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Keeping Records

Businessmen in general deplore the insatiable appetite for statistics by the various Government departments. The obtaining of data for the filling-up of forms is only too often time-wasting and costly. There are, however, other types of information which should be garnered. Quite often we note that a firm has attained an important anniversary, which in the normal way is the occasion for celebration, but which has been overlooked. Applying the lesson to ourselves, we are ignorant as to the identity of the person or persons who launched the FOUNDRY TRADE JOURNAL. In our investigations we recently sought out Mr. Alexander Hayes, who, if not officially editor, looked after the editorial side of the JOURNAL from about 1905 to 1919. He was also for about three years secretary of the Institute of British Foundrymen—then the British Foundrymen's Association—and possesses a wealth of information on the personalities of the period.

The Paper which the late Mr. F. J. Cook presented in 1927, whilst giving an excellent résumé of the history of the "Institute," would have been improved by the inclusion of some tabular matter, for easy reference. Such tables could usefully include the dates of the establishment of the branches, some of which will within the next few years be celebrating their 50th anniversary, starting with that of the Institute on April 9, 1954. As it is with institutes, so it is with commercial firms, and it is the duty of the publicity manager of the establishment (be it sufficiently large to have such an official) to keep and use such records. He should be in a position to tell the management that it is 25 years ago to-day since Bill Smith joined the firm, so making it possible for an executive to give a word of congratulation. The periodic handing out of clocks, though excellent, becomes routine and expected. A timely hand-shake, probably unexpected, is worth just as much.

We wonder how many executives, like ourselves, keep a tobacco box full of visiting cards of V.I.P.s and then fail to find the one needed in an emergency. We have just realised that a "private" visitors' book would be a better system of recording with a minimum of trouble. Another suggestion is that abstracts of a historical character from the chairman's speeches delivered to the shareholders should be made and filed for future use. Many such speeches need brightening up, for in some cases it is impossible to ascertain whether a firm markets marbles or monkey-nuts. Many technicians keep a full diary of plant extensions, often embellished by dated photographs. These, in the hands of a live publicity man, can be put to good use. Where a house organ is published, it can be a useful repository of facts for the historian and, again, the publicity man can store up useful material. When executives make trips abroad, their reports should also contribute facts for future use—especially the names and positions held of people visited. All such information as we have suggested exists in the business files of the various firms, but what we have in mind is the compilation of data which may either be forgotten or difficult to find just when it is wanted. Each year or so, the major portion of such records can be scrapped, always retaining what is now known as the "high-lights"; after all, we are only suggesting the keeping of a diary for one's firm and then retaining for posterity an abstract from its pages.

PRINTING INDUSTRY DISPUTE

We regret that the dispute in the London printing industry has compelled us to restrict the number of pages in this week's issue of the "Journal" and to omit certain articles and advertisers' announcements. The situation is obscure at the time of going to press and it is impossible to foresee what may happen next week. We are not a party to the dispute, and if there is again a break in publication our readers will appreciate that we are powerless in the matter. Normal publication will, of course, be resumed at the earliest opportunity.

Book Reviews

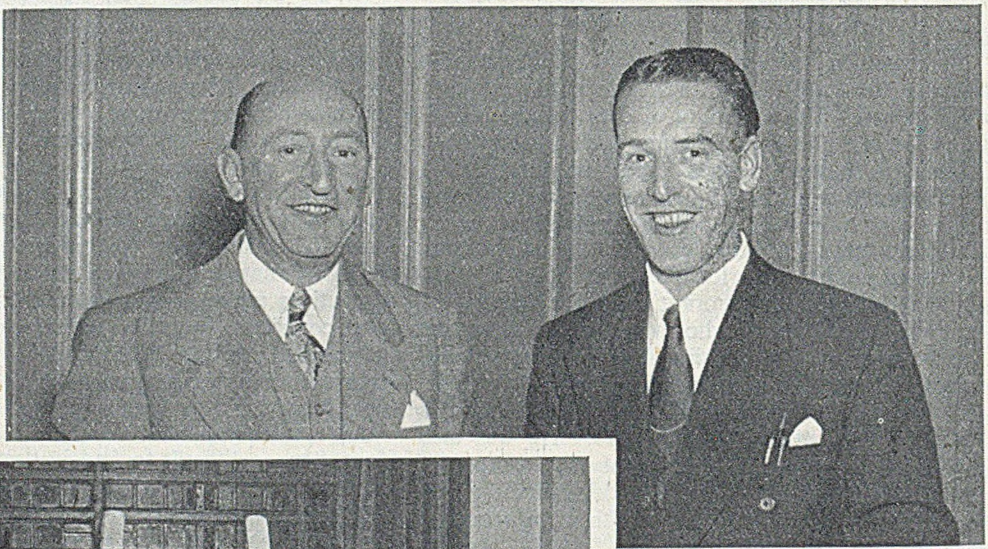
Holzmodelbau (Wooden Patternmaking Practice), Vols. I and II. Third edition. By R. Löwer. Published by Springer Verlag, 20, Reichpietschufer, Berlin, W.35. Price DM. 3.60 each.

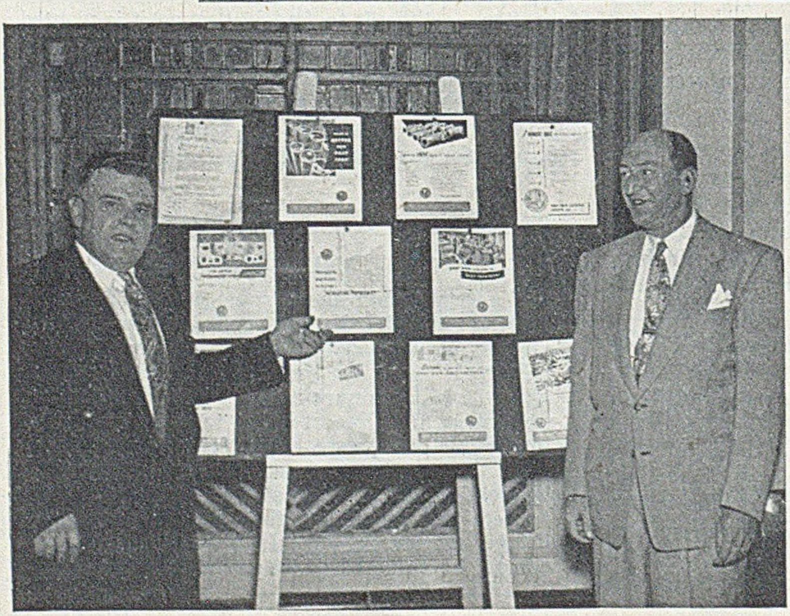
Obviously intended for the guidance of apprentice patternmakers and the journeyman patternmaker of limited versatility and experience, both these booklets are profusely illustrated with examples of common application in general engineering and jobbing foundry patternmaking. Pattern construction confined exclusively to wood almost becomes an international language, since these two booklets tell their main story by their diagrams, which have a striking similarity to publications in English on patternmaking, and show that practical methods of construction are similar in Germany to those used in Britain. The student would gain many useful hints on elementary wooden patternmaking by reading the booklets, as a close connection is shown with the moulding methods of each pattern example for loose-pattern or small-quantity moulding and a good insight is given to the use of strickles and loam-moulding equipment. Printed in German, a translation to English would be necessary for the home reader. B. L.

Specification for Heavy-duty Electric Overhead Travelling Cranes for Use in Iron and Steel Works. Published by the British Iron and Steel Research Association, 11, Park Lane, London, W.1. Price 15s.

Unquestionably, when buying such plant as an overhead crane it is essential to know what is required and to see that it is supplied. There is no outstanding difference between a steelworks and a foundry crane, except that the latter may require to operate slowly and smoothly when removing patterns or placing a top-part of a mould. In any case, attention is drawn to this under clause 9 of the "information to be supplied with tender" on page 56. Any firm in the market for a new crane should certainly be in possession of this book.

J.I.C. PRODUCTIVITY CONVENTION SEPTEMBER 1950.





Above—Mr. H. P. Good, President, Gray Iron Founders' Society of America, with Mr. J. Stewart of A. F. Craig and Company Limited, member of the Productivity Team.

Left—Mr. R. L. Collier, vice-president of the American Society and Mr. Good against a background of foundry propaganda.

Rationalisation of Sand Preparation*

By J. F. Goffart

The urge to understand, to comprehend, is a salient trait of human nature. Man cannot rest until he has synthetised into a harmonious pattern the multiplicity of sensory observations recorded day by day. Hence, man develops explanations, particular theories on all subjects to which observation has directed his attention. These are personal theories, individual theories, always in flux, always in evolution, correcting themselves and changing meaning, with each new observation. Theories, in a word, of purely subjective value. But, there are other theories: those born of collective ideas, born of a community of observation and explanation by groups of individuals; and these can lay claim to a higher objectivity. Any particular individual theory may well approach very closely to a general theory, without complete identity. It is far more likely, however, to find itself flatly contradicting some other personal theory. This has been the personal experience of the present writer, in regard to the problem of reclamation and regeneration of foundry sands.

THE AUTHOR has had the opportunity of visiting many foundries, both in Europe and in America, and has made some noteworthy observations. It would appear, however, that there is still no valid general theory or well-established practice, in regard to sand-reclamation methods and the layout of sand-preparation plants. This result is somewhat surprising, since during the past twenty years much original and productive research has been made on moulding sands, resulting in a reasonably profound knowledge of the subject. This would appear to be an incomprehensible divergence. The Author has seen sand-plants violating all the principles of his own personal theories, and, indeed, generally "accepted" theory and practice.

