Cast Toys Brighten Christmas for Young America

DESTRUCTIVE tendencies exhibited by the younger generation have caused makers of toys to search for materials and methods of manufacture which will produce an article capable of withstanding much rough usage. The demand of proud parents for toys that will last the offspring "more than fifteen minutes" has led to the extensive use of cast metals in this line of industrial activity. Several factors, including cost, ease of manufacture and the stability of the manufactured article, have pointed to the foundry as the logical seat of manufacture, the trend during the past few years being toward a greater number of toys made of cast iron. The line of iron toys presents many ramifications, extending from the trifles which may be purchased at the dime stores, to the expensive articles supplying the wants of the customer with the well filled purse. A partial list of cast iron toys is as follows: Automobiles, including touring cars, trucks, fire trucks, busses, and taxicabs; tractors, stoves, kitchen utensils such as pots, pans, waffle irons and meat grinders; irons, banks, sewing machines, vacuum cleaners, lawn mowers, garden tools, hammers, wagons of all kinds, trains, including engines and cars; jack stones, printing presses, traffic signals and agricultural implements. The selling methods employed to merchandise these articles are varied as will be noted on page 1008 of the present issue.

Find Where Castings May Be Sold

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LOCAL small foundries and machine shops are a necessity to industrial communities. The need is as real as for the corner grocery, and local lawyer, and doctor. These plants supply quick repairs for nearby factories, farms, public utilities, contractors, and builders; they provide a ready source for obtaining special articles in small lots.

These services could not be rendered by far distant plants because of such factors as local invention and design, likelihood of frequent changes in design, desire of owners of patterns to retain custody of them and avoid transportation charges and risks of delay or loss through shipment of drawings, patterns, and completed articles.

The small plant cannot perform its local service by becoming a big plant and endeavoring to serve a correspondingly large territory. Its function is limited by nature. It is a sort of retail manufacturing function. If small plants try to augment their sales by manufacturing in a small way, goods which can be made better or cheaper on a mass production basis, then the small plant immediately meets strong competition from outside manufacturers who have specialized both their production and sales methods.

Makes for Service

From the standpoint of the general public, the problem is to secure an industry which will give quick service in accepting orders and making special goods; to obtain such service without repeated solicitations from conflicting interests; and to secure within its locality an industry characterized by prosperity and progressiveness.

The problem from the foundryman’s standpoint is to supply local units for order taking and production in peculiar articles. At the same time it is desirable to eliminate the uneconomic overlapping effort with consequent duplication of expense when such units attempt individually to administer, finance, buy, advertise and sell in the same aggregate territory.

The solution of the problem, in the writer’s opinion, will be in consolidating the ownership and control of the majority of the small shops that exist in each industrial district. The consolidation of ten or 15 plants where each has an average annual business totalling from $50,000 to $250,000 will result in one organization acting a gross business of from $1,500,000 to $2,250,000 per annum. Consider the availability of a fund amounting to 1 per cent of the consolidated gross sales of a year. An amount of $15,000 or more will be available in common.

In a previous article in THE FOUNDRY of Sept. 15, the writer outlined the demoralizing effect of indiscriminate competition of small plants in the sales field. Other weaknesses of the small shop industry will suggest how a reorganization will yield financial strength, more constant profit, and advancing standards of service to the public.

The following examples are drawn from circumstances of actual occurrence, names and details of course being altered to preclude identification. Similar conditions doubtless will be recognized by readers as largely prevalent in industrial communities with which they are familiar. Concrete illustrations permit one to draw definite inferences as to what benefits may be expected from changes that are proposed.

The Z company has been in business 20 years. Its employs now number over twenty-five. Its president is William Jones, who also is the production manager, although he is not accustomed to thinking of himself by that particular title.

It is Friday morning. In comes Thomas Smith, the secretary and commercial man, who says “Bill, do you know that we must have $1200 tomorrow for pay roll, and there’s only $400 in the bank?"

Now, William Jones is not taken wholly without warning. He knows business is dull, and has listened without excessive perturbation. He says:

“Tom, haven’t we got plenty coming in? When was that account for $1500 due from A, B & C company?”

