of the British Iron and Steel Federation South Wales Area Trade Training Committee for the Cardiff visit in July of the touring exhibition which is showing processes in steelmaking in every steel centre in Great Britain. The chairman of the committee is Mr. J. H. Birchall, of Guest Keen & Nettlefolds (South Wales), Limited, The exhibition will open at Swansea on February 13, and go from there to Scotland.

THE STEEL-CASTINGS DIVISION of Head, Wrightson & Company, Limited, Thornaby-on-Tees, has increased output by 50 per cent. since the war, mainly owing to the introduction of new methods from the United States. In 1945 the rate of melting was 165 tons a week. This was increased to 250 tons in 1950, and by the end of this year it is expected to exceed 350 tons. Mr. D. Atkinson, the firm's assistant foundry manager, has left for another visit to America to study methods used there.

THE ROYAL SOCIETY OF ARTS announces that the following have agreed to act as judges of the Society's 1951 prize of £500 and a gold medal offered for the best means of promoting the production or the economic utilisation of food in Britain:—Sir Frank Smith, G.C.B., G.B.E., F.R.S. (chairman), Prof. E. N. da Costa Andrade, F.R.S., Sir John Russell, O.B.E., F.R.S., Sir James Turner (president, National Farmers' Union), and a nominee of Lord Digby (president, Royal Agricultural Society of England). The closing date is March 1 and the award will be made on May 1.

Institute Elects New Members

At a meeting of the Council of the Institute of British Foundrymen, held at the Waldorf Hotel, Aldwych, London, W.C.2, on January 20, the fo lowing were elected to the various grades of membership:—

First List

As Members

A. K. Bennett, ironworks representative, Stanton Ironworks Company, Limited; *W. Bradley, general foundries manager, Clay Cross Company, Limited, Derbyshire; *W. J. Driscoll, development engineer, British Cast Iron Research Association; P. Edwards, foundry planning engineer, Ford Motor Company, Limited, Dagenham; E. Evans, representative, J. W. Jackman & Company, Limited, Manchester; R. E. Gray, chief chemist and metallurgist, Davey, Paxman & Company, Limited, Colchester; G. Greenfield, assistant chief inspector, Vokes, Limited, Guildford; R. Hansford, foundry and patternshop superintendent, British Insulated Callenders Cables, Limited, Erith; F. C. Harpur, general manager, Garston Foundry Company, Limited, Speke; C. Holliday, managing director, Joseph Stubbs, Limited, Manchester; *L. M. McDonald, works mechanical engineer, Ley's Malleable Castings Company, Limited, Derby; J. McGrandle, chief metallurgist, Mavor & Coulson, Limited, Glasgow; T. Peacock, foreman, Fine Castings, Limited, Bristol; A. Plana, director, Instituto del Hierro Y del Acero, Madrid; *R. Player, assistant to general manager, Sterling Metals, Limited, Coventry; *W. R. Robertson, teacher of patternmaking and foundry practice, Corporation of Glasgow Education Department; G. D. Thompson, head of founding and patternmaking departments, Melbourne Technical Co'lege, Australia; J. D. Townsend, general manager (castings division), Thos. Firth & John Brown, Limited, Scunthorpe; A. C. Wallace, core-shop foreman, Crossley Bros., Limited, Openshaw; G. R. Whitehead, foundry manager, John Fowler & Company (Leeds), Limited, Doncaster.

As Associate Members

F. Bailes, works superintendent, Ideal Boilers & Radiators, Limited, Hull; W. Baker, moulder, Alliance Foundry Company, Luton; J. Baldwin, chargehand, non-ferrous moulder; G. Boyd, iron foundry assistant foreman, Daimler Company, Limited, Coventry; G. W. Burger, overseas technical representative, Foundry Services, Limited, Birmingham; H. Clayton, production and planning engineer, Sir W. H. Bailey Company, Limited, Patricroft; A. D. Cochran, moulder, South African Railways and Harbours, Salt River, Cape Town; J. W. Curry, foreman patternmaker, Geo. Angus & Company, Limited, Newcastle-upon-Tyne; G. C. Das, engineer (in training), B.S.A. Tools, Limited, Birmingham; K. C. H. Field, foundry superintendent, High Duty Alloys, Limited, Slough; H. Flatters, chief foundry inspector, Ruston & Hornsby, Limited, Lincoln; R. S. Fowle, foreman, Alliance Foundry Company, Limited, Luton; H. Greenwood, senior foreman, Bristol Aeroplane Company, Limited, Bristol; H. E. Hawley, chargehand loam moulder, Foster-Gwynnes, Limited, Lincoln; D. E. Hope, metallurgical laboratory assistant, J. Stone & Company, Limited, Charlton; A. Horridge, chargehand moulder, Dobson & Barlow, Limited, Bolton; W. T. Hulse, pattern checker, Osborn Foundry & Engineering Company, Limited, Sheffield; J. Hyde, foundry planner, Davy & United Engineering Company, Limited, Sheffield; B. W. Ixer, design and development engineer, Stone Wallwork, Limited, London; T. G. Keeling, patternmaker, Wright & Platt, Limited, Birmingham; F. Kelly, foundry cost accountant, Hepworth & Grandage, Limited, Bradford; J. R. Keter, foundry foreman, Mavor & Coulson, Limited; W. J. Ma'in, foreman, inspection department, Sterling Metals, Limited, Nuneaton; T. Marsden, patternshop foreman, Samuel Osborn & Company, Limited, Sheffield; J. O. Maxfield, foundry managers' assistant, Drakes, Limited, Halifax; E. Naldrett, foundry manager, Longford Engineering Company, Limited, Bognor Regis; A. G. Nash, patternmaker, Fine Castings, Limited; E. Needham, senior foundry metallurgist, Dobson & Barlow, Limited; D. W. Nicholson, foundry foreman, Little & Angus, Barrow-in-Furness; D. H. Robinson, foundry estimator, English Steel Corporation, Limited, Sheffield; R. W. Sandilands, foreman moulder, Lawside Engineering & Foundry Company, Limited, Dundee; L. Shaw, moulder, British Insulated Ca'lenders Cables, Limited, Prescot; J. V. Shearer, foundry manager, Dawson & Downie, Limited, Clydebank; R. Wakefield, non-ferrous foundry manager, Line Equipment, Limited, Bridgend; A. Wilson, foundry superintendent, Ideal Boilers & Radiators, Limited; W. S. Woodyer, foundry foreman, Henry Broadbent & Son, Limited, Ashton-under-Lyne.

As Associates (over 21)

B. Abbott, assistant foundry metallurgist, Henry Wallwork & Company, Limited, Manchester; R. A. Boustred, student, National Foundry College; R. N. Chatterjee, engineering apprentice, Bhartia Electric Steel Company, Limited, Calcutta; W. T. Cook, foundry trainee, Eagle Brass Foundry Company, Limited; A. Dearden, metallurgical laboratory supervisor, Dobson & Barlow, Limited; J. Ferguson, patternmaker, North British Steel Foundry, Limited, Bathgate; C. C. Knox, assistant foundry engineer, Henry Wallwork & Company, Limited; G. C. B. Lamb, foundry technician, Ley's Malleable Castings Company, Limited; H. Lawton, moulder, T. & T. Vicars, Limited, Newton-le-Willows, T. G. Pendlebury, assistant metallurgist, Dobson & Barlow, Limited; Albert Smith, brass moulder, Wadsworth & Sons, Limited, Bolton; Jack Smith, patternmaker, G. Russell & Company, Limited, Motherwell; G. Wheway, student, National Foundry College.

As Associates (under 21)

J. K. Astley, apprentice, Qualcast (Wolverhampton), Limited; D. E. Baggott, apprentice metallurgist, John Harper & Company, Limited, Willenhall; C. H. Bartlett, apprentice patternmaker, John Hall & Son, Oldham; G. Carrick, apprentice patternmaker, Geo. Angus & Company, Limited; W. C. Cotterhill, apprentice patternmaker, Priorfields Foundry, Ettingshall; R. Duddington, trainee metallurgist, Ideal Boilers & Radiators, Limited; R. C. Head, apprentice foundry draughtsman, John Gardom & Company, Ripley; R. D. Mills, time-study apprentice (foundry), John Harper & Company, Limited; J. A. Ruck, apprentice patternmaker, E.M.I., Limited, Hayes.

Second List

As Subscribing Firm Member

Cockburns, Limited, steam valve manufacturers, Clydesdale Engineering Works, Cardonald, Glasgow, S.W.2.

* Transferred.