It is not intended to deal here in detail with all the observations, which contradict or appear to contradict, existing conceptions. They have been very numerous, the principal being: illogical type of sand mill and feeding arrangements; a somewhat casual attitude to the selection of the point in the cycle, at which the water is added; errors in storage layout, hesitation as to the need for aeration and the part played by the aerator, etc. It has, therefore, been thought best, in the present Paper, simply to explain what is considered to be a suitable and rationally-designed sand-handling plant. No claim is made to originality, nor to represent any particular school of thought; but merely to develop the Author's personal theories and borrowings from various general theories, and present them with all their imperfections. Contrary views will certainly be current in Britain; comparisons should be instructive for both parties.

Reclamation

Sand reclamation consists in submitting the used sand to such regenerative treatments as will restore to it its inherent moulding properties. A proper understanding of the processes of reclamation requires, first, an exact knowledge of the properties required of a moulding sand, and the modifications which it experiences in the course of casting. From this knowledge, the treatments can be deduced, which are necessary to restore the spent sand to its original condition.

Moulding Sands

A moulding sand is, by general definition, a structure of silica grains held in an agglomerating matrix. These two basic constituents must be selected and disposed in such manner that the sand, when rammed in a mould, can take the shape of the pattern in reverse, preserve this shape during pouring and solidification of the metal, permit the escape of air and various gases produced during casting, and separate easily from the casting in the subsequent removal and fettling.

Granular Structure

The granular structure of a sand is basically formed of silica in the form of quartz grains. Usually, however, any sand will be found to contain some felspar and mica, although only in small quantity. The silica grains are in fact the final stage in the fragmentation, and physical and chemical transformation, of the parent rock, while the felspars and mica are instable degradation products and tend under the influence of various agencies to decompose into clays. Further factors in the separation of the silica, are erosion and transportations. Sand beds are formed by granular deposits carried by drainage waters, brooks and rivers, precipitated when the velocity of the flow diminishes. The power of suspension of solids being a function of the kinetic energy of the water, the sand grains will be deposited in decreasing order of size, as a bed of sand of increasing fineness. At some given point, a deposit of uniform grain size will be found. If the water flow is abruptly interrupted, the deposit on the upstream side of the interruption will be dispersed, and a deposit of widely-varying grain size will be found.

It is not intended here to discuss the geological mechanism of sand formation, which is consider-

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* Official Exchange Paper from the *Association Technique de Fonderie de Belgique*, presented at the Buxton Conference of the Institute of British Foundrymen. The Author is works manager at S. A. John Cockerill, Seraing, and a consulting engineer.

Rationalisation of Sand Preparation

ably more complex than the general scheme given above: but only to show the manner in which the founder can specify the grain size of the sand selected. Theoretically, therefore, and often practically, at least in Belgium, the grain size is prescribed, either by a constant dimension, or by a continuous curve of fineness. In actual fact, it should be possible to obtain any desired curve of fineness, by a suitable selection of different sands.

The grain size of any given sand is thus a fundamental characteristic which the practical founder can select according to his needs. In fact, it should be possible, if the correct grain size is to be attained by mixing, to define the required grain between the two extremes: acicular or conchoidal form; the latter resulting from recent bursting of the initial pebble, tending to the perfect sphere, which is the ultimate, geometric form of the grain, produced by tidal currents and aeolian influences. The grain having been defined by shape, mass and distribution, the founder can then determine one of the fundamental properties of a moulding sand, its permeability. It remains, therefore, to give these, theoretically dry and naked grains, the posibility of agglomeration, by providing them with with a plastic or adhesive substance—the agglomerating agent or vehicle.

Agglomerating Agent

In the first instance, the natural agglomerants will be examined, *i.e.*, the argillaceous components of the natural sand, deposited by geological means in the same bed as the sand: dealt with subsequently. Clay is the natural agglomerant for granular quartz. As a matter of fact, it originates from the silicates forming the cement of the parent rock.

Chemically, this clay is a hydrated silicate of alumina of the formula 2 $SiO_2Al_2O_3.2\ H_2O$, which owes its plastic properties to the crystalline structure of its molecule. Clay corresponding exactly to the above chemcial formula, is a dry powder: in order to exhibit properties of plasticity it requires to be brought into plastic or colloidal form, *i.e.*, to be flocculated in water. Such flocculation, however, presupposes the union of two conditions: —

(*a*) Flocculation itself depends on the presence of a certain proportion of salts, the most active of which are the salts of calcium and magnesium. These water-soluble salts, by ionisation, produce the electrolytic medium favouring colloidal dispersion.

(*b*) The presence of a given proportion of fine, pulverulent material, acting in two ways. If the fineness of this material is of colloidal order, it will flocculate automatically; otherwise, the coarser grains will form nuclei for colloidal suspension, and thus form the skeleton of the resulting gel.

Thus, the contained clay would appear to represent a very complex constituent, from the point of view of its colloidal and agglutinating properties. Thus, in addition to the crystallographic characteristics, two factors are of cardinal importance: the proper proportion of soluble salts, and the fineness of the natural, or artificially produced, pulverulent component. Obviously, the clayey component can either be initially of the fineness necessary for agglomeration, or it can be brought artificially to the necessary degree of fineness, *e.g.*, by the addition of carbon black, of silica meal, or of wood powder, in the requisite proportions, which can be determined experimentally, and which will vary with the type and fineness of the original clay: according to its nature, *i.e.*, its property of exfoliation, and its intrinsic flocculating property. A further and yet unfamiliar property of fine dusts is their scouring action, which may play a part in the behaviour of dry clays.

Bond

Moulding sand thus contains the following ingredients: (*a*) Quartz granules of definite grain size; (*b*) much smaller grains, termed dust, or simply "fines"; (*c*) colloidal clay gel, and (*d*) water of crystallisation, and water of hydration of the gel. These different constituents are acted upon by centripetal ionisation and centrifugal dispersion forces.

It has already been pointed out that the fines in the compound play the part of the colloidal skeleton; in other words, and by virtue of their extremely fine comminution, they are electrically-charged. The gel proper is maintained in the disperse state by the surrounding ionised medium. Logically and naturally, therefore, the dust particles or fines form condensation nuclei for the gel, just as dust particles in the atmosphere form nuclei on which the atmospheric humidity condenses to form mist or fog.

Returning to the quartz grains, it will be seen that they too have superficial electrical properties, which are determined by the combined superficial area of the particles and their mass or volume. The factors favouring adhesion between the sand grains and the agglomerating agent are as follows:—(*a*) The fineness (degree of communition) of the sand grains; (*b*) the surface condition of the grains, whether geometrical (conchoidal, rough) or colloidal (natural silica gel), and (*c*) the colloidal properties of the agglomerating agent.

Artificial Bonding Agents

It is not proposed to discuss in detail the various bonding agents used in foundry practice. Their action will, however, be briefly surveyed as follows:

In the first instance, it should be remembered that the action of natural bentonite, or natural clays, whether activated or not, while substantially the same as that of artificial bonding agents, is in principle, *i.e.*, qualitatively, identical with that of the natural clays, geologically associated with the sand, and briefly discussed above.

Artificial bonding or agglomerating agents have been developed, particularly for core sands, with a view to facilitating core removal and additionally to obtain increased strength, whether in green sand or baked cores, of thin and intricate shapes, to counteract the natural hygroscopicity of the sand, or to facilitate baking. Occasionally, some of these bonding agents have been used for straight moulding sands, principally the synthetic mixtures, either to reinforce the bonding power of the clay, or to prevent excessive air-drying of porous moulds, etc.

Such artificial bonding agents can be classified according to their action, as follows:—

(*a*) Those which, in the same manner as the natural clays, exert a colloidal effect in accordance with the mechanism already analysed qualitatively above. These include flour, starch, dextrine, gluten bonds, the bonding power of which depends on a combination of their physical and chemical properties.

(*b*) Agents polymerising at a given temperature in the presence of oxygen or sulphur, and forming macro-molecules which combine in a complete network, imprisoning and retaining the sand grains. These include, in particular, vegetable drying oils and some resins of the rubber type, chemically hardenable by oxidising polymerisation or vulcanising.

(*c*) Thermoplastic bonding agents, coating and enclosing the grains in a matrix, in the manner of a cement. This group comprises the resins, the mineral oils, pitch and bitumen, having only a physical action.

(*d*) Similar, molasses is capable, after thermochemical transformation, of binding the grains by the formation of caramel sugar. The hardening of molasses caramel is a physical and chemical process.

(*e*) Thermo-setting synthetic plastics likewise undergo a physico-chemical process leading finally to the formation of a solid cement. This group includes the formaldehydes and silicones. They produce a mechanical coating and bonding of the grains.

(*f*) The cementing agent employed in the Randupson process, sets by a chemical process; but here again, cohesion is obtained by mechanical coating of the grains in the solidifying mass.

Special Note. Before proceeding further, it is necessary to consider one particular feature of eminent importance, with regard to the action of colloidal bonding agents. This type of bond is the only one for which, owing to the physico-chemical phenomena on which its action is based, the combined external surface of the grains is an important factor. The basic feature of this type of bond is the necessity for complete contact over the whole surface, between the grains and the bonding agent, if full use is to be made of the cohesive powers of the latter. In other words, clay-bonded moulding sand is almost the only type which requires that all individual grains shall be initially coated with a uniform colloidal layer or film of the bonding clay.