Tom replies that the A, B & C company account is not due yet for 15 days. Sometimes the customer discounts his bill in ten days, but this time he didn’t, so returns cannot be expected until actually 16 or 18 days in the future.

“Well,” says William Jones, “I’ll go down to the bank and they’ll let me have $1000 for 30 days. We’ll pay it back after A, B & C company’s check gets here and we’ll have a little leeway besides.”

This is a reasonable borrowing transaction. It is based on a definite prospect of repayment of the loan.

As consecutive pay days roll around, incidents such as the foregoing become more frequent, except that eventually the loans are not repaid to the bank in 30 days. Then bills payable seem to be getting strangely large, and payees awkwardly insistent. Bill Jones, embarrassed by frequent journeys to his banker says:

“Tom, we’ve got to have more work-
Borrow in Haste

Right here William Jones, his little company and his accommodating—and probably usurious—banker, are all taking a step in the wrong direction. William Jones’ company has no definite prospect of paying back the loan of $5000. He is piling up for his company a heavy burden of interest by the easy course of borrowing, instead of finding and correcting the real cause of his trouble. The root of trouble is in faulty internal management or lack of adaptation to outside conditions which have come into being. Jones probably has obligated himself personally by endorsement on the last loan. It is possible that the banker may have demanded as collateral security a certificate of deposit for $1009 by endorsement on the last loan. It is possible that the banker to collect $360 interest per annum with only $5000 at risk. Had the banker grasped the opportunity, he might at this point have performed a more serviceable act and one eventually as profitable, by pointing his client the best way to a sound financial organization of his business.

The organization which is financed properly borrows no money without a calculated ability to repay the loan. The loan is taken for a specific purpose, its proceeds are applied only to that object, liquidation is effected within a given period from predetermined resources, and the granting of the credit has been secured, not at the risk of a personal endorsement, but on the merit of the enterprise itself satisfactorily demonstrated to the creditor. Is not such a basis of finance more likely to be found in an organization which controls many plants, with average total business and net income stabilized through consolidation?

The execution of orders in small shops often is a make-shift—the use of what equipment happens to be available, by such an operator as happens to be at hand, to get by some. How with such a product as the customer may be induced to accept. The small shop should be as carefully redone as to buildings, equipment, personnel and location, with a view to most economically performing its peculiar function in the district it is to serve, as is the large establishment.

A large jobbing brass shop devoted to the needs of a community of 200,000 people, employs an installation of crucible melting furnaces. At one time it was decided by the company officials that ingot metal should be used instead of scrap metal as its raw material. However, it was found that there was insufficient draft, even with the use of blowers, to melt solid copper ingots in a reasonable time. The policy was abandoned and a return made to the old uncertain system of using variable scrap as raw material.

Under a centralized management, with this shop as a local producing unit, specialists of suitable training would have planned that furnace installation to provide adequate draft, correct capacity, proper placing and right number to conform to a predetermined task and policy of the company. What had actually taken place in this case was that some officials lacking in technical qualifications had made what amounted to a guess as to what would be a good number of furnaces, a fair size and connected them with a stack that looked like it would do.

Ability Paramount

The Blank Construction Co. wants a bronze plaque with 10 to 15 square feet of surface and 100 to 200 letters to place in a large concrete structure. It must be in place within six days. Certain scaffolds used for other work are necessary to the erection of the plaque. The contract requires that the expensive scaffolds be cleared away by a predetermined date and any re-erection later would be financially impractical. There has been an oversight both in designing and ordering of the plaque by the Construction company. Appeal is made to the local foundries, with a willingness to sacrifice something—but not too much—in quality to insure quick delivery.

Here is a requirement which under ordinary circumstances would be outside the field of the ordinary local shop. It abounds in special needs, failure in any one of which may be sufficient to cause refusal of the product by the customer, even though he be in an awkward predicament. The following factors should be especially adapted to the work in hand:

(a) Pattern and letters of sufficiently good art and finish
(b) Molding sand of correct grade
(c) Material and apparatus to make and finish the mold
(d) Correct metal mixture, heating and pouring
(e) Skilled finisher for the cast plaque
(f) Suitable equipment for finishing the letters and surface of the plaque.
How many jobbing shops today could execute to any considerable degree an order for such a plaque? Assuming for argument that the shop can turn out such a piece of work in something better than the roughest quality, then—will a price be charged adequate to the special skill involved and the extraordinary overhead expense really applicable because of special equipment, supplies, and superintendence required? If such proper price is made on the product will expert selling talent rightly convince the customer that the charge is justified by the circumstances, so as to insure the good will of the customer and further business in like emergencies?