Institute Elects New Members

As Members

*J. L. Arbuthnott, chargehand, foundries and patternshop, Port Engineering Works, India; *C. R. van-der Ben, foundry superintendent and metallurgist, National Gas & Oil Engine Company, Limited; C. J. Cook, patternmaker, Machine Pattern Company, Slough Trading Estate; H. J. W. Cox, foundry director, L. Wilkinson & Sons, Limited, Great Harwood; A. M. Elijah, foundry superintendent, Gayaji Iron & Engineering Company, Limited, and works metallurgist, Baroda Rolling Mills, Baroda, India; A. H. Hodgetts, technical adviser, Alite Foundry, Limited, London; R. J. McKillen, foundry manager, Platt Bros. & Company, Limited, Oldham; F. H. Moorby, radiologist and metallurgist; *J. R. Wilson, foundries superintendent, Cockburns, Limited, Cardonald.

As Associate Members

G. W. Chew, foundry manager, James Proctor, Limited, Burnley; *J. Colwell, coreshop foreman, Blakeys Boot Protectors, Limited, Leeds; J. Glover, foundry foreman, J. Heatley & Son, Limited, Blackburn; J. R. Hargreaves, foundry superintendent, Newman Industries, Limited, Yate; L. Hurly, supervisor, African Malleable Foundries, Limited, Benoni; A. Johnston, moulder, Atlas Steel Foundry & Engineering Company, Limited, West Lothian; P. Millington, foundry planning and development engineer, Metropolitan-Vickers Electrical Company, Limited, Manchester; A. Oldfield, chief engineer, B. Thornton, Limited, Huddersfield; J. Roe, foundry foreman, J. H. Bury, Oswaldtwistle; E. Stead, foreman, Hepworth & Grandage, Limited; W. Sykes, foundry foreman, Roberts Castings, Limited, Huddersfield; H. K. Thomas, foundry manager, Forcast Foundries, Limited; A. Whitehead, foreman patternmaker, Meldrums, Limited, Timperley.

As Associates (over 21)

T. Bunton, student metallurgist, John Dale, Limited; J. Marsh, coremaker, Harrison, McGregor & Guest, Limited, Leigh; J. Pemberton, jobbing moulder, Harrison McGregor & Guest, Limited.

As Associates (under 21)

P. Bodimeade, apprentice patternmaker, D. Napier & Sons, Limited, London; R. J. Bown, patternmaker, Machine Pattern Company, Slough; G. J. F. Clatworthy, apprentice foundryman, Western Foundries, Southall; V. J. Hopkins, apprentice patternmaker, Wimbledon Foundry Company, Limited, Merton; R. F. Horsley, foundry apprentice, D. Napier & Son, Limited; D. Humphries, apprentice patternmaker, Machine Pattern Company; D. A. Kingerley, apprentice moulder, S. H. Johnson & Company, Limited; G. R. Leithboro, apprentice patternmaker, G. D. Peters Company, Limited, Slough; W. J. Mouncey, apprentice patternmaker, Watford Foundry Company, Limited; E. C. Rouse, apprentice patternmaker, Fraser & Chalmers Engineering Works, Erith; S. D. Smith, patternmaker, Masson Scott, London; L. D. Sparrow, apprentice, Fraser & Chalmers Engineering Works.

Third List

As Members

*J. E. Bailey, technical consultant, Fordath Engineering Company, Limited, West Bromwich; *J. B. Hollis, foundry and metallurgical engineer, International Meehanite Metal Company, Limited, London; *H. Letherland, inspecting engineer, Thos. Firth & John Brown, Limited; *A. E. Warn, assistant foundry manager, John Hill & Son, Limited, Wolverhampton.

As Associate Members

R. J. Armstrong, metallurgist, Malleable Castings, Limited, Sydney, Australia; C. Brown, foundry foreman, Wassell & Clayton, Limited, Sheffield; C. C. Jones, foundry estimator, William Mills, Limited, Wednesbury; A. J. Dodd, works chemist, Coalbrookdale Company, Limited; A. R. B. Gameson, works metallurgist, T. Gameson & Sons, Limited, Walsall. *C. P. Hemming, assistant to production control manager, F. H. Lloyd & Company, Limited, Wednesbury; *M. C. Mould, departmental manager and chief inspector, A. H. Mould & Sons, Limited, Walsall; J. Sinha, special trainee (foundry foreman, India), Sir James Farmer Norton & Company, Limited, Salford; J. C. R. Smith, works engineer, Gresham & Craven, Limited, Salford; F. B. Stead, foundry engineer, G. Oxley & Sons, Limited; Sheffield; H. T. Dyball, foundry metallurgist, Morris Motors, Limited, Coventry; T. S. Jones, chief foundry inspector, Morris Motors, Limited; S. Pendlebury, die foundry manager, William Mills, Limited.

As Associates (over 21)

A. S. Brett, student, National Foundry College; W. A. Costley, metallurgical chemist, Morris Motors, Limited; C. J. Hwa, student, National Foundry College; R. Jackson, assistant metallurgist, British Piston Ring Company, Limited, Coventry; A. H. Pickering, foundry laboratory assistant, British Piston Ring Company, Limited.

As Associate (under 21)

T. C. Stanford, apprentice moulder, Electric Construction Company, Limited, Wolverhampton.

* Transferred.

British Iron and Steel Industry

Growth and Efficiency

In 1950, the output of steel ingots and castings in this country reached an all-time record of 16,293,000 tons, compared with 12,695,000 tons in 1946, while in the same period the exports of finished steel increased from 10,522,000 tons to 14,947,000 tons estimated as the production in 1950. These figures are among many others given in an article on "Five Years of Progress," published in the December issue of the British Iron and Steel Federation's "Statistical Bulletin." Direct exports of steel are shown to have increased from 2.5 million ingot tons to an estimated figure of 3 million in 1950. There has been a growing tendency since the war to export steel indirectly, in the form of engineering products, vehicles, etc. These indirect exports of steel amounted to only 1.6 million tons in 1946, but increased to an estimated figure of 3.6 million tons in 1950. There has been a marked increase in labour productivity during the period under review, and for the post-war years much fuller information is available. The index which measures annual production in steel melting and rolling shows that output per man-year, which in 1946 was about 14 per cent. above 1938, is now almost 40 per cent. above that level. The importance of a high labour productivity has for long been fully recognised in the steel industry and there is no complacency about the progress so far achieved. Another important direction in which efficiency has increased is in fuel consumption which in terms of coal has been reduced from 41.4 cwts. (including the coal equivalents of oil consumed) in 1946 to 34.4 cwt. provisionally estimated for 1950, per ton of finished products.

Template Making for Pipe Specials

By C. Thomas

The production of a pipe from a wooden template is more often than not a source of trouble both to the patternmaker and machinist. The troubles often are caused by the template being made by a handyman or joiner and of rough unfinished timber. When he has built the template in between the existing flanges it looks a good job from his point of view, but when it is lifted out it has a tendency to alter its shape through not being built rigidly. This is the type of template that usually arrives at the pipe-founders for the people concerned to work from. The patternmaker starts the job by placing the template on the surface table and finds that he can vary the position of the end flanges due to the fact that the template is not rigid. The end flanges also, being built of rough timber, are very often not true on the face and when, after considerable trouble, he has fixed the template in what he thinks is the correct position, he is by no means satisfied and this doubt also persists right through to the machine shop.

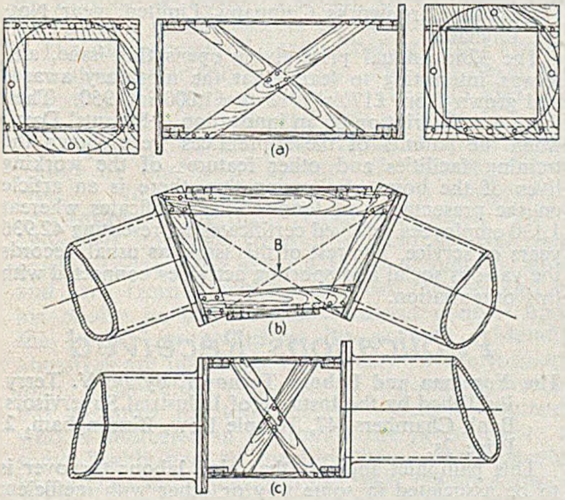


Fig. 1.—*Three Views of a Template made for Casting a Pipe Connecting Piece.*

It is definitely a much better proposition for the pipe-founder to insist on his foundry providing the material and man to make the template. All the troubles caused by the rough non-rigid template are then avoided. The patternmaker making the template will be wise if he makes square flanges instead of the usual round ones which are on most templates. He should make the frames from 4½-in. by 1½-in. stock. Yellow pine is suggested as the most suitable timber to use as this, if properly seasoned, will not twist. The overall size of the frames should be the same as the diameter of the flange they are to match up against. These should be faced up on the surface table and made perfectly true. The connecting pieces and struts should be of 4½-in. by 1¼-in. section and planed up. On receipt of this timber at the site where the template has to be prepared, the patternmaker can start building the template. It will be seen from Fig. 1 why the square flanges are much better than the round ones, as they enable the connecting pieces and struts to be more firmly placed.