In the case of all other bonding agents, whatever their manner of hardening, the grains are held together mechanically. None of them requires that the grains shall be evenly coated over their whole surface with the bonding agent: it will suffice if the bond is uniformly distributed throughout the total volume. The grain-bond mixture requires to be uniform in composition; this implying merely that, throughout the total volume of the sand as in any elementary volume as small as permitted by the state of division of the constituents, the volumetric proportions between the sand grains and the bond shall be constant.

Sand Characteristics

The characteristics of a foundry moulding sand can at this stage be summarised as follows:—

(*a*) An assembly of mono-crystalline quartz particles of a given grain-size distribution;

(*b*) a bonding agent, usually in the form of colloidal clay, specifically adapted for incorporating in a moulding sand, containing fines in suspension, and evenly distributed over the surface of the quartz grains;

(*c*) water in the form of water of constitution in the clay, and of water of absorption, allowing the plastic properties of the clay to be fully developed;

(*d*) as auxiliary ingredients, blacking and, in the case of synthetic sand mixtures, special additives, and

(*e*) artificial bonding agents in the place of clay, and core sands.

This sand should present the appearance of a loose mass, free from foreign bodies, and free from lumps, well aerated, crumbly and soft to the touch with a low temperature not exceeding about 40 deg. C. Such sand is prepared more or less synthetically, by mixing sands of different origin with the natural clays accompanying the sands, or with the addition of special clays. This is the sand suitable for ramming in a mould or pit, against a pattern, or for strickling-up a mould, by a board or templet, after which it is dried, the molten metal poured in, and the sand mould therefore, spoiled.

Deterioration of Sand after Casting

Omitting all details, the condition of the sand after the mould has been broken and the cooled casting withdrawn, in the most general case of baked moulds is as follows:—The moulding sand deteriorates in two different ways, depending on whether one considers the state of the heap of sand resulting from breaking a given mould, or the progressive degradation of the sand from the outer surface to the part of the mould in contact with the casting.

(*a*) The sand, as a whole, has lost its plasticity, due to evaporation of the water of saturation of the bonding clay, by drying.

(*b*) Instead of consisting of completely separate, mono-crystalline grains, the sand presents an exceedingly heterogenous structure, with elements ranging from lumps of considerable bulk to dust particles sufficiently fine to be drawn upwards by the currents of air and steam, rising from the mould.

(*c*) It is intermingled with refuse particles proceeding from the materials of construction of the mould: cinders and pieces of coke, pieces of reinforcing rods, hooks, pins, core nails, chills, residues of straw rope, etc., more or less imbedded in hard lumps of sand.

(*d*) The silica grains are degraded and fragmented, depending on the degree of heating, by passing through the critical points corresponding to the allotropic modifications of the quartz.

(*e*) The clay has, where overheated, lost its water of constitution, has become burnt, and is no longer capable of flocculation: *i.e.*, is unsuitable for any regenerative treatment.

(*f*) The evaporated water has left behind soluble salts, formerly contained in solution.

(*g*) The surface coatings or washes, burning away or distilling, have left behind them, cinders or coke deposits.

(*h*) The temperature of the sand has considerably increased. This is the sand, therefore, as it comes from the foundry to the sand-recovery plant, for regeneration.

Sand Reclamation

The sequence of operations by which this spent moulding sand may be made to recover its original properties is now implicitly suggested:—

(*a*) Returning the water of saturation to the clay;

(*b*) breaking up the hard lumps, and reducing them to a mono-crystalline structure:

(*c*) separating the tramp-iron scrap by magnetic recovery, and the non-ferrous scrap by riddling;

(*d*) removing the excess of fines formed by breakdown of the original grain;

(*e*) removing the burnt clays; this being related to the preceding stage;

(*f*) the soluble salts deposited in the sand, cannot be removed by any economical means: if present in excess of the quantity just adequate to flocculate the colloids, they have an opposite effect, and retard flocculation. Periodical control of the contained water by hardness tests is the only measure that can be suggested;

(*g*) screening cinders and ash, and coating residues—*i.e.*, merely a matter of dust removal;

(*h*) aerating the reclaimed sand; and

(*i*) cooling the sand to below 40 deg. C.

This cycle of operations can be most conveniently performed by the following equipment:—

(*a*) A crusher.
(*b*) A screen.
(*c*) One (or two) magnetic separators.
(*d*) A dust separator or preferably a battery of dust separators.
(*e*) A mill.
(*f*) An aerator and pulveriser.

Thus there are four units extracting foreign matter, and two units for reclamation proper. It is important, that both these machines should be positive in their action. It is not proposed to deal at length with the handling machinery and storage equipment linking the different units.

Sand Mill

The "grinding" mill is undoubtedly the most important unit of a sand recovery plant. Its designation is somewhat of a misnomer, since it does everything but grind. It kneads, mixes, rubs, but does not grind in the true sense. It should, of course, in fresh sand, break up agglomerations of cemented grains, but should not crush, break or grind, the individual grains. Its duties are:—

(1) *For clay-bonded sands.* (*a*) Distribution of the new silica material intended to replace the volume lost by the removal of dust; (*b*) distribution of the new clay bonder to replace the burnt clay lost in the form of dust; (*c*) replacement of the fines removed with the undesirable dust, and their uniform distribution through the clay; (*d*) distribution by kneading, of the fresh water previously introduced into the clay by capillary action, and (*e*) coating of each silica grain with a complete and uniform film of plastic clay.

In all, therefore, the mill plays three roles:—(*a*) As the mixer for uniformly distributing all the constituents of the moulding sand and forming a homogeneous mass; (*b*) as a kneader or pugger for plasticising the clay; and (*c*) as a muller for rolling the grains in the colloidal medium and coating them with a clay envelope.

These three functions of the mill are not always of equal importance. They should be developed to the maximum when regeneration is effected by adding fresh, rich sand to the reclaimed material. In the regeneration of bentonite, on the other hand, as in the case of synthetic moulding sands, in view of the high colloidal properties of this substance, the rolling action of the mill is of less importance. The same applies where the addition of a lean sand is sufficient for making up the sand and clay components.

(2) *For sands with artificial bonding agents.* This case is in general rarely encountered, since regeneration of core sands is not a usual practice. Regeneration of such sands is difficult, since the proportion of cinders, ash, and combustion products of the artificial core binders, is considerable, and raises problems of removal for which an economical solution is difficult to find. Instead of discussing methods for the regeneration of core sands, consideration of the method of their preparation will be more profitable.

Starting from an extremely lean sand, thus consisting entirely of quartz grains of given size, it is necessary:—(*a*) To incorporate and distribute uniformly, the fines usually added (silica meal or wood flour); and (*b*) to incorporate and distribute uniformly, the binder or bonding agent or agents. The problem is greatly simplified by the fact that it is only necessary to prepare a mechanical mixture.

Aerator and Pulveriser

The object of this machine is to complete the preparation of the sand coming from the mill after regeneration and preparation. The mill, when acting as a muller and working on rich, regenerated sand, tends to form soft lumps which have to be broken down in the pulveriser. In the latter too, owing to the high velocity of the sand, an emulsion or suspension of sand in air is formed, by which the binder-coated sand grains are separated so that the resulting sand mass is loose and spongy in texture; indicating easy flowing properties of the moulding sand which will permit it to pack well round the pattern.

Types of Sand Mills

The mills used for the reclamation of moulding sands, can be classified in four types, as follows:—

(1) Rotating table or pan mills; (2) fixed pan mills; (3) screw mills, and (4) turbine mills. The selection now lies between these four types.

Rotating Table or Pan Mill

This consists essentially of a platen or circular table rotating on a vertical axis. Two or more rollers with their axes radial to the platen, work over its surface. These rollers are of considerable length and are mounted on a universal joint permitting approximately vertical displacements in such manner that each roller acts only by its proper weight or mass. A number of scraper blades is arranged at table level, in front of the rollers. The platen or plan is movable, and drives the rollers by friction.

The roller drive is adjusted to a standard circle, along the circumference of which the peripheral velocities of the platen and the rollers are identical; while at any distance from this mean circle, the peripheral velocity of the rollers with relation to the platen or pan increases or decreases as the distance from the particular point on the roller decreases or increases. In other words, along any line of contact, velocity differences are present, decreasing towards the standard driving circle, and again increasing when this standard circle is passed. The sand is fed to the middle of the rotating circle and is carried towards the periphery of the mill by natural spreading and by the action of the scrapers towards the axis, after repeatedly passing under the scraper blades. It leaves the table or pan peripherally, with the help of a further scraper.

At each passage under each roller the sand is subjected to a compressing action without, however, any actual crushing of the grains taking place, and particularly to a rubbing action, the differential velocity causing the rains to roll. The scrapers are particularly intended to spread and mix the sand in front of each roller and push it gradually to the edge of the platen. The mill is thus, essentially, a continuous machine with a partial mixing and kneading effect due to the action of the scrapers. It should be added, for the sake of completeness, that intermittently-acting grinders also exist, but are merely compromise designs.

Fixed-pan or Bowl Mill

This machine works on an entirely different principle. As the name indicates, it consists of a high, stationary bowl or cylinder, around the vertical axis of which an assembly of two rollers and one or two large scrapers rotates. The rollers are relatively large but flat, *i.e.* contrary to those of a mixing "grinding" mill, their external diameter is large with reference to the thickness or width. These rollers rotate on horizontal axes and are driven by the rotation of the whole assembly. The rollers are raised a certain distance (a few millimetres) above the bottom of the bowl. Some rubbing action is obtained by a different method to that used in the rotating-pan mills. The turning circle of the rollers about the vertical axis is small relatively to the turning circle of the edges, with the result that a radial rubbing action is obtained in addition to the rolling motion.