Production Management

One hundred automatic clasps were to be manufactured. Each clasp required three castings weighing about 3% pound, a sliding tongue of tool steel, two coil springs, two small studs, drilling and milling of ordinary accuracy using jigs, and careful assembly. The parts of the complete clasp were to be interchangeable. A certain factory—Smith Co.—produced a number of satisfactory clasps. Being then occupied with work of its own standard design, Smith Co. referred the customer to a local jobbing shop, Brown Co., for the production of 100 of the clasps. The Brown Co. operated a good foundry, a machine shop, a toolmaking room, and an assembly room, all on a small scale. It had been in business more than 20 years. It made that lot of clasps over two or three times and finally had to turn most of them back to Smith Co. to rebuild them before the customer received a satisfactory product.

Here was a case not requiring extraordinary skill. Brown Co. had men of skill of the required kind and the necessary equipment. Yet its management was so weak that it proved unable to secure proper co-ordination between departments and failed to apply its facilities in the right way. A contract which should have resulted in profit and satisfaction, instead resulted in both immediate and future loss to the Brown Co.

When the functional management of a number of small plants is centralized, the way is immediately opened to obtain technical and professional service not available to small separated institutions. It becomes possible to make reliable forecasts of business, to control operations by budget, and to make economic physical preparation for the future. All the plants will benefit from the service of chemical, metallurgical and mechanical engineers and men of special talent in finance, administration and marketing.

Picture a procedure under centralized management as a step forward in service to the industrial community and at the same time consider whether such a course is practically possible to the separately owned and operated plant ordinarily found.

Under unified management the consolidated shops gathers information through its sales force which covers the entire industrial district that various kinds of metals are offered to the trade and used for bushings and bearings which run at a variety of speeds and loads. The Jones Co. uses the XYZ brand of bronze for replacing motor bearings. The Robinson Co. always uses MNO bronze for replacing bearings in its rolling mills, except when in an emergency it goes to any local foundry and takes anything the foundry foreman makes up for a roll bearing ranging from a 78-12-10 mixture, to a 92-4-4 mixture. The Green Co. uses anything that looks red offered by local foundries for general repairs to textile machinery, but always supposed it was getting 85-10-5 mixture.

The management of the Consolidated Shops having gathered this information, then causes sample castings to be made in several mixtures judged to be suited to the needs found in the territory served. The nature of these castings may be made a matter of record through chemical, mechanical and microscopic examination and the castings then submitted to the various customers for tests under actual working conditions. These practical tests are followed under actual observation by engineers of the Consolidated Shops, and note made of the exact working conditions and service. On the basis of results obtained from these tests, a new set of sample castings may be made, more accurately estimated to meet the working conditions encountered and the procedure is repeated until highly satisfactory products are obtained for each of the special needs of the community. When this result is obtained, the management of Consolidated Shops can guarantee that on all repeated orders for the same requirement, the customer will receive the same and a uniform product. That becomes possible by systematic management, and laboratory check against production. To what extent may similar results be obtained in most present day small shops where mixtures are left largely to the judgment of the foreman? A study of community needs as cited readily may result in a more reliable hold by the Consolidated Shops upon its market, and less danger of losing it to progressive outside manufacturers. Aside from immediate commercial effect and without specific demand by buyers, small foundry proprietors should seek to advance the standards of their production and elevate the plane of their business activities. Is there not a moral satisfaction in having contributed to the advance of an industry?

Steps to Centralize

It requires moral fibre to effect a reorganization or consolidation. It may involve the retirement of some proprietors from active participation in management. Yet retirement from a listless business may not prove so great a sacrifice as at first it reems if it be followed by dependable returns from a thriving enterprise. A proprietor bound to the slow dissolution of his business is better able to reconstruct his life now, than after five or ten more unsatisfactory years.