Building the Template

To build the template, the wooden squares should be clamped on to the pipe flanges. Whether these squares are set to a spirit level or not depends on the position of the existing pipes with which the template has to connect and must be left to the judgment of the patternmaker. If these are not set to spirit level, a line should be stretched from corner to corner of the wooden squares, as shown in the illustration, and one of the squares can then be adjusted until the lines touch each other in the centre marked B in Fig. 1. These two squares will then be on the same plane as each other and all connecting pieces, etc., will bed down without any twist.

The outside diameter of the flanges and the position of the four holes should now be marked on each square from the flanges. These holes should be bored through the wooden squares and the connecting pieces are then screwed to the squares. The difference in the centres of the pipes can be compensated for by placing these pieces so much above and below the centre of the square flanges. The latter must be parallel to the edge of the squares and are next bolted to the existing pipe-flanges and the connecting pieces and struts are built in as shown. Before removing the template from between the existing pipes the patternmaker should get the pipe erector to cut a nick across the edge of one flange and the patternmaker transfers this to his template. When the erector receives the casting, he knows that the mark on the casting should match that he cut on the existing pipe flange. The mark on the new casting is, of course, cut after machining. He should also, while he has the erector with him, ascertain what allowance has to be made for joint rings and mark this information on the template.

James Watt Medal for Dane

The 1951 James Watt International Medal of the Institution of Mechanical Engineers is to go to the eminent Danish engineer, Dr. H. H. Blache. The medal, which is the highest that any mechanical engineer can receive, is awarded in alternate years and was founded to commemorate the bicentenary of the birth of James Watt on January 19, 1736. The award is made to men who have attained eminence in mechanical engineering in any field—science, research, invention, production, or as a works administrator or teacher.

The council of the institution is making the 1951 award to Dr. Blache, who was nominated by the Danish Society of Engineers, for his contributions to the advancement of mechanical engineering, and particularly for his pioneer work in the development of the large marine Diesel engine. He was connected for many years with Burmeister & Wain, of Copenhagen, of which company he was formerly a director.

After two years as consulting engineer to that company, he occupied, from 1937, a similar position with Harland & Wolff, Limited, the Belfast shipbuilders.

Wartime Regulations Continued

By F. J. Tebbutt

By the issue of Orders in Council, certain enactments down to expire can be continued, this being provided for in the Emergency Laws (Miscellaneous Provisions) Act, 1947. In that Act there were a number of Defence Regulations down to expire December 10, 1950, but by a recent Order in Council most of these are continued until December 10, 1951. On the other hand, there is one Act, affecting industrial practices, the operation of which is postponed until that date.

The number of regulations which are to remain with us is large, though some have little trade interest. One continues the use of identity cards and another gives power to Post Office officers to ask for their production. Continued also are various Regulations referring to patents, trade marks, etc., these allowing Government departments to obtain information from any person in respect of inventions, designs or processes, if required in the national interest or to make use of such inventions, etc.

Postponed

An Order in Council puts off until December 10, 1951, the operation of The Restoration of Pre-war Trade Practices Act, 1942. By this Act employers are required to restore any trade practice which was in operation before the war (i.e., prior to September 3, 1939, or, if then on munitions, April 30, 1939) and has been departed from since; this to be done within two months after a date to be named by the Ministry of Labour as for this purpose representing the end of the war. There have been various dates laid down earlier. only for another date in the future to be substituted before that stipulated had arrived. Now, by a new Order, the date is to be December 10, 1951, which means that any war-time practice can be continued throughout 1951, that is, until December 10.

By the new Act, the date from which the two months will apply, will be a date appointed by His Majesty by Order in Council, following a recommendation of the Minister of Labour. not to be worded as constituting the end of the war as above, but the Order must be laid before both Houses of Parliament, so the wartime practices can again continue beyond the ending date of the present Order.

Automatic Crane Development

What may be the world's first fully automatic crane has been completed after a year of planning and research by the Paterson Hughes Engineering Company, Limited, Glasgow. The crane, which is made of aluminium, can lift a 4-ton load and transfer it a distance of 150 ft. The company have just completed tests during which the machine operated non-stop for eight hours without being touched by hand. It can move 80 tons an hour, and has been specially designed for transferring phosphate from bulk storage to bagging plant in the works of the Scottish Agricultural Industries at Ayr.

The plant, including its load, weighs 15 tons and will do the same work as a crane weighing 27 tons manufactured from steel. In its robot working it can move its grab from point to point to pick up phosphate from the store. It is 200 ft. long and was transported from the firm's Maryhill works to Ayr by road on a special convoy of lorries and trailers.

The Ideal Home Exhibition which is being held in March at Olympia is adhering to its original concept by creating a whole village of "ideal homes."

House Organs

Carron Cupola, Vol. II, No. 1. Issued by the Carron Company, Falkirk.

This magazine is now just a year old and the excellent start then made has been well maintained. The London article should not have been started at the base of a column, but at the sacrifice of the picture it could have been fitted in on page 14. Otherwise the layout conforms to the best practice.

S. & W. Magazine, Vol. 4, No. 9. Issued by Smith & Wellstood, Limited, Bonnybridge.

This issue contains an illustrated description of the mechanised foundry which went into commission on November 20. It has been formally opened during the current week. There is printed a list of sixty recipients of long service—over 50 years—certificates and other rewards. It is surely outstanding for a firm of this size to claim such a large number.

The Stantonian, Vol. 17, No. 6. Published by the Stanton Ironworks Company, Limited, near Nottingham.

The 32nd annual prize-giving opens this issue, and it was interesting to learn that the monetary awards had grown from £17 in 1918 to £1,000 in 1950. Then there is a description of an innovation, "Parents' Day," when the parents of the apprentices were shown the training facilities and other features of the working lives of the boys. Following this, there is an article on the presentation of long-service certificates whereat 1,130 employees received certificates representing 42,936 years of service. The rest of this issue, as usual, records the various social and sporting activities connected with this organisation.

Publications Received

The Foreman and Labour Turnover, by N. V. Terry. Published by the Institute of Industrial Supervisors, Bank Chambers, 47, Temple Row, Birmingham, 2. Price 2s.

This pamphlet suggests that high labour turnover is to be associated in some way or other with inefficient management, and that one more register should be kept with the object of self examination. The reviewer believes this to be ill founded and quite extraneous matters completely override the written argument. Slack management can result in "cushy" jobs and reduced labour turnover. Local housing conditions have their effect. Extra high inspection—a prime requisite in some shops—reduces net wages, whereas slack inspection may increase them. It is on these grounds that the reviewer rejects the logic of the pamphlet.

V. C. F.

New Catalogues

Portable Compressor. Holman Brothers, Limited, of Camborne, have just issued a leaflet describing the Holman Tractair 13. This machine has a displacement of 130 cub. ft. per min. It can operate at full pressure two heavy road rippers, a heavy-duty rock drill, or the like. The leaflet sets out a simplified specification of the machine.

Mechanical Shovels. A pamphlet issued by the Chaseside Engineering Company, Limited, of Station Works, Hertford, is an attempt to answer the question as to whether the Chaseside shovel really pays for itself. The solution to the question is nicely set out in tabular form for both petrol and diesel engines. From these the minimum number of hours of working in order to make the machine pay are clearly apparent.

Hard-drawn Steel Pellets for Cleaning and Peening

By J. E. Hurst, D.Met., J.P.

THE DEVELOPMENTS in America in the manufacture and use of hard drawn steel pellets primarily for the surface peening of springs and other articles, to obtain improved fatigue resistance, has been described in the technical Press.* This new material, which comes as the latest of a long line of materials which have been suggested at one time or another for shot-blasting, cleaning or peening operations, is now manufactured in this country by Bradley & Foster, Limited, of Darlaston, the well-known manufacturers of metallic abrasives.