For better illustration, the "grinding" action produced in mills with large rollers may be compared to straight rubbing between a pair of hands moving reciprocally to and fro; while the action of a mill with narrow rollers resembles that of a pair of hands rubbing with a rotary motion. The rubbing or grinding effect is thus weaker than that of the mill with large rollers, since the differential velocities are smaller. On the other hand, the large scrapers ensure a better mixing and kneading action. Finally, the duration of treatment of the sand in the pan mill can be varied, thus giving a further opportunity of controlling the quality, or the uniformity of the quality, of the sand treated. The pan mixer is thus essentially an intermittently-operating mixer with an auxiliary grinding action.

As a variant of this type of mixer, an American mill may be cited, in which a very deep pan lined with rubber is used, containing a rotating set of vertical narrow rollers which are forced against the side of the pan by centrifugal force. A powerful current of air keeps the sand in suspension and partially forces it to pass under the edges of the rollers. The rollers have thus a simple rotating motion and no rubbing or grinding action whatever. The machine acts by emulsifying all the materials introduced, extensively separating the sand grains, atomising the water and rapidly flocculating the clay (or bentonite), producing what might be called a "homogenising effect." The machine is thus essentially a discontinuous mixer or homogeniser with a mechanical flocculating effect on the introduced colloids.

Mills on the Endless-screw Principle

These and similar types, including those working with cranked shafts, are well-known, and need to further description. They may be continuous or intermittent in operation, and act simply as mixers.

Turbine Mills

These, which may be vertical or horizontal, as well as mills using metal bands (ribbon mills), platens fitted with pins or pegs, etc., will not be further described here. All machines of this type act principally as agitators and aerators, serving additionally for moistening, and breaking up small lumps. They can rough-classify the sand by mass, the fines falling to the bottom of the machine. They are very useful for cooling the sand.

Choice of Mill

The problem of choice of mill can be simplified by eliminating initially:—

(*a*) Turbine mixers and the like, which are to be used only as agitators and aerators. However, even in this limited sphere, they remain a valuable part of foundry equipment, usually adequate for all work with bulk sand, and

(*b*) Endless-screw mixers, pug mills and similar machines which are useful in the sand plant only as mixers. They are usually sufficient for the preparation of sands with artificial binders, such as core sands.

There remain, consequently, the machines suitable for handling loam sands—roller mills with rotating platens (chaser mills), or fixed-pan mills.

It will now be opportune to examine some specific cases of sand regeneration of frequent occurrence and determine the most suitable equipment for the purpose.

Preparation of a Synthetic Moulding Sand

Starting with a very lean, silica sand, the following ingredients are required, apart from the organic additives: high-grade, dry, colloidal clay, and the necessary quantity of water. The silica sand and the binders now have to be mixed to complete homogeneity, in such manner that the added water encounters the clay in closest contact with the silica grains in such manner that flocculation can take place by simple absorption. If high-grade colloidal clay is used, such simple flocculation, subsequent kneading and light grinding will suffice to obtain a satisfactory product The best machine for the purpose is a bowl mixer.

Preparation of Moulding Sand from Reclaimed Sand

Well-cleaned sand stripped from the mould, properly cooled and, if necessary, with dust removed, requires to be regenerated by the addition of fresh clay to make up losses caused by "burning." Either a slightly richer sand than that to be regenerated may be used, or a natural, rich, *i.e.* loamy sand, or, possibly, recourse may be had to bentonite

In the first case, the problem is doubled, since it is first necessary to obtain an intimate mixture of the old sand with the new sand, and then to prepare the mixture, since the loam binder is not in a dry state and cannot be dispersed sufficiently to ensure perfect homogenisation. The loam or clayey component in fresh sand, is in a plastic state and cannot be spread around the silica grains without rolling them in the binder until they become properly coated. Hence, a "grinder" must be used, but since a machine of this type cannot also knead and work the material sufficiently, it is necessary for the constituents to be previously mixed, at least summarily; this condition is also imposed by the continuous operation of most "grinders."

As for the other two cases (regeneration by rich, loamy sand, and by bentonite) it would appear as if, by drying the rich sand thoroughly before mixing, these two cases can be assimilated, and the rich sand considered merely a very low-grade equivalent of bentonite. That would indicate the suitability of pan mills, such as used in preparing synthetic moulding sands. However, in regenerating with highly-dried, rich sand, the flocculating power of the contained clay (loam) will be found retarded by the high percentage of associated silica; while on the other hand, this excess of silica retains a large proportion of the clay binder.

To summarise—a pan mill will suffice for regeneration with bentonite; but, where dried, rich loam sand is used, the choice is more difficult: the Author's personal preference is for a "grinder."

Preparation of Special Moulding Sand from Natural Sand

It is assumed that the constituent sands are not dried. The problem is rather one of grinding than of mixing, and a grinding mill should be used. Summarising, when working with natural sands, the proper selection is a grinding mill: in this case, the geological conditions of sedimentation themselves, will have ensured sufficiently homogeneous distribution of the loam binder through the sand, and preparation is merely a question of "grinding." On the contrary, when preparing artificial moulding sands from quartz sand and a rich, colloidal clay, it is primarily necessary to ensure homogeneity of the mixture by kneading of pugging; the plastic properties will develop by flocculation of the clay in contact with added water. In the intermediate case of regeneration of spent sand by a rich, natural sand, highly dried, or by bentonite, it will depend on the individual case, whether "grinding" or kneading is more important, and the equipment should be selected accordingly. Another factor influencing selection is that of continuous or batch operation.

Continuity or Discontinuity of Operation

A pan mill treats a fixed and constant volume of sand in each batch, and discharges it when working is completed. This machine operates intermittently, allows the different ingredients to be weighed out in correct proportion, the tempering water to be added in correct quantity, and the properties of the product to be summarily tested and controlled before discharging; the operator can also by stopping or continuing treatment, influence the efficiency of grinding.

The pan mill is an ideal machine for handling small batches of sand with accurately-controlled properties, for finishing mixtures, etc. It has, however, the disadvantage of intermittent delivery. By skilful arrangement and operation, using a battery of small units working in parallel, in place of a large, single mill, it is possible, however, to obtain a nearly continuous output, if the discharge times are staggered and the sand flow controlled. On the other hand, the possibility of controlling the quality of the product by varying the treatment time, is lost. Such arrangements are also more complicated in operation and more expensive in of view of the fact that conveyor belts, etc., have to be dimensioned for a peak output and not for a regular, "mean" delivery.

The "grinding" mill is essentially a continuous machine, continuity of operation being an inherent feature of the process. This continuity is, of course, the prime factor in the economy of the "grinding" mill. Intermittently-working "grinders" have been tried, and some satisfactory types exist. They are and remain, however, hybrid machines. In order to obtain discontinuity of operation, *i.e.*, to enable batches of a given size to be treated, it is necessary to increase the size of the scrapers or ploughs, in order to ensure that the sand does not simply pack against the bottom of the pan. For the same reason, the rollers require an elastic suspension, ensuring a minimum depth of material in the pan to obtain a proper rubbing action. The sand turned over by a large plough, however, will not lie in a sufficiently uniform layer, with the result that the rubbing action is exerted only on the thicker portion of the layer and the rubbing efficiency of the machine is thus reduced.

In conclusion, it may be remarked that:—

(1) It is possible, by suitable arrangements, to obtain practically continuous sand delivery, using a number of small batch mixers working in parallel; but the possibility of influencing the duration of treatment and thus more narrowly controlling the quality of the product, is sacrificed.

(2) It is not possible to operate a continuous "grinder" discontinuously. Furthermore, batch "grinders" can only be made to work at the cost of efficiency in grinding.

(3) The batch mill is essentially a machine for handling the more expensive sands since it allows results to be obtained, by varying the duration of treatment, far superior to those possible with continuous mills except by a disproportionate increase in the added new material.

General Layout of Sand Reclamation Plant

With the knowledge gained earlier, the principles on which the layout of an up-to-date sand reclamation plant should be based become clear. They fall under two headings: preparation and regeneration.

First Phase: Preparation

The starting point is the recovered sand from the moulds, in the conditions described in the section on deterioration. It is immaterial if the recovery be effected with the help of a riddle or mechanical shake-out or not. Such a machine might, however, be considered as forming the initial unit of a sand reclamation plant, since it plays a real, if subordinate, part in the recovery of used moulding sand. The purpose of the initial riddling or shake-out is threefold:—(*a*) First, the grating retains large lumps of sand which cannot pass it naturally; (*b*) it also retains foreign matter in pieces larger than the mesh of the screens: gaggers, clinkers, coke lumps; (*c*) its bottom being usually under suction, a great part of the gases, steam, and fine dusts is removed.

The vibrating riddle thus begins the operations of regenerating the used sand, by a rough "cleaning" which is not only intrinsically valuable but also facilitates the further transport of the sand, which could be much impeded, for instance, by large gaggers, etc. The separation of large lumps is in any case superfluous and, in fact, undesirable. These should be broken up and made to pass the grating, by a shovel, a crowbar, a roller, or any suitable means. The grating thus merely gauges the size of the passing lumps, which again facilitates mechanical transport of the sand. If such a shaker screen or grid is not provided, the sand must be delivered to the treatment plant in the rough state, with the usual disadvantages due to the presence of gaggers, large lumps, and steam.