A first essential is that leaders of integrity in the community become convinced of the real meaning of conditions and of the improvements logically to be expected through consolidation. Then form a corporation with provision for issue of securities sufficient in amount to cover the value of all properties likely to be absorbed under the common control. When it is determined what proprietors are willing to enter the consolidation, an appraisal is obtained of each property by disinterested outside professional appraisers. Thus the physical property in each case is valued with consideration for depreciation and obsolescence to date and the good will of each business may be determined upon the basis of earning capacity shown in the last preceding five or ten years. Securities of the new company then may be issued on an equitable basis, in consideration for the surrender of the individual properties and agreement of former proprietors to refrain from competitive activities for a period of years as affecting the same territory.

The large majority of the persons engaged actively with the individual organizations would be required by the consolidated business. The united resources under one management represent a strength sufficient to cope with the uncertainties, changes and problems which are inherent even in the most ordinary business life. The owners, the employees and the surrounding public will benefit from an industry that is characterized by adequate finance, progressive policies and sound economic position.
ECONOMIC advantages of good lighting in industrial plants now are recognized generally by factory executives and need not be reviewed at length. However, a summary of the gains to be expected from good lighting may refresh the memory of those interested and justify a detailed discussion of proper methods of lighting foundries. The economic advantages of good lighting in industrial plants may be listed as follows:

Five to 15 per cent increase in production; 5 to 15 per cent decrease in spoilage; 5 to 15 per cent reduction in seconds or poor work; 25 per cent reduction in accidents; a reduced labor turnover; and improved morale.

The cost of the lighting resulting in these advantages is approximately 1 per cent of the payroll.

A foundry is one of the most difficult industrial buildings to illuminate, both from the standpoint of daylight and artificial light. Maintenance is the chief obstacle encountered in either method. The windows, skylights, reflectors and lamps quickly become coated with dust, which, because of its character, bakes on and is hard to remove. The walls, ceilings, columns, girders and other surfaces soon have a dark neutral gray color, so that little light is diffusely reflected and direct light from windows or reflectors must be relied upon entirely for illumination. Ordinarily the light comes from several comparatively small sources, while the dark background and other surroundings are ideal conditions for glare and sharp shadows. These unfavorable conditions usually are further accentuated by underillumination. Objects are seen by the light reflected from them. The quantity of illumination sufficient for a printing plant where black ink and white paper supply excellent reflection and contrast, would be insufficient in the foundry where the molds reflect little light and where there is practically no contrast. It is a mistaken idea...
to believe that since the work done in the foundry is more or less of a rough nature, it does not require the discrimination of fine detail and that a low level of illumination is sufficient. The accident hazard in foundries together with the low reflection properties and low contrast of materials used in the work makes a relatively high illumination intensity greatly desirable.

It is a well known principle that satisfactory vision for ordinary purposes may be secured with an illumination of approximately 2 foot-candles reflected from the work to the eye. An illumination in excess of 2 foot-candles must be incident on the work if this condition is to be obtained in the foundry. The 2 foot-candles of illumination must be increased to compensate for the light absorbed by the dust. Since 0.4 represents the reflection factor of the material worked on, the light delivered by the reflectors must be 2/0.4 or 5 foot-candles. If this 5 foot-candles is to be maintained between the cleaning and relamping intervals, the amount of illumination must be increased further by an amount equal to the lamp depreciation due to aging and by an amount representing the dust and dirt depreciation of the reflector and the lamp. The depreciation due to aging is represented by the factor 0.8 and the depreciation due to dust and dirt in the lamp and reflector by 0.6. The illumination of 5 foot-candles then becomes

\[ \frac{0.8 \times 0.6}{10} \text{ foot-candles.} \]

failure to take these losses into account when the original lighting installation is made often causes future dissatisfaction. For general foundry work the initial illumination on the work should be 10 foot-candles if the workman is to receive the equivalent of two foot-candles necessary for good vision.

At all times the general atmosphere of the foundry is laden with fine dry dust, and when the molds are shaken out and the sand wet down at the end of the day, clouds of steam are thrown up into the building. This steam and dust has considerable velocity, and when striking the surfaces of the lamps and reflectors, forms a film which quickly bakes and causes rapid depreciation of the lighting equipment. The prismatic foundry unit has a large opening at the top through which the dust passes. The cleaning action of this large opening has been found by actual experience to decrease considerably the depreciation due to dust accumulations on the lamp and reflector.