The old process of "sand-blasting," first applied to castings over fifty years ago, has now developed into a very important industry. The old idea was that any abrasive material was suitable for shot-blasting purposes has been replaced almost completely by the newer concept of "fitness of purpose." No longer is shot and grit confined in application to the mere removal of scale, rust or unwanted coatings from iron castings and steel work. Today there exists a range of metallic shots and grits from which the user can choose, and by his choice he can exercise a direct control upon the surface properties of his product. Metallic abrasives are no longer used solely by the foundryman, stone-cutter, engraver, or vitreous enameller, but are now the tools of the precision engineer, who is interested in improving the performance of some highly-stressed machine part. The peening hammer of the blacksmith has been replaced almost entirely in this function by air-blast and mechanical shot-peening methods employing metallic shot.

The modern development of shot-peening to improve the fatigue strength and endurance limit of highly-stressed steel machine parts has made big demands upon the quality of shot. The newly-developed hard-drawn steel pellets have proved to be first-class peening material from the standpoint of uniformity of physical properties, maintenance of size and useful life

General Uses of Pellets

Hard-drawn steel pellets, although chiefly used for the peening of highly-stressed steel shafts, springs, gears and splines, are also of interest for cleaning purposes. In this respect their characteristic toughness results in a long working life, which in certain circumstances may offset the cost of this type of abrasive as compared with cast steel or iron shot and grit. The breakdown rate of pellets is extremely slow, and thus the material remains true to size for a longer period than other types of shot.

Another advantage which is claimed for pellet abrasives is that these can be manufactured in almost all ductile metals and alloys, *e.g.*, stainless steel pellets are being used for specialised cleaning purposes in the case of stainless steel and non-ferrous articles. Such pellets are applied to the cleaning of bronze and brass castings where the presence of iron impacted in the surface might lead to objectionable stains during the finishing process. Non-ferrous castings are improved and are left with a natural pleasing surface colour, and their machining has been speeded up and troubles due to tool breakage at hard spots has been eliminated.

The potential uses of blasting pellets are many and are at present largely unexplored. The full importance of the development will only be realisable in the future. For the present, the application of steel pellets to the peening process is their main use.

Use for Peening

Pellets for peening are made in a machine which has been designed to cut wire accurately and without flash into lengths equal to the diameter of the wire. The sizes regularly produced are pellets 0.0625 in., 0.055 in., 0.0415 in. and 0.0313 in. diameter. Other sizes can be made available to users' requirements. The wire from which the pellets are

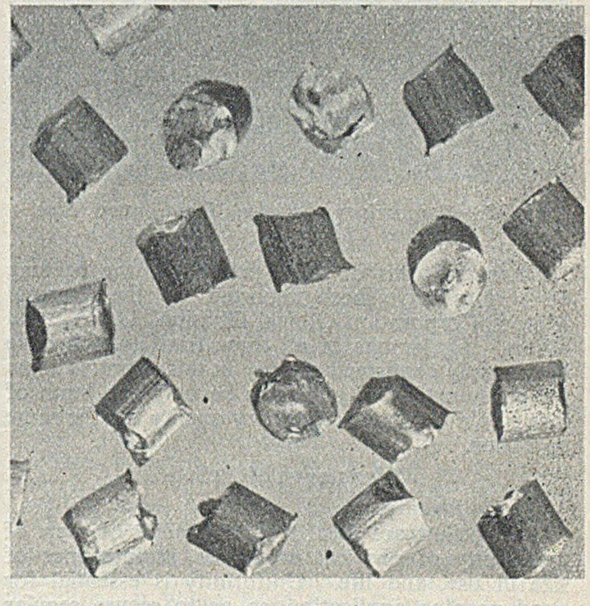


FIG. 1.—*Hard-drawn Steel Wire Pellets.* × 6 *dias., showing Sharp Edges.*

* *e.g.*, H. H. Miller, *S.A.E. Journal*, August, 1949, and D. H. Cargill. *Iron Age*, 1950, April, page 95.

Hard-drawn Steel Pellets for Cleaning and Peening

produced has a tensile strength of 100 to 130 tons per sq. in. and a hardness between 400 and 500 Brinell. As supplied, the pellets are cylindrical in shape, a typical example at a magnification of × 6 diameters being illustrated in Fig. 1.

When using hard-drawn steel pellets for the first time for a peening operation, it is necessary to blunt the sharp corners by using on scrap or better still, by using first in a forging or castings cleaning plant. Small day-to-day additions or "make-up" to a peening plant already operating on pellets can be made in the form of new pellets without causing difficulties. However, for jobs where there might be exacting surface requirements, such as aircraft parts, it may be desirable to use well-conditioned, rounded particles. The ultimate shape of each pellet in use becomes a sphere. Fig. 2 shows a comparison of hard-drawn steel pellets, and ordinary chilled shot in their natural sizes.

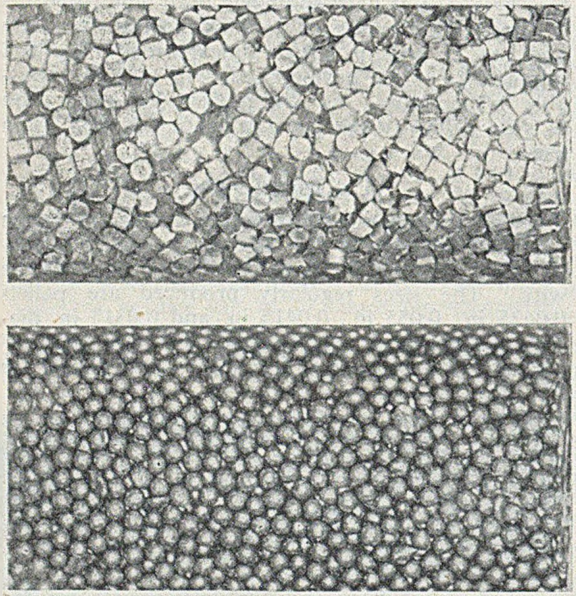


FIG. 2.—*Comparison between Hard-drawn Steel Pellets and Chilled Shot (Natural Size).*

Extensive trials of these pellets for the peening of springs have been reported by the General Motors Corporation, Buick Division, U.S.A., and others. The results of all these trials (which have been amply confirmed already in this country) show the consumption of pellets to be only one tenth of that of chilled shot of ordinary quality for the same operation.

Advantages of Pellets

(1) *Uniformity.*

Steel pellets are ideal from the point of view of uniformity of physical properties, maintenance of size in use, and life. Uniformity is essential for good peening application so as to secure regular response to the improvements in endurance life of the treated steel machine parts. The use of steel pellets removes many of the objections to shot peening. It allows a much better control of the process and should result in a new attitude towards peening which, in turn, will probably make possible many further applications.

(2) *Efficiency.*

The uniform toughness and particle size enables machines for blasting, peening and cleaning to be worked at optimum production efficiency. The physical characteristics of hard-drawn steel pellets are such that less wear of working parts of both the blast type and mechanical shot-projecting machines takes place.

(3) *Cost.*

For the peening of springs, the value of the steel pellets compared with chilled cast-iron was found to be in the ratio of 10 to 1. Whilst the cost of pellets is much higher than that of chilled cast-iron shot, it is not in this high ratio. The savings possible depend upon the application. The cost advantages over other peening materials may only be assessed when full account is taken of its long life and efficiency with a consequent reduction in handling costs.

(4) *Applicability.*

Blasting pellets, which can be obtained in a variety of metals, give a wider range of materials now available to engineers for the cleaning and peening of machine parts and castings. Pellets may be produced economically in metals which could not be produced as graded shot and grit.

Hadfields' New Chairman

In consequence of his retirement, John Bernard Thomas is relinquishing his appointments as chairman and managing director of Hadfields, Limited, Sheffield, at the end of this month. His successor will be Harold Humphries, deputy managing director of the company.

Mr. Thomas, who joined Hadfields in 1917, was appointed financial adviser to the company in 1922. In 1936 he joined the board of Hadfields as financial director. He became general manager in 1945 following the retirement of Sir Peter Brown and Major A. B. H. Clerke.

Mr. Thomas has served on the boards of many companies—as chairman of Hadfields Steels, Limited. Hadfields Foundry & Engineering Company, Limited. George Wostenholm & Son, Limited. Ernest Newell & Company, Limited, and several others.