The sand is now on the way to treatment, and the first step before it can be fed to the machines is the removal of the larger pieces of tramp iron: at this stage, the only possible operation. It should be remembered that the sand will contain two types of tramp iron: pieces free from sand, in particular the bulkier and heavier pieces; and pieces still embedded in the lumps of sand, sprigs, pins, fins, etc., *i.e.*, the smaller and lighter pieces. The sand must therefore be spread out on a suitable conveyor belt and passed through a powerful magnetic separator which will retain the free iron. When this has taken place, the sand can pass to a breaker in which the lumps of sand are broken down.

This breaker should be a percussion or hammer mill, since machines working by pressures or abrasion will act also on the included foreign substances, reducing them to coke dust, fine cinders, etc. This breaker mill requires careful thought, since it has to treat lumps of very varying size, arriving at random. Its power should also be so adjusted as to break up the sand lumps without pulverising the accompanying foreign matter. On leaving this "breaker mill," the sand has already a better appearance; the apparent grain size is more uniform, the humidity more distributed, it is cooler, and freer from gases and steam.

On the other hand, after passing the breaker, the tramp iron embedded in the lumps has been freed, and can now be removed: by passing the sand through a second magnetic separator for final cleaning. At this stage, the sand still contains admixtures requiring removal. This can only be effected by screening, after the second magnetic separator. The sieve used is suitably a rotating, conical drum, arranged horizontally, the surface of which consists of a suitable wire mesh, the sand being fed internally. The oversize or tailings pass along the inclined surfaces of the drum and are discharged; these tailings include, besides the foreign matter, coke, cinders, etc., also lumps of sand which have passed the breaker, usually in the form of fused grains or pieces of core. The mesh of the screen should be of a size to be determined experimentally, according to the type of sand (refractoriness of the included clay), the nature of the work done (average bulk of the pieces), and the efficiency of the breaker; and will usually be of the order of 5 to 10 mm. It should not be too fine, to avoid excessive loss in the tailings.

Removal of the fines is effected by blowing a current of air at a controlled rate through a thin layer of the sand in such manner that the fines up to a predetermined particle size are carried away. It is usually unnecessary to effect this dust removal at any particular point in the circuit; the best solution is to repeat the operation several times. In practice, the fall of the sand from one conveyor band to another, or into a machine, are used as the points at which air blast or suction are applied for dust removal.

Wetting and Storage

If the sand is examined at this stage of treatment, it will be found free of all foreign bodies, hard lumps, or excessive fines, and fairly cool. The mean grain size will vary from the lower limit of the admitted fines or dusts, to the upper limit set by the mesh of the screens. Nothing has yet been done to regenerate this sand; it has merely been cleaned and reduced to a uniform, mean grain size.

It then remains to:—

(*a*) Make up the loss of sand (as dust and in the oversize) to the original volume; (*b*) replace the peptised clay lost in the fines and oversize; (*c*) replace the moisture lost by evaporation; (*d*) regenerate the plastic properties of the sand, and (*e*) aerate.

Essentially, it would only appear necessary to make up a suitable regenerating mixture of fresh sand and clay, with any necessary additives, and to "grind" in any suitable mill, calculated proportions of old sand and regenerating mixture. There remains the essential problem, however, of adding the necessary water for re-tempering.

This tempering water is required to permeate evenly the thin coating of clay which will surround each grain of the final product, and which still surrounds most of the grains of the old sand. Obviously, this is not a case of mere mechanical admixture. However thorough such mixing, the utmost possible is a uniform distribution throughout a given volume of sand: but it is necessary to go still further with the process, to obtain homogeneous distribution on the level of the individual grain, and ensure that the clayey coating of each grain is properly and evenly moistened.

This cannot be attained by relatively rough mechanical means; capillary processes have to be used, and due time given for their development and completion. Two closely-linked factors are thus involved: moistening by capillary action, and the time needed for the completion of this process, which is undoubtedly a slow one. On the industrial scale of a sand-recovery plant of the type considered, this resolves itself into a decision as to the correct stage for storing the sand, and the correct time for adding the water.

Moulding sand ready for use is unsuitable for storing or keeping since, being aerated, it dries quickly and loses its moulding properties. This is why the hoppers of moulding machines are usually of moderate capacity. Hence, it is the sand to be regenerated which should be stored and left to season. Water should preferably be added before storage. More definitely, sufficient water should be added to the sand before storing to ensure that the moisture content of the sand entering the "grinder" or mixer is slightly less than that finally required; any small deficiency being then made up in the mill.

The advisability of adding most of the tempering water before storage can be justified as follows:—

(*a*) While in the hopper or bin, the water is able to permeate the whole of the clay by capillarity; (*b*) small, hard nodules, which may be fairly numerous in a rich sand, taking up water gradually, crumble gradually, and lose consistency. This is unattainable in the sand mill, and (*c*) the addition of water to the sand before aeration, followed by more or less prolonged tempering, enables the sand to be cooled to an appreciably lower temperature without excessive loss of evaporation.

The advantages of this seasoning of the sand after moistening were well known to the old foundry masters, who used only this method of "ageing" for preparing their sands.

Regeneration Process Proper

Sand prepared in the manner described will already be a good moulding sand, ready for use in many cases. However, its total bulk and moulding properties are rapidly reduced if the losses of sand and clay are not made up. The next operation is, therefore, an essential and fundamental stage: milling. This can consist either of treatment in a continuous "grinder," or in a discontinuous, or batch mixer.

It has already been pointed out that a continuous "grinding" mill is a bad mixer. In the sand plant, therefore, the bins of old sand, fresh sand, clay, blacking, etc., should be so arranged that the "grinding" mill receives a continuous feed of a mixture of the most homogeneous character possible. Usually, it will suffice to have the different ingredients on the feeder conveyor, in superimposed layers in such manner that any cross-section will show identical proportions of the constituents. The make-up water should be added immediately in front of the mill entry, preferably in the form of a spray.

A batch mill is an excellent mixer, and the plant arrangements in front of such a mill will be of a particular nature. It is required to prepare successive batches, corresponding to the capacity of the mill. Homogeneity of the constituents in the feed is no longer necessary; it is sufficient for each batch to contain the correct quantities of the different ingredients. On leaving either type of mill, the sand should be aerated in a turbine mill.

It is unnecessary to deal with the handling equipment linking the operative units of a sand plant; this would exceed the scope of the present Paper, and adds nothing to the discussion of the principles of installation and operation of a modern sand-reclamation plant. The regeneration cycle is now completed; the used sand has been reclaimed and rendered fit for use again, as the loose and soft mass so welcome to the foundryman. Simultaneously, a complete description has now been given, of a modern sand plant, as conceived by the present Author and his associates, and as recommended for all modern foundries.

Temperature-control for Vats

At one time, apparatus for controlling automatically the temperature of heated baths and vats used in pickling and cleaning and allied processes was regarded as a refinement, if not a luxury. With the present cost of labour and fuel, however, it is becoming recognised as an essential economy. What f llows is an account of apparatus devised by the Bristol's Instrument Company, Limited, for this purpose.

Any temperature-control system consists of two main components; a thermometer or temperature-sensitive system, and a controlling unit which acts on the signals given by the thermometer.

Thermometer.—The immersed element is a small metal bulb, suitably protected from corrosion and partially filled with a volatile liquid. A capillary tube leads from below the surface of this liquid to the "pressure spring." This spring, a special feature of the "Bristol" instrument, is in fact an extension of the Bourdon-tube principle. The several helical turns of flat tube that form the spring "unwind" under internal pressure sufficiently to simplify or make unnecessary the mechanical magnification usual in Bourdon-tube instruments. As both capillary and "spring" are completely filled with liquid, temperature variations other than those in the bulb do not affect the accuracy of the system. As much as 250 feet of tubing may be used. The torsional deflection of the helical element

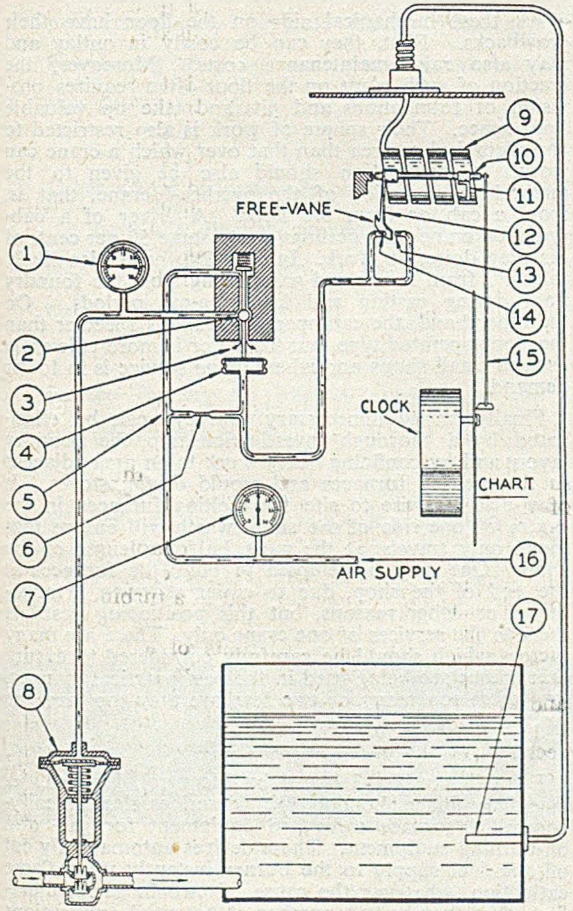


Fig. 1—Simplified Diagram of the Free-vane Control System

may then be used to record and control the temperature.