A lighting system probably will be maintained for a time after it is placed in service, but after the newness and novelty has worn off, maintenance is likely to become slack. Lighting installations giving only a small portion of the illumination possible with the current used are common occurrences. If someone quit work at night and went home leaving the entire lighting system burning all night, he probably would be discharged the next morning. However, the waste of current due to poor maintenance is equivalent to burning the entire system all night every other night. It is human nature to put off disagreeable tasks as long as possible, so that if cleaning lighting equipment is made easy, there is greater possibility of its being done.

Two methods of making lamp and reflector maintenance easy are shown in Figs. 2 and 3. A disconnecting hanger arranged so that the lighting unit may be lowered to the floor for cleaning and replacing lamps is shown in Fig. 2, while an inexpensive method of hanging where the unit may be disconnected and lowered to the floor is shown in Fig. 3. The disconnecting hanger requires one man, while the second method necessitates two men.

It often is necessary to place lights on the under side of the crane girder where a traveling crane is employed for moving heavy castings, molds and molten metal to compensate for the loss of illumination when the crane is directly under one or more of the regular lighting units. It also is desirable to have a higher intensity of illumination directly under the crane as a safety measure and to facilitate the work. When lighting units are installed on the under side of the crane beam they should give an intensive light distribution so that the light will be concentrated on the crane operation. It is essential that a spring shock absorber be placed between the crane girder and the reflector to absorb the vibration and prevent premature lamp failure. A device of this type is shown in Fig. 4.

Foundries may be divided in two classes as far as lighting is concerned, namely those making small castings which are handled by manual labor, monorail or gantry crane, and those making heavy castings which are handled by overhead cranes.

In foundries making small castings and having no overhead crane, the lighting units may be suspended relatively close to the floor and a wide or extensive type of light distribution may be employed to advantage. The enameled steel dome reflector shown in Fig. 7 is a good commercial reflector of this general type. This reflector always should be equipped with

The Foundry

December 15, 1925
December 15, 1925

A bowl-enamelled lamp to give adequate shielding of the lamp filament. The candlepower values at the high angles to the vertical are effective in producing illumination on vertical surfaces. It will be necessary to use 300-watt white bowl lamps in the enamelled steel dome reflectors spaced on 10 feet centers and mounted from 10 to 15 feet above the floor in order to obtain the required equivalent of two foot-candles reflected into the eyes from the work.

The distance between the floor and the lighting unit is excessive in foundries where the lighting units must be placed above the traveling crane and if the steel dome reflector having a wide angle light distribution is used, a considerable portion of the available light will strike the upper side walls and will be absorbed. For this type of foundry, a reflector giving an intensive type of light distribution should be used. Figs. 6 and 7 show the typical reflector available for this service.

The intensive type unit should be spaced on centers not to exceed the mounting height above the floor and three watts for each square foot of floor area should be installed so that the required 2 foot-candles will be reflected from the work into the eye. Clear, not white, bowl lamps should be used in the intensive type reflectors. The angle type and deep bowl steel reflectors are not so well adapted to foundry lighting as are the foregoing types. The angle type reflector often produces glare and defeats its purpose by making the eyes of the workers less responsive to the general level of illumination provided. The deep bowl steel reflector has its efficiency sacrificed for its shading effect. There is a popular impression that the deep bowl steel reflector gives an intensive type light distribution but such is not the case and the reflector should not be used where an intensive type of distribution is necessary.

**THE FOUNDRY**

**Piano Frames Crack**

**Question**—What is the best metal mixture for piano frames? We are using at present a charge containing 50 per cent pig iron and 50 per cent No. 1 scrap, but the results are not as we desire. A number of these frames cracked during the construction of the pianos, and some cracked when the pianos were tuned.

**Answer**—Piano frame castings should be made of metal which is strong, but comparatively soft. For this reason the silicon should range from 2.20 to 2.50 per cent and the phosphorus from 0.40 to 0.50 per cent. Sulphur should be held under 0.10 per cent and the manganese should be approximately 0.60 per cent.