When, in 1943, Mr. T. H. Summerson resigned from his position as Director for Steel Castings, the Iron and Steel Controller invited Mr. Humphries to fill the vacancy, asking him at the same time to retain his duties as director for Steel Forgings, and Tyres, Wheels, and Axles. Two years later Mr. Humphries succeeded Mr. W. B. Pickering as commercial manager of Hadfields. Limited, and also became a local director of the company. A member of the council of the British Steel Founders' Association, he is also chairman of Rayboulds. Limited, and a director of Ernest Newell & Company, Limited, Hadfields Forgings. Limited. Hadfields Foundry & Engineering Company, Limited. and Hadfields Steels. Limited.

Correspondence

[We accept no responsibility for the statements made or the opinions expressed by our correspondents.]

To the Editor of the FOUNDRY TRADE JOURNAL

FORTY YEARS AGO

SIR,—To those of use who enjoy retrospection, your extracts from 40-year-old issues are a source of much delight. For instance, reference in your issue of January 11 to photo-micrographs in a Paper by the late H. I. Coe recalls that as an assistant in the metallurgical department of the Birmingham Technical School, I prepared and photographed the specimens from Mr. Coe, himself recently graduated from one of the younger universities.

I could not then have known and am frankly surprised to learn now that the work deserved merit even at to-day's standard. It would be in no way disloyal to my well-loved seniors of those days, students as they had been of the great Roberts-Austen himself, to suggest that up to Mr. Coe's arrival the micro work of the department was in need of an overhaul and improvement, and what I most remember is the great difficulty experienced in meeting Mr. Coe's requirements with the equipment then available.

How satisfying it is then to unfold memory and to read your comments to-day. It is because I look forward to the printing of similar and reliable records from the early days of your Journal, records which I hope many contemporaries will share with me, and certainly not because of any praise due for the photographs of that day, that I write to encourage you to keep us well posted on the things which we thought worth doing then, and no less think the same as we look back on them from 1951.—Yours etc.,

H. FIELD,
director.
John Harper & Company, Limited.

January 23, 1951.

MOULDING-BOX LIFTING BEAMS

To the Editor of the FOUNDRY TRADE JOURNAL

SIR,—Referring to Mr. J. Steele's Paper in the FOUNDRY TRADE JOURNAL of January 11, 1951, entitled "Safety and Hygiene in the Foundry," I think it is desirable to point out that the beam for turning over large boxes (Fig. 5) should be provided with stops at the ends of the beam.

We had several near accidents with the type of beam illustrated due to falling off of the struts and chains while shifting them on the beam. To move the struts along to another notch a set at one end is lifted, with the result that the beam tilts and the struts and chains on the opposite end drop off. Instantly, the strut and chains being moved are released by the swing of the beam, which tilts downwards, with the result that the strut and chains fall off on to the feet of the employee.

Where we had room to spare we drilled and secured bolts through the thickness of the beam with suitable packing. In other cases stops were bolted on at the extremity of the beam.—Yours, etc.,

W. E. DENNINGTON.

56, The Green, Welling, Kent.
January 24, 1951.

LLOYD'S REGISTER OF SHIPPING have decided to offer a scholarship in Marine Engineering, value £175 per year, and tenable for three years at a British university, to be awarded in 1951 under the auspices of the Institute of Marine Engineers. Full particulars and entrance forms may be obtained on application to the secretary of the Institute, 85, Minories, London, E.C.3.

Notes from the Branches

London Branch—East Anglian Section

The East Anglian section of the London branch of the Institute of British Foundrymen met on January 11 in the lecture hall of the Central Library, Ipswich, when the Institute's Technical Committee Report No. T.S.23, "The Repair and Reclamation of Grey-iron Castings by Welding and Allied Methods," was presented by Mr. L. J. Tibbenham, of the Suffolk Ironfoundry (1920), Limited, who was a member of the original committee. The meeting was under the chairmanship of Mr. W. L. Hardy.

Copies of the Report were distributed to the members before the meeting, and Mr. Tibbenham emphasised the more important aspects of welding technique. Following the lecture, an animated discussion took place.

MR. HARDY, in his remarks from the chair, emphasised that welding of steel castings was a technique accepted by inspecting authorities, and there was no legitimate reason why iron castings should not be repaired in the same manner, particularly in these days when raw materials were in very short supply.

MR. R. F. COATES stressed the value of the Report in dispelling the suspicion that had surrounded welding of iron castings. He thought that the Report was presented in excellent and comprehensive form, and should do much to lift this important branch of foundry technique from the hole-and-corner business which it has been regarded as being in the past. He also asked Mr. Tibbenham whether it was possible and economical to repair by welding short-run castings in very light sections.

MR. TIBBENHAM replied that it was possible to weld short-run castings in very light sections, but certainly not economical, and in most cases it was cheaper for the foundry to re-make the article.

MR. CARRICK asked whether small defects in several categories were better dealt with by electric-arc welding rather than by oxy-acetylene.

MR. TIBBENHAM agreed that small defects would be more effectively dealt with by electric-arc welding.

MR. PATCHETT said that he had used welding extensively on certain castings which were to be subsequently machined, and in nearly every case the weld metal exhibited a different colour from the parent metal after welding.

MR. TIBBENHAM replied that adequate preheating eliminated the difference in colour between weld and parent metal with cast-iron welds.

MR. R. J. HART asked if Mr. Tibbenham had carried out physical tests on welded cast-iron bars. He also emphasised the risk of cracking after welding.

MR. TIBBENHAM replied that welded test-bars were as strong as the parent metal. Regarding cracking after welding, several methods could be adopted to allow the weld and adjacent metal to cool at an even rate, one method being to cover the weld with sawdust.

At the conclusion of the meeting a vote of thanks to Mr. Tibbenham was proposed by Mr. Coates.

THE PAGET ENGINEERING COMPANY (LONDON), LIMITED, Braintree Road, South Ruislip, Middlesex, announce that they have developed and are marketing moulding boxes fabricated from steel sections. Both hand and machine moulding types are available.

INDUSTRIAL IMPREGNATIONS, LIMITED, specialists in reclamation of porous castings, have removed from Brentford to 9, Willow Road, Poyle Estate, Poyle Road, Colnbrook, Bucks. Castings weighing up to 5 tons can be treated.

Iron and Steel Stock Valuations

Several more iron and steel companies have announced the compensation payable in respect of their shares on transfer to public ownership under the Iron and Steel Act.

The value of the share capital of the Templeborough Rolling Mills, Limited, has been agreed at £7 a £1 share. British Ropes, Limited, is interested directly or indirectly in 50 per cent. of the total share capital of £216,003. British Ropes' directors point out that the compensation will result in a substantial capital surplus to the company, but the income receivable in respect of this investment will be reduced unless and until the compensation can be employed to advantage. In the case of the interest in Templeborough Rolling Mills held by the United Steel Companies, Limited, the surplus will vest in the Iron and Steel Corporation, which takes over the United Steel assets next month.

The 3½ per cent. loan stock, 1950-55, of Richard Thomas & Baldwins, Limited, has been valued at £101 per £100 of stock. Other valuations are:—Four per cent. redeemable first mortgage debenture stock, £103 8s. 4d. per £100 stock; 6½ per cent. cumulative participating preference stock, 34s. 10d. per £ unit; ordinary stock, 15s. 3d. per 6s. 8d. unit.

Valuations of the Darlington & Simpson Rolling Mills, Limited, stocks are:—5½ per cent. preference £1 shares, 25s. 7d. a share; 6 per cent. preference £1 shares, 25s. a share; ordinary £1 shares, 32s. 9d. a share.

The compensation values of securities of Burnell & Company, Limited, to be vested in the Iron and Steel Corporation have been agreed as follow:—Seven and a-half per cent. cumulative participating £1 preference shares, 40s.; ordinary shares of 5s. each, 25s.

The stockholders' representative of Gjers, Mills & Company, Limited, announces that the value for compensation purposes has been agreed with the Minister of Supply at 33s. a share.

The value of the preference and ordinary stocks of Colvilles, Limited, has been agreed at 38s. per £1 unit of ordinary stock and 26s. 6d. per £1 unit of 5½ per cent. preference stock. With regard to the values of the preference shares of two subsidiaries, the Lanarkshire Steel Company and Smith & McLean, Limited, the value of the Lanarkshire 6 per cent. £1 shares has been agreed at 25s. a share, and that of the Smith & McLean 5 per cent. £10 shares as £11 10s. a share.

Because of steel nationalisation, holders of the 3½ per cent. first charge debentures of John Brown & Company, Limited, are asked to authorise redemption of the whole £427,926 outstanding on April 30 next at 103 per cent., plus the half-year's accrued interest. The stock, issued in 1944, is a sub-mortgage of a first legal charge on the Atlas and Scunthorpe works of the subsidiary, Thos. Firth & John Brown, Limited. The legal charge is £399,050, the final instalment of £37,591 being payable on January 1, 1964. The debentures, redeemable by an annual sinking fund, are ultimately repayable at par on June 30, 1964.