Controller Systems.—Two basic types of controller, air and electric, are available. For the air models, a supply at a pressure of not less than 17 lb. per sq. in. is required; a reducing valve and a filter supplied with each controller allow it to be connected to the factory compressed-air system.

The operation of the air controller is shown in Fig. 1. Rotation of the helix (9) with internal pressure moves a thin metal vane between two small air-jets. The position of the vane affects the degree of back-pressure in the pipe and in the capsule (4); this capsule moves a pilot-valve (2) which controls the flow of air to a pneumatic valve (8) in the steam or hot-air line to the bath. A second pneumatic valve can be arranged, if desired, to work in antiphase in the cooling water line. A great advantage of these air controllers is that they are not necessarily either "on" or "off"—any intermediate throttled condition can be maintained appropriately to the heat losses from the bath, giving ideally accurate control. Air consumption is less than ½ cub. ft. per min.

Where compressed air is not available, electrical controllers are used. Movement of the helix is then used to monitor an electrical circuit. In some models this is done conventionally by the closure of contacts carrying a small current to relays; these in turn energise solenoid or motor-driven valves or, of course, electrical heating elements.

Whether air- or electrically-operated, these controllers give an indication of the bulb-temperature on a suitable scale. Where proof of the equipment's fidelity is vital, then a recording controller is to be preferred. In this, the pen-arm, mounted directly on the helix without gearing, traces on a visible circular scale which is rotated at a chosen speed by a synchronous motor or clockwork.

Correspondence

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

PLATITUDES VERSUS TECHNOLOGY

To the Editor of the FOUNDRY TRADE JOURNAL

SIR,—Referring to the recent correspondence in your columns, and being as brief as possible, it is worthwhile to make the following comments:—

(1) The post-graduate course at the Salford Royal Technical college is intended to explore and carry out a course of maximum utility in combining the basis of technology and management.

(2) Only by progressive experience shall we find the true balance of satisfaction to both free and "forced" post-graduate students.

(3) Let us continue in our efforts to make these regional courses of the highest value.—Yours, etc.,

M. SEAMAN.

David Brown-Jackson, Limited,
Manchester, 5.
September 25, 1950.

The R.F.D. Company, Limited, of Godalming, have sent us some details of a line of chemical proof clothing which is claimed to be as light as a boiler suit and to be impervious to acids such as nitric and sulphuric and alkalis such as caustic soda. The range of clothing made is wide and includes laboratory coats, as well as overalls and the like. Three standard sizes are available in either white or lime green.

Travelling Cranes

By D. Spence

A recent article in an American magazine stated that the average housewife walked over 1,000 miles more than she need do in her kitchen during a year. One wonders, therefore, what mileage is covered by overhead travelling cranes in foundries and how many of the journeys are necessary. So expensive an item is an overhead travelling crane that it should only be installed in a foundry where one can be satisfied that it will be in work for a high percentage of its time. This is particularly true of the cab-operated type where the driver's time must also be considered. The ideal condition is where the crane is fully occupied without causing any waiting time on the floor, but how often does this occur?

Overhead cranes are probably the most versatile of all lifting and shifting equipment and are called upon for duties other than lifts for the moulders and metal handling, which were their first concern. In a busy shop, therefore, the stage is reached where the crane becomes overworked and causes waiting time. One method of avoiding this state of affairs is to install more cranes, but is this always the best way? For example, to install one extra crane on a gantry immediately shortens the area over which any other crane operates, and this particular crane may hold up production because it prevents other cranes from passing over the area in which it works. One can conclude that the great disadvantage of having several cranes on a single gantry is the inability of one crane to by-pass another. Another disadvantage which may arise is the fact that one may have to duplicate cranes of high load capacity. For instance, one may have to install heavy load capacity machines to serve each end of the gantry, it being impossible for a second crane to approach near enough.

A Circular Layout

A Danish firm has had the novel idea of constructing a circular foundry where the cranes rotate about the centre. This considerably reduces the liability of one crane being able to block the path of another. This construction, of course, has its limitations. Several engineering firms have installed two separate crane gantries, that is, a narrow one at a low level and to one side of the shop which carries two or three light cranes, and a high level gantry of full width carrying two or three heavier load capacity cranes. This idea might quite successfully be applied in many heavy foundries but it necessitates structural alterations or additions requiring extra building height.

Rather than install overhead travelling cranes, it may often be preferable to make use of the wide range of specialised equipment. The extent to which such equipment may be installed depends on the extent to which the crane must be relieved. The movement of large moulds can be effected, for instance, by roller tracks, powered conveyors or wheeled bogies, and the crane's services can further be dispensed with by provision of roll-off and pick-off mechanisms at the moulding stations.

Alternatives to Cranes

When making work of a repetition nature and where much core-setting is required, a wall or pillar jib crane, with manual, electrical or pneumatic hoist carried on the jib can be a sound investment. Jib cranes can also be useful for transport from one bay to another and in many other places, including the knock-out area. Belt conveyors transporting sand which is regularly required can save considerable waiting time by moulders and also the use of power. A telpher track circuit running completely round the foundry can prove to be a boon with intelligent use and can relieve the cranes of much work.

For metal carriage to fixed points, monorails constitute a satisfactory method of transport. Small ladles can be push-travelled, while larger ladles can be suspended from an electric hoist with powered travelling gear, the current supply being collected from downshop leads similar to those of a crane. As a result of the shorter suspension the swing of ladles is reduced and an important feature is that movement is controlled by the caster and not by some distant figure in a crane cab. Photographs of American foundries reveal an extensive use of underslung travelling monorails capable of being traversed in any direction by pushing on the load, but as yet these do not appear to have been adopted in this country. Conveyors, skip hoists and elevators all play their part in freeing the crane for more useful work. They can dispense with a considerable amount of wasted power used by cranes to lift work or materials from the foundry floor. They also lessen the danger risks which can be caused by bad slinging and inefficient signalling.

Drawbacks to Floor Installations

All these mechanical aids on the floor have their drawbacks. First, they can be costly in outlay and may also raise maintenance costs. Moreover, the erection of such plant on the floor often requires provision of foundations and pits and take up valuable floor space. Their sphere of work is also restricted to considerably less area than that over which a crane can work. Consideration should also be given to the method of operation of the overhead crane, that is, from a cab or from the floor. A driver of a cab-operated crane may perhaps waste some 50 per cent. of his time doing no work. In addition, he is also likely to suffer from fumes and gases rising from the foundry floor during casting and knocking-out periods. On the other hand, the cab-operated crane is speedier than the floor-operated type, but the latter is more efficiently used in small shops and where crane service is in lower demand.

Finally, many unnecessary journeys can be eliminated by a thorough investigation into the foundry layout and by confining heavy work to an area adjacent to the melting furnaces and mould drying stoves. It may also be wise to site the melting furnaces in the centre of one side of the shop, which will ensure that metal only travels, at the most, half the length of the shop. One may be tempted to build the furnaces at the end of the shop, due to easier charging arrangements or other reasons, but this positioning restricts them to the services of one crane only. There are many factors which should be carefully considered to ensure that cranes are being used in the best practical manner. Are there too many or two few, are they too large or too small, busy or idle?

* An entry for a Short Paper Competition organised by the East Midlands branch of the Institute of British Foundrymen.

DATA SHEET No. 3 issued by Elcontrol, Limited, 10, Wyndham Place, London, W.1, describes electronically-controlled furnace safeguard equipment for gas- and oil-burning equipment. These devices automatically cut off the fuel supply to the burner instantly upon flame extinction, whatever the cause. It would seem, therefore, that they have a number of potential applications in foundry and vitreous enamelling practice.

Film Review

MALLEABLE CASTINGS

This full-length propaganda film in "glorious technicolor," shown by courtesy of Col. Holmes, of the U.S.A. Military Supply Board, to the gathering of Midland ironfounders on September 27, was made by a Hollywood unit for the United States Malleable Ironfounders' Society. It aims to impress on the general public the significant part played by malleable castings in their everyday life—and it does just that! It gives alternate glimpses of foundry and machine-shop production balanced against shots of the castings in their service applications in a dozen fields. The changes of scene are linked by a commentary in forceful "American sales key," which yet withall is easily understood by a layman. Throughout the half hour or so of showing, the viewer is never allowed to escape for one moment the conclusion that malleable has that something the others haven't got. The dynamic enthusiasm with which this is put across really is infectious. Diagram and solid photography are mingled with dramatic and penetrating effect—even the complicated microstructural changes of the annealing process are made palatable. A tensile test is so realistically put over that one flinches automatically as the specimen breaks. There is no gainsaying that all the arts of camera, voice, music and colour have been brought to bear in telling fashion to do just what was intended—make a general-public audience malleable conscious.

The showing of this film has especial significance to-day when the Council of Ironfounders' Associations has just announced the imminent launching of a publicity campaign designed to make our own public "casting conscious." No better way than such a film could be found. By further courtesy of Col. Holmes and the American producers, the film is available for further exhibition in this country; particulars can be obtained by writing to John Gardom at Ripley, Derbyshire. The reviewer recommends local secretaries to secure the film for showing to their members.