Thos. Firth & John Brown is one of the companies whose securities, including the legal charge, will be vested in the Iron and Steel Corporation. Compensation in Iron and Steel stock equal in value at date of issue to the value of the legal charge has been agreed with the Ministry of Supply at £106 per £100.

The Stock Exchange Council has ruled that on and after January 31, and until the vesting date, the minimum commission chargeable on purchases and sales of Iron and Steel securities, being valued securities under the provisions of the Iron and Steel Act, 1949, shall for all classes be ¼ per cent. on money.

Contracts Open

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

ACCRINGTON, February 10—Castings, for the Borough Council. Mr. J. W. Buick, borough engineer and surveyor, Town Hall, Accrington.

BARNSLEY, February 19—Cast-iron manhole covers and gratings, for the Borough Council. The Borough Engineer and Surveyor, Town Hall, Barnsley.

CANTERBURY, February 19—Castings, for the City Council. Mr. J. E. Rhodes, city engineer and surveyor, Municipal Buildings, Dane John, Canterbury.

EXMOUTH, February 24—Castings, for the Urban District Council. Mr. R. J. Humphreys, engineer and surveyor, Templetown Lodge, Exmouth.

GILLINGHAM, February 14—Cast-iron manhole covers, etc., electrical wire, cables, etc., for the Borough Council. The Borough Engineer and Surveyor, Municipal Buildings, Gillingham.

HEYWOOD, February 17—Cast iron, for the Borough Council. Mr. A. Middleton, borough surveyor, Municipal Buildings, Heywood.

LONDON, E.C., February 8—Iron castings, valve, meter, hydrant and stopcock boxes, non-ferrous castings, etc., sluice valves, spindles, fire hydrants, etc., for the Metropolitan Water Board. The Chief Engineer, Room 171, Offices of the Board, New River Head, Rosebery Avenue, London, E.C.1.

NEWCASTLE-UNDER-LYME, March 9—Castings, for the Borough Council. The Borough Surveyor, Lancaster Building, Newcastle-under-Lyme.

OLDBURY, February 17—Castings, for the Borough Council. The Borough Engineer and Surveyor, Municipal Bank Chambers, Oldbury.

OSWALDTWISTLE, February 19—Cast-iron pipes, etc., brass fittings, for waterworks, etc., for the Urban District Council. The Surveyor, Town Hall, Oswaldtwistle.

SLOUGH, February 12—Cast-iron manhole covers, frames, rainwater pipes, etc., for the Borough Council. Mr. E. G. Thorp, borough engineer, Town Hall, Slough.

SOUTHEND-ON-SEA, February 12—Iron castings, for the Borough Council. Mr. R. G. Baxter, borough engineer, Municipal Buildings, Southend-on-Sea.

STOKE-ON-TRENT, February 15—Cast-iron pipes, specials, etc., for the Town Council. The City Surveyor, Town Hall, Stoke-on-Trent.

TURTON, February 24—Cast-iron gully grates and manhole covers, for the Urban District Council. Mr. R. Dart, engineer and surveyor, Council Offices, Bromley Cross, near Bolton.

BEVERLEY, February 9—Supply and laying of 400 yds. of 6 in. dia. spun-iron pumping mains, etc., for the Rural District Council. Mr. J. H. Haiste, consulting engineer, 4, Queen Square, Woodhouse Lane, Leeds, 2. (Deposit, £3 3s.)

LOURENCO MARQUES, April 19—Cupola furnace, for the Permanent Purchasing Commission, Treasury Department. Room 1086 (reference, CRE (IB) 51330/51).

New Companies

("Limited" is understood. Figures indicate capital. Names are of directors unless otherwise stated. Information compiled by Jordan & Sons, 116, Chancery Lane, London, W.C.2.)

WEIR VALVES, Holm Foundry, Cathcart, Glasgow—£100,000. J. K. Weir and J. A. Lang.

F. & C. W. BRIGGS, 11, Peter Street, Manchester, 2—Pattern and tool makers, etc. £2,000. F. and C. W. Briggs.

J. RICHARDS (MALLEABLE), Victoria Foundry, Groveland Road, Dudley Port, Tipton (Staffs)—£30,000. J. and G. Richards.

H. J. DOWNS (BRISTOL), Deep Pit House, Deep Pit Road, St. George, Bristol—Scrap metal merchants. £6,000. H. J. and E. M. Down.

DUDLEY IRON & STEEL COMPANY (1950), Halesowen Road, Netherton, near Dudley—£10,000. D. Wellings, L. E. Whelan, and I. R. Willetts.

R.T.S.C. EXPORTS, 47, Park Street, London, W.1—Ferrous and non-ferrous metal dealers, merchants, factors, etc. £1,000. H. F. Spencer and E. J. Pode.

F. G. HISTON, 5, Lower Temple Street, Birmingham, 2—Manufacturers of aluminium and stainless-steel goods, etc. £10,000. F. G. and N. G. Histon.

J. K. SMIT & SONS DIAMOND TOOLS, 160, Audrey House, Ely Place, London, E.C.1—£20,070. J. J. Smit, senr. and junr., P. Smith, and K. S. Phaff.

G. R. GILBERT, Hackbridge Mills Estate, Hackbridge (Surrey)—Mechanical engineers, ironfounders, etc. £20,000. G. R., W., and R. W. Gilbert, and G. W. Shell.

Raw Material Markets

Iron and Steel

There is a persistent demand for all grades of pig-iron. The engineering foundries have for some time found the supply of low- and medium-phosphorus irons inadequate, and the increased demands for hematite and the refined irons have swallowed up any balances of these grades which the furnaces had available. Difficulty in obtaining ore and coke has weakened the supply position, resulting in reduced outputs and deliveries to consumers. In many instances indents against licences terminating at the end of December are not yet fully implemented by the hematite furnaces, which have been working on reduced ore supplies. Ample supplies of raw materials will bring back the furnaces to normal outputs, but with the heavy demands now being made by the engineering foundries, overall tonnages will have to show an appreciable increase fully to satisfy their requirements.

Two furnaces in Derbyshire and one in Northamptonshire have changed over from foundry pig-iron to the production of steelmaking iron. This has been necessitated by the shortage of scrap and foreign ore. While the importance of maintaining steel production cannot be underrated, the deficiency in supplies to the foundries will be difficult to overcome. Prior to the changeover, outputs of high-phosphorus pig-iron, particularly of the Derbyshire grade, were hardly sufficient, and the position has now been worsened.

While the supply of foundry coke has shown some improvement, the position is far from satisfactory, as many foundries are still working from truck to cupola. Some stock must be available to rid them of their troubles, as delays in transit are frequent.

Scrap is in heavy demand. Ganister, limestone, and ferro-alloys are equal to requirements, and firebricks are available to specification, providing sufficient notice of requirements is given.

The products of the re-rollers are in heavy demand. Orders on hand will occupy them for a long time ahead, and new business is difficult to place except for deferred delivery. All sizes of bars, sections, and strip are readily accepted by home users, and supplies available for oversea buyers are limited. Unfortunately, production is affected detrimentally by the shortage of steel semis, which cannot be procured from home steelworks at the rate demanded.

Non-ferrous Metals

Last Friday brought news of the February zinc quota, but details of the individual allocations were delayed even longer, and it is a matter for regret that the Ministry of Supply found it necessary to run the consumers up to the last minute before informing them of their tonnage. As was feared in many directions, the February share-out shows a reduction on the first month of the year, the change being in high-grade metal. In January electrolytic zinc used for brass-making and high-purity zinc for diecasting were both rationed at 85 per cent. of the average of the first nine months of last year, but February sees this brought down to 80 per cent. Electrolytic zinc for rolling strip and plates remains at 70 per cent. and G.O.B. metal is held at 50 per cent.

On the whole, this presents a pretty sorry picture, particularly as users have no guarantee that the Ministry's failure to secure sufficient zinc will not result in a further downward adjustment for March. This month by month allocation savours too much of a hand-to-mouth arrangement to be acceptable to the consumers, who are unable to plan more than a few weeks ahead. No explanation has been offered by the Ministry of why the ration of high-grade zinc has been reduced, and as usual the person most interested—the consumer—is kept in the dark about the future.

It is indeed unfortunate that the Government's intention to control scrap prices, announced before Christmas, has not as yet been implemented by an Order giving effect to this move. For some time now official confirmation in the shape of a schedule of maximum quotations has been looked for almost daily, but at the time of writing it is still not forthcoming. When the news that a scrap price control Order was pending first became known before Christmas and a list of "shadow" prices was published, market values of old metals moved down quite sharply, for it was felt that the matter might be settled within a few days. Some weeks have elapsed since then, and we have seen values recover and then fall back again. Last week saw the price curve moving up again, for material appears to be in very short supply, and consumers, hard driven through lack of zinc and copper, were anxious to keep their plant running at almost any cost.

In the House of Commons, on Monday, Mr. G. R. Strauss, Minister of Supply, announced that he intends to make Orders controlling the price and distribution of non-ferrous scrap in order to obtain the maximum amount of scrap. The British Iron and Steel Federation had undertaken a drive to secure larger quantities of ferrous scrap from sources in this country and was buying all that could be obtained from abroad. Copper supplies for civilian production, he said, would have to be reduced as defence needs progressively increased, and it would be necessary from February 1 to limit supplies to consumers to 85 per cent. of the rate in the first six months of 1950.

Tin prices have established new all-time records this week, advancing well above the previous record of £1,300 to £1,305 reached on December 19 last.

Official tin quotations were as follow:—

Cash—Thursday, £1,255 to £1,260; Friday, £1,270 to £1,275; Monday, £1,345 to £1,350; Tuesday, £1,350 to £1,355; Wednesday, £1,360 to £1,375.

Three Months—Thursday, £1,230 to £1,235; Friday, £1,235 to £1,240; Monday, £1,310 to £1,320; Tuesday, £1,310 to £1,315; Wednesday, £1,325 to £1,330.

Book Reviews

Transactions of the Manchester Association of Engineers, Session 1949-50. Edited by G. M. P. McKellen. Published by the Association from 20, Booth Street, Manchester, 2.

Unlike many earlier volumes, this one from the foundry point of view is not a good vintage, yet this is not to say that the quality of the Papers presented has in any way been lowered. Actually they reach a high standard and cover a wide range of engineering interests. The volume is especially important as it carries an alphabetical subject index covering the last ten years.

Mechanical World Electrical Year Book, 1951 Edition. Published by Emmott & Company, Limited, 31, King Street West, Manchester, 3. Price 3s. net.

The publishers of year books and the like often stress that some section or other has been brought up-to-date, but in truth the real value of such books is the availability between one set of covers of as much as possible of the data likely to be wanted by the man in the profession for which it caters. From this angle the book is most satisfactory.

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

(Delivered, unless otherwise stated)

January 31, 1951

PIG-IRON

Foundry Iron.—No. 3 Iron, Class 2:—Middlesbrough, £10 10s. 3d.; Birmingham, £10 5s. 6d.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent P, £12 1s. 6d., delivered Birmingham. Staffordshire blast-furnace low-phosphorus foundry iron (0.10 to 0.50 per cent. P, up to 3 per cent. Si)—North Zone, £12 10s.; South Zone, £12 12s. 6d.

Scotch Iron.—No. 3 foundry, £12 0s. 3d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £13 2s. 6d.; South Zone, £13 5s.

Refined Malleable.—P, 0.10 per cent. max.—North Zone, £13 12s. 6d.; South Zone, £13 15s.

Cold Blast.—South Staffs, £16 3s. 3d.

Hematite.—Si up to 2½ per cent., S. & P. over 0.03 to 0.05 per cent.:—N.-E. Coast and N.-W. Coast of England, £12 0s. 6d.; Scotland, £12 7s.; Sheffield, £12 15s. 6d.: Birmingham, £13 2s.; Wales (Welsh iron), £12 0s. 6d.

Spiegeleisen.—20 per cent. Mn, £17 16s.

Basic Pig-iron.—£10 11s. 6d., all districts.

FERRO-ALLOYS

(Per ton unless otherwise stated, basis 2-ton lots, d/d Sheffield works.)

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

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

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

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

Ferro-tungsten.—80/85 per cent., 31s. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 33s. per lb. of W.

Ferro-chrome.—4/6 per cent. C, £66, basis 60% Cr, scale 22s. per unit; 6/8 per cent. C, £61, basis 60% Cr, scale 21s. per unit; max. 2 per cent. C. 1s. 6¾d. per lb. Cr; max. 1 per cent. C, 1s. 7¼d. per lb. Cr; max. 0.15 per cent. C, 1s. 8d. per lb. Cr; max. 0.10 per cent. C, 1s. 8¼d. per lb. Cr.

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

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

Ferro-manganese (blast-furnace). — 78 per cent., £30 5s. 11d.

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

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—Basic: Soft, u.t., £16 16s. 6d.; tested, up to 0.25 per cent. C (100-ton lots), £17 1s. 6d.; hard (0.42 to 0.60 per cent. C), £18 16s. 6d.; silico-manganese, £23 19s.; free-cutting, £20 1s. 6d. Siemens Martin Acid: Up to 0.25 per cent. C, £22 4s.; case-hardening, £23 1s. 6d.; silico-manganese, £26 6s. 6d.

Billets, Blooms, and Slabs for Forging and Stamping.—Basic, soft, up to 0.25 per cent. C, £19 16s. 6d.; basic, hard, over 0.41 up to 0.60 per cent. C, £21 1s. 6d.; acid, up to 0.25 per cent. C, £23 1s. 6d.

Sheet and Tinplate Bars.—£16 16s. 6d.

FINISHED STEEL

Heavy Plates and Sections.—Ship plates (N.-E. Coast), £20 14s. 6d.; boiler plates (N.-E. Coast), £22 2s.; chequer plates (N.-E. Coast), £22 19s. 6d.; heavy joists, sections, and bars (angle basis), N.-E. Coast, £19 13s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., untested, £22 6s.; flats, 5 in. wide and under, £22 6s.; rails, heavy, f.o.t., £19 2s. 6d.; hoop and strip, £23 1s.; black sheets, 17/20 g., £28 16s.

Alloy Steel Bars.—1-in. dia. and up: Nickel, £37 7s. 3d.; nickel-chrome, £55; nickel-chrome-molybdenum, £61 13s.

Tinplates.—I.C. cokes, 20 × 14, per box, 40s. 11d., f.o.t. makers' works.

NON-FERROUS METALS

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

Tin.—Cash, £1,360 to £1,375; three months, £1,325 to £1,330; settlement, £1,370.

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

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

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

Other Metals.—Aluminium, ingots, £124; antimony, English, 99 per cent., £325; quicksilver, ex warehouse, £73 10s. to £74; nickel, £406.

Brass.—Solid-drawn tubes, 21¾d. per lb.; rods, drawn, 29¼d.; sheets to 10 w.g., 26⅜d.; wire, 27½d.; rolled metal, 25⅛d.

Copper Tubes, etc.—Solid-drawn tubes, 23¼d. per lb. wire, 226s. 6d. per cwt. basis; 20 s.w.g., 254s. per cwt.

Gunmetal.—Ingots to BS. 1400—LG2—1 (85/5/5/5), £255 to £265; BS. 1400—LG3—1 (86/7/5/2), £265 to £275; BS. 1400—G1—1 (88/10/2), £340 to £350; Admiralty GM (88/10/2), virgin quality, £340 to £350, per ton, delivered.

Phosphor-bronze Ingots.—P.B1, £350 to £360; L.P.B1, £270 to £285 per ton.

Phosphor Bronze.—Strip, 35d. per lb.; sheets to 10 w.g., 37⅛d.; wire, 39⅞d.; rods, 36½d.; tubes, 41½d.; chill cast bars: solids, 42d, cored, 43d. (C. Clifford & Son, Limited.)

Nickel Silver, etc.—Ingots for raising, 2s. 3¾d. per lb. (7%) to 3s. 2¼d. (30%); rolled metal, 3 in. to 9 in. wide × .056, 2s. 9¼d. (7%) to 3s. 8½d. (30%); to 12 in. wide × .056, 2s. 9½d. to 3s. 8¾d.; to 25 in. wide × .056, 2s. 11½d. to 3s. 10¾d. Spoon and fork metal, unsheared, 2s. 6½d. to 3s. 5½d. Wire, 10g., in coils, 3s. 3d. (10%) to 4s. 2½d. (30%). Special quality turning rod, 10%, 3s. 2d.; 15%, 3s. 6¾d.; 18%, 3s. 11d. All prices are net.

Forthcoming Events

FEBRUARY 5

Institute of British Foundrymen

Sheffield branch :—" Oxygen as an Aid to Production of Carbon Foundry Steel in the Arc Furnace," by A. C. Brearley, at 7.30 p.m. at the Royal Victoria Station Hotel.