Gas Council Research Committee

The Gas Council announces that, to assist in the organisation and conduct of research, it has set up a research committee, to consist of three eminent men of science not engaged in the industry, three members of the Council, the president for the time being of the Institution of Gas Engineers, the Livesey Professor for the time being at Leeds University, and the directors of the research stations (probably three) which it is intended to establish. Its initial constitution is:—Sir Edgar Sylvester, K.B.E., chairman; Sir Robert Robinson, O.M., F.R.S., and Sir Cyril Hinshelwood, F.R.S., scientific members; Mr. E. Crowther, Dr. R. S. Edwards and Mr. W. K. Hutchison, members of the Gas Council; Mr. F. M. Birks, C.B.E., president of the Institution of Gas Engineers; Prof. A. L. Roberts, PH.D., F.R.I.C., Livesey Professor at Leeds University; and Dr. H. Hollings, F.R.I.C., controller of the existing laboratories of the North Thames Gas Board.

New Steel Order

HIGHER PRICES FOR WIRE AND WIRE PRODUCTS

THE maximum prices of a limited range of iron and steel products are amended under an Order signed by the Minister of Supply. The principal alterations are increases in the maximum prices of electrical sheets, wire, and wire products. The Order—the Iron and Steel Prices (No. 3) Order, 1950 (SI No. 1427)—came into force on August 29.

Following are the new prices for wire and wire products:—

Mild-steel wire.—Catchweight coils, 6/8 standard wire gauge, for sales by makers: Hard drawn, £28 12s. 6d.; mild drawn, £33 17s. 6d.; annealed, £31 7s. 6d.

Galvanised barbed wire.—Two or four points, two-ply, 12½ gauge, for sales by makers, £50 5s.

Wire rope.—Best patent steel, 80/90 tons per sq. in., basic grade, 1-in. dia., six strands each of seven wires with main fibre core, for sales by makers, £68 10s.

Wire netting.—Galvanised after made, two-ply selvedges, 3-in. mesh, 19 gauge, 36 in. wide, per roll of 50 yds., 12s., plus 77½ per cent. per roll.

Wire chain-link fencing.—2-in. mesh, 14 gauge, 3 ft. high, per roll of 25 yds., £1 2s. 6d., plus 69½ per cent. per roll.

Wire nails.—Ordinary round chequered head, 6 in. by 4 gauge, delivered in England and Wales (except Isle of Wight, Cornwall, and Devon), £51 10s., less 34 per cent.

Wire-rod reinforcement mesh, wire reinforcement mesh.—Working stress, 25,000 lb. per sq. in., weight 4.32 lb. per sq. yd., for sales by makers, per sq. yd., 1s. 8½d.

Variation of the prices of electrical steels is effected in the related schedules to the principal Order.

Beilby Memorial Awards

From the interest derived from the invested capital of the Sir George Beilby Memorial Fund, at intervals to be determined by the administrators representing the Royal Institute of Chemistry, the Society of Chemical Industry and the Institute of Metals, awards are made to British investigators in science to mark appreciation of records of distinguished work. Preference is given to investigations relating to the special interests of Sir George Beilby, including problems connected with fuel economy, chemical engineering and metallurgy, and awards are made, not on the result of any competition, but in recognition of continuous work of exceptional merit, bearing evidence of distinct advancement in science and practice. In general, awards are not applicable to workers of established repute, but are granted as an encouragement to younger men who have done original independent work of exceptional merit over a period of years.

The administrators are empowered to make more than one award in a given year if work of sufficient merit by several candidates is brought to their notice. In 1949 three awards, each of one hundred guineas, were made to Mr. F. R. N. Nabarro, Dr. C. E. Ransley and Dr. K. W. Sykes respectively. Consideration will be given to the making of an award or awards from the fund early in 1951 and the administrators will therefore be glad to have their attention drawn to outstanding work of the nature indicated, not later than December 31, 1950. All communications on this subject should be addressed to the convener of the administrators, Sir George Beilby Memorial Fund, Royal Institute of Chemistry, 30, Russell Square, London, W.C.1.

Recent Shipbuilding Orders

Among recent shipbuilding orders announced are the following:—

BARTRAM & SONS, LIMITED, Sunderland—Lamport & Holt Line, Limited, Liverpool, has ordered a 10,000-ton cargo ship.

HARLAND & WOLFF, LIMITED, Govan—A 5,500-ton single-screw cargo motorship has been ordered by the Royal Mail Lines, Limited, London.

COCHRANE & SONS, LIMITED, Selby (Yorks)—National Sea Products, a Nova Scotia firm, has ordered two trawlers, to be engined by Amos & Smith, Limited, Hull.

WM. PICKERSGILL & SONS, LIMITED, Southwick-on-Wear, Sunderland—A cargo ship of 7,000 tons dw. has been ordered by Lamport & Holt Line, Limited, Liverpool.

AILSA SHIPBUILDING COMPANY, LIMITED, Troon (Ayrshire)—An order to build a cargo motorship of about 750 tons dw. has been received from the Isle of Man Steam Packet Company.

GOOLE SHIPBUILDING & REPAIRING COMPANY, LIMITED —A contract for two single-screw cargo motorships of about 1,800 tons dw. each has been secured from F. T. Everard & Sons, Limited, London.

JOSEPH L. THOMPSON & SONS, LIMITED, Sunderland—W. A. Souter & Company, Limited, Newcastle-upon-Tyne, has ordered a motor tanker of just over 18,000 tons dw. for delivery early in 1953. Wm. Doxford & Sons, Limited, Sunderland, will supply the propelling machinery.

FURNESS SHIPBUILDING COMPANY, LIMITED, Haverton Hill-on-Tees—Lykiardopulo & Company, Limited, London, has ordered a motor tanker of 18,200 tons dw. The vessel will be fitted with a six-cylinder Doxford oil engine, to be constructed by the North Eastern Marine Engineering Company (1938), Limited, Wallsend-on-Tyne.

VICKERS-ARMSTRONGS, LIMITED, Barrow-in-Furness—A self-unloading bulk ore carrier of about 15,500 tons dw. has been ordered by Reynolds Jamaica Mines, Limited, Richmond, Virginia, USA. Propelling machinery, consisting of Brown-Boveri steam turbines, will be constructed by Richardsons, Westgarth & Company, Limited, Hartlepool.

SIR JAMES LAING & SONS, LIMITED, Sunderland—A motor tanker of 18,000 tons dw. is to be built for the Alva Steamship Company, Limited (Navigation & Coal Trade Company, Limited, managers), and supplied with propelling machinery by Wm. Doxford & Sons, Limited, Sunderland. Hunting & Son, Limited, Newcastle-upon-Tyne, has ordered an oil tanker of 16,500 tons dw.

SHORT BROS, LIMITED, Pallion, Sunderland—For general West African service the Palm Line, Limited, London, has ordered two cargo motorships, each of 8,600 tons dw. Propelling machinery in each case will be supplied by the North Eastern Marine Engineering Company (1938), Limited. The United British Steamship Company, Limited (Holdin & Company, Limited), London, has ordered a cargo motorship of 10,000 tons dw. John G. Kincaid & Company, Limited, Hamilton Street, Glasgow, is supplying Diesel engines for the motive power.

News in Brief

SHIP-DECK MACHINERY worth £70,000 has been ordered from Thomas Reid & Sons (Paisley), Limited, for Argentinian vessels.

THE STEEL FOUNDERS' SOCIETY OF AMERICA is offering prizes, the total value of which amounts to $1,000, for Papers which show real novelty.

NEWMAN INDUSTRIES, LIMITED, Yate, near Bristol, announce important price reductions on certain of their 15-, 20- and 25-h.p. electric motors.

THE WOLFRAM MARKET continues to be sensitive, due to shortage of supplies, and the price has moved up to 225s. to 235s. per unit, c.i.f., nominal.

THE OFFICES of the public and personnel relations department of Richard Thomas & Baldwins, Limited, are being removed from 47, Park Street to 82, Brook Street, London, W.1.

THE SOUTH AUSTRALIAN GOVERNMENT is to place a second order in Britain for 10,000 tons of steel rails for use in broadening the rail gauge in the south-eastern area of the State.

LYONS INTERNATIONAL FAIR is to be held from March 31 to April 9, 1951. Applications for space should be addressed to Robert Brandon & Partners, 45, Dover Street, London, W.1.

TEXTILE FINISHING MACHINERY worth £60,000 has been ordered from J. Dalglish & Sons, Limited, Pollokshaws, Glasgow, S.3, by mills in India and South America. Each order is worth £30,000.

FRASER & CHALMERS ENGINEERING WORKS of the General Electric Company, Limited, have received an order for a 100-tons-per-hr. capacity heavy-media separation plant for treating managanese ore in West Africa.

THE GLACIER METAL COMPANY, LIMITED, is extending its Kilmarnock (Ayrshire) factory by 65,000 sq. ft. so as to relieve the congestion at the company's other factories. The area of the extension is being provided by Scottish Industrial Estates, Limited.

EXTENSIONS ESTIMATED to cost some £100,000 are being made at the engineering works of Ruston & Hornsby, Limited, Grantham (Lincs), to provide increased accommodation for the erection, fitting and testing of the company's oil engines.

THE FORGROVE MACHINERY COMPANY, LIMITED, Oakhurst Avenue, Leeds, is to open a branch works on the Team Valley trading estate, at Gateshead, for the making of automatic wrapping machines. The new premises cover 40,000 sq. ft. and will provide work for 250 people.

THE GOVERNMENT has ordered £700,000 worth of mechanical handling equipment from Steel & Company, Limited, Sunderland, in connection with the country's rearmament programme. To cope with the amount of work in hand, the firm is to build a 40,000 sq. ft. extension to its works and increase its labour force by 500 to 2,000 employees.