Incorporated Plant Engineers

London branch :—" Capital Outlay," by B. White. B.SC., at the Royal Society of Arts, John Adam Street, Adelphi, London, W.C.2, at 7 p.m.

FEBRUARY 6

Institute of British Foundrymen

Burnley section :—Meeting at the Accrington Grammar School, Blackburn Road, Accrington, at 7.30 p.m.

Institute of Metals

South Wales section :—" Oil Fuel in the Non-ferrous Metal Industries," by M. Roddan, at the Metallurgical Department, University College, Singleton Park, Swansea, at 6.30 p.m.

Institution of Works Managers.

Leicester branch :—" Designing for Standardisation and Production," by J. E. Chadbund, at the College of Technology, 7 p.m.

British Institute of Management

" Methods-time-measurement," by H. B. Maynard (president, National Management Council, U.S.A.), 5.30 p.m., at Management House, 8, Hill Street, London, W.1.

FEBRUARY 7

Institute of British Foundrymen

Lancashire branch :—" Some Aspects of Non-ferrous Founding," by T. Freeman, 7 p.m., at the Engineers' Club, Albert Square, Manchester.

Institution of Production Engineers

Wolverhampton section :—" Mechanical Handling Techniques," by J. Bain, 7 p.m., at the County Technical College, Wednesbury.

South Essex sub-section :—" Material Handling," by W. J. T. Dimmock, 7.30 p.m., at the Mid-Essex Technical College, Chelmsford.

North-Western Fuel Luncheon Club

" Smokeless Zones," by J. L. Burn, M.D. 12 noon for 12.45 luncheon, at the Engineers' Club, Albert Square, Manchester.

FEBRUARY 8

Institute of British Foundrymen

Lincolnshire branch :—" Patternmaking," by S. A. Horton, 7.15 p.m., at the Technical College, Lincoln.

Institution of Production Engineers

Southern section :—" Industrial Applications of the Lost-wax Process," by A. Short, M.I.B.F., 7 p.m., at the Polygon Hotel, Southampton.

Engineers' Guild

Metropolitan branch :—" The Engineer in Industry," introduced by A. L. L. Baker, B.SC., 6 p.m., at Caxton Hall, Caxton Street, London, S.W.1.

FEBRUARY 9

Institution of Production Engineers

West Wales sub-section :—" Materials Handling—Some Impressions of a Visit to America," by W. J. T. Dimmock, 7.30 p.m., at the Central Library, Alexandra Road, Swansea.

FEBRUARY 10

Yorkshire Graduate section :—" Use of Ropes," film and discussion, 2.30 p.m., at the Great Northern Station Hotel, Leeds, 1.

Institute of British Foundrymen

Newcastle branch :—Works Visit (details to be circularised).
Scottish branch :—" Experiences while Visiting Foundries in the U.S.A., as Members of Productivity Teams," by E. J. Ross and J. Jackson, 3 p.m., at the Royal Technical College, George Street, Glasgow.
West Riding of Yorkshire branch :—Works Visit, details to be obtained from the secretary.

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.

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DIE-CASTING (Gravity) EXPERT seeks situation. Production from scratch; design dies.—Box 562, FOUNDRY TRADE JOURNAL.

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SITUATIONS VACANT—*Contd.*

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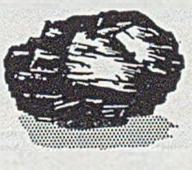

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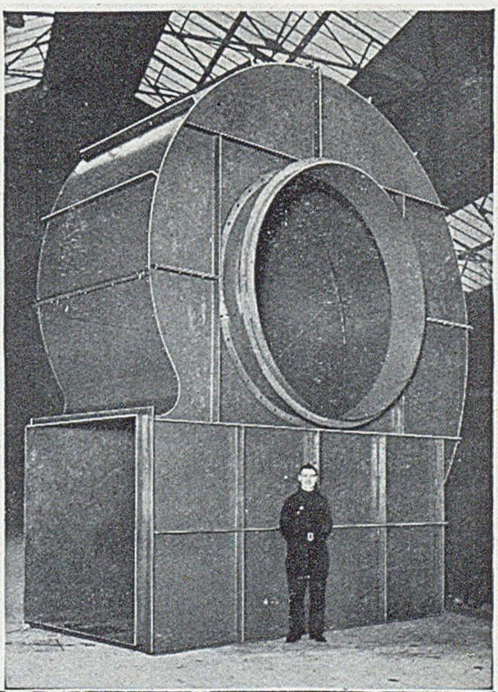

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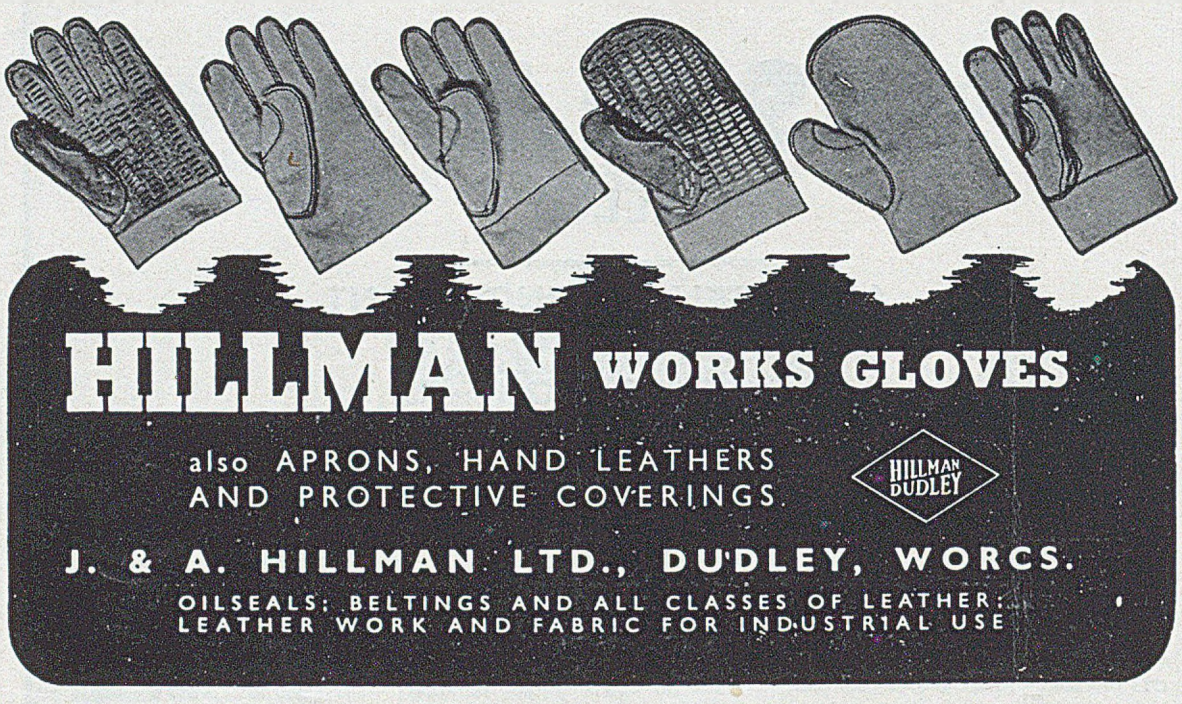
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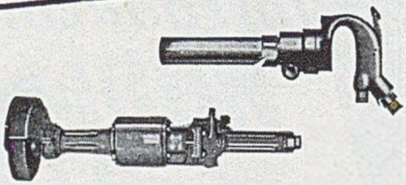

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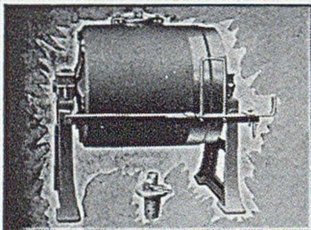

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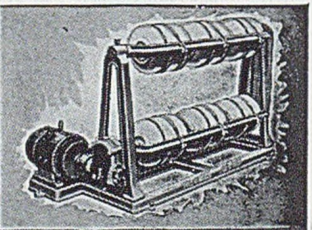

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FOUNDRY TRADE JOURNAL

EST. 1902

VOL. 90
No. 1796
Registered at the G.P.O. as a Newspaper

WITH WHICH IS INCORPORATED THE IRON AND STEEL TRADES JOURNAL
FEBRUARY 1, 1951
Offices: 49, Wellington Street, Strand, London, W.C.2

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