THE PURCHASE TAX on gas space-heating appliances for domestic use, where the distribution of gas is assisted by electric fans or pumps consuming in all not more than 100 watts, has been reduced from 100 per cent. to 66⅔ per cent. under a new Order entitled the Purchase Tax (No. 8) Order, 1950 (Statutory Instruments, 1950, No. 1444), which came into force on September 4.

A TWO-STAGE hydraulic bending machine, manufactured by Chamberlain Industries, Limited, of Staffa Road, Leyton, E.10, will bend cold and unloaded, to any angle up to and including 180 deg., copper tubes from 1 to 2 in i.d. (B.S.S.659), gas tubes from ¼ to 2 in. i.d. (B.S.S.1387) and light-gauge tubes from 1 to 2 in. o.d. In addition, with the use of simple rollers, round solid bar sections from 1- to 1½-in. dia. can also be bent to angles up to 180 deg.

Scottish Ironfounders' Secretary Honoured

Recently retired from the legal firm of A. & J. C. Allan, Falkirk, Mr. James Allan, solicitor, has been honoured by members of No. 1 District (Central Scotland Area) of the National Light Castings Ironfounders' Federation. During the past 38 years Mr. Allan acted as district secretary of the Federation and in other offices connected with the industry. He was entertained at lunch and presented with an illuminated address and a cheque in recognition of his many years of valuable service to the members.

At the lunch, Mr. W. H. Smith, deputy managing director of Allied Ironfounders, Limited, and director of Falkirk Iron Company, Limited, presided. Among those present were Capt. H. J. Kennard, director of Allied Ironfounders, Limited; Mr. Wm. Rennie, J.P., chairman of Federated Foundries, Limited; Mr. R. L. Hunter, director Allied Ironfounders, Limited, and general manager, M. Cockburn & Company, Limited; Mr. Walter Mitchell, director of the Grahamston Iron Company, Limited; Mr. James Mundie, director of Scottish Central Iron Company, Limited; Mr. F. F. M'Fadzean, Glasgow, secretary of the National Light Castings Federation; and Mr. H. V. Shelton, chairman, British Ironfounders' Association.

In making the presentation, Mr. Smith referred to Mr. Allan's long connection as secretary of the Federation, mentioning particularly the prominent part he had played in the negotiations between the Federation and the Light Metal Trades Unions. He had proved himself most valuable and efficient and he wished him the best of luck in his retirement.

Mrs. Robb, who had acted as Mr. Allan's assistant, was also the recipient of a cheque along with a letter of appreciation and thanks for her valuable work. In replying, Mr. Allan thanked the members of the Federation most cordially for their kindness, and in retrospect he recalled the names of many of the former ironfounders he had been privileged to be associated with. The illuminated address, which bore the names of 21 ironfounding firms, was in the following terms:—

"We, the members of No. 1 District of the National Light Castings Ironfounders' Federation, desire to place on record our respect and esteem for Mr. James Allan, of A. & J. C. Allan & Company, solicitors, Falkirk, and our appreciation of his services to the light-castings ironfounders, particularly in the Falkirk area. During the past 38 years he has acted as the district secretary of the Federation, and in other offices connected with the industry, and throughout all these years he carried through his duties with great acceptance and benefit to the employers. His services will be long and gratefully remembered by all in the industry, and in token of our esteem, we have to-day presented him with two articles which are products of the light-castings industry".

Seating in Factories

Section 6 of the Factories Act, 1948, comes into operation on October 1 of this year. Whereas Section 6 of the 1937 Factories Act laid down that there should be suitable sitting facilities for female workers whose work is done standing, sufficient to enable advantage to be taken of opportunities for rest which may occur in the course of their employment, Section 6 of the 1948 Act extends this provision to all employed persons. Where a substantial proportion of the work can properly be done sitting, a seat of suitable design, construction and dimensions is to be provided.

SINEX HIGH FREQUENCY VIBRATORS AND VIBRATING SCREENS

3 Ton Model Illustrated

Larger and smaller machines available

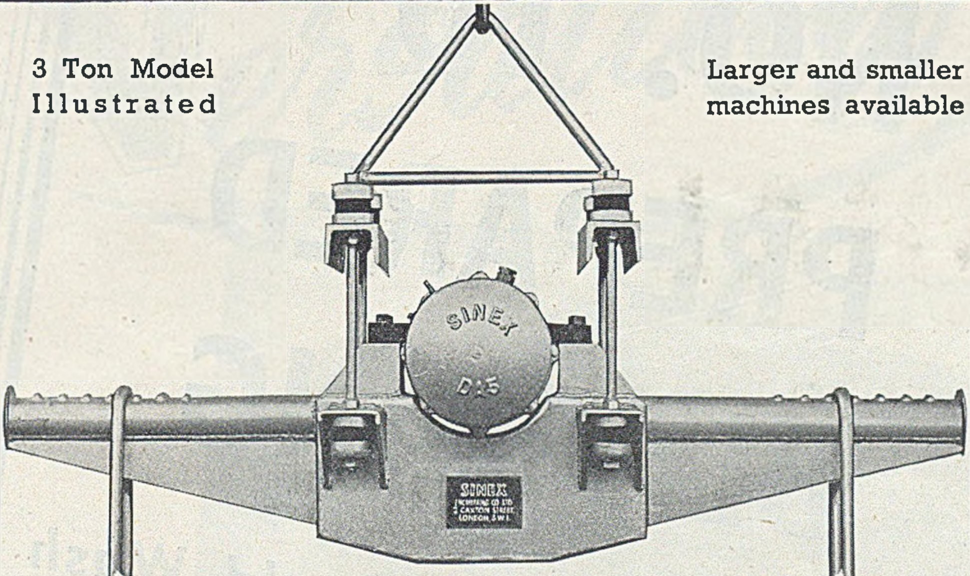


FIG. 7 SINEX VIBRATING BEAM

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

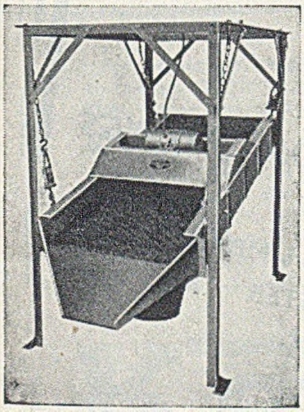
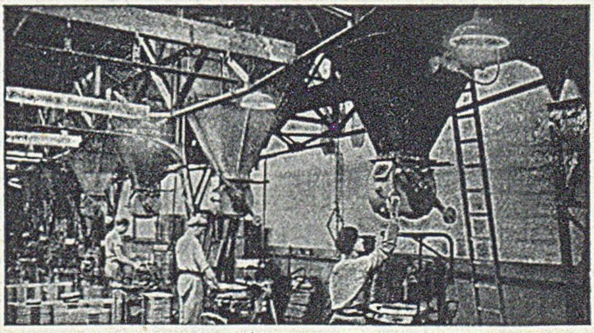


FIG. 10 (on left) Sinex Vibrating Screen 6ft. × 3ft. Single Deck. Hourly output —15 tons of sand through ⅛ inch mesh.

This screen is also manufactured in sizes to suit requirements.

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

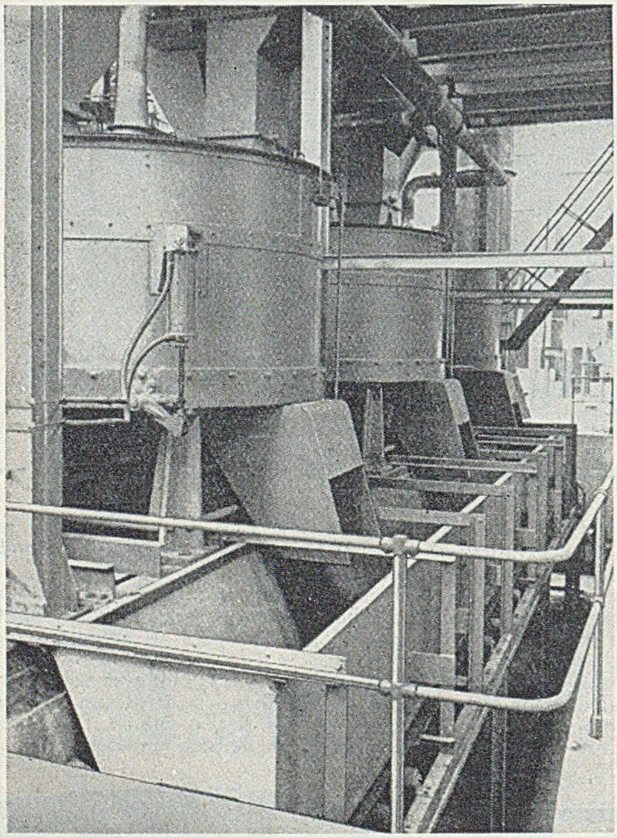


THE **Sinex** ENGINEERING CO., LTD.

Telegrams: Armorique, Sowest, London

Telephone: VICtoria 7503/5

2, CAXTON STREET · LONDON · S·W·1



Photograph by kind permission of Messrs. Ruston & Hornsby Ltd., Lincoln.

The outstanding feature of every great notion is its simplicity. There is always an obviousness about it—**when it is done.**

And sand ? — Well August's were thinking about, and perfecting sand handling plant for the best part of half-a-century : to arrive finally at this clean, efficient aid to modern foundry practice, here shown in use.

Photograph shows: Three No. 3 size August's Simpson Intensive Sand Mixers discharging into Receiving Hopper fitted over sand delivery Conveyor.

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

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