The cause of cracks in your castings is difficult to determine since you do not state where the cracks appear, or the analysis of your present mixture. We believe that the phosphorus and sulphur are too high, as these constituents tend to produce brittleness. We also advise that you use no foreign scrap, but only that from your own shop. The moulds should be well gated, and have from 5 to 7 pouring gates with one riser near the center. Uncovering the center of the mold shortly after it is poured will prevent warping.

Your attention is directed also to an article on piano plate castings published in The Foundry, June 1, 1920.

**Anneal Malleable Iron Without Packing**

**Question**—Kindly inform us as to the possibilities of annealing malleable iron castings in the open oven without packing them in a receptacle.

**Answer**—Malleable iron is annealed without packing in muffle furnaces; that is, furnaces where the burned gases do not come in contact with the castings. This process has been carried on for many years. Also, malleable iron is annealed in boxes without the use of any packing material. This is a more recent practice. Some foundries which make large castings as well as small ones pack the small castings in annealing boxes and distribute the larger ones in the oven without the use of pots or packing. This causes more or less surface oxidation on the castings. Usually, it is felt to be advisable to put the castings in pots and to lute the pots with clay to prevent oxidation by the gases in the furnace.

**Tests Steel and Iron**

By Robert E. Masters

In 1886 a number of railway master mechanics held a conference in Richmond, Va., with D. R. Wade, superintendent of motive power, Richmond & Danville railroad as chairman. Previously to this time the railroads had been using cast-iron cross head guides, especially for repairs. While they were not as ponderous as today, the disposition seemed to be to discard the cast iron for steel.

I brought the matter up before the meeting and asked if anyone ever had heard of a reinforced cast iron guide breaking in service outside of a wreck. As none had, I charged that the change was not being made as a matter of safety and claimed that cast iron for service was superior and more economical than steel. I maintained that the cast iron guides were cheaper, held the oil better in service and were more enduring and had better wearing qualities than steel. It was decided to put a pair of each on an engine and test them.

The master mechanic of the Richmond, Fredericksburg & Potomac railroad put cast iron guides on top and steel guides on the bottom on one side and reversed them on the other side, the engines operating on express trains. When the final measurements were taken, the cast iron guides showed a 5 per cent wear to a 6 per cent wear with the steel.
Controlling Molding Sand in a Radiator Shop-I

Sand Used in Foundry Making 125 Tons of Small Castings Daily Is Checked Carefully for Strength, Moisture and Permeability by One Man, and Definite Properties Obtained

By H. W. Dietert and W. M. Myler

IMPORTANT physical properties of molding sand have been determined and given specific names, which enables a description of sand in common terms. Three of the most important of these terms are strength, moisture and permeability. The first two undoubtedly will be self-explanatory. The term permeability is used to express the openness or venting quality of a sand. Simple testing apparatus has been developed by which these properties or condition of molding sand may be measured and described in numerical values.

Foundrymen are capable of judging sand closely, but cannot pass this ability on to their men. The tempering crew may be told that the sand is too dry or too wet, but no definite mark may be given them to shoot at. All they get is the continual supervision of the foundryman.

A moisture test would release the foundryman from this work for then he may ask definitely for sand which would read between certain experimentally determined moisture limits. One bad result of the old system of describing moisture in sand is the fact that a molder sometimes will hesitate to report sand which he knows to be a little too wet or too dry for fear that the sand weter may carry the sand to the other extreme when trying to correct a small error.

In every foundry are certain sands which produce better results than others. There may be a man in the foundry who could add just the correct portion of new sand daily until the floor which are off would produce good results, but as a rule this man has gone so far up the ladder that his time is taken up otherwise. However, if a test sheet came regularly to his desk showing openness, strength and moisture, he immediately could guide his men to low foundry loss without any undue effort. He would show his men the best sand condition for each class of work by linking the practical results with the daily moisture, strength and permeability values. Instruction may be as follows: Machines 8, 9, 10 and 11 need sand which is tempered between 7 and 8, enough new sand added to keep bond up to strength readings between 2½ to 3 pounds and use the coarse, new sand when the permeability figures drop below 39 volumes of air.

We recall periods in our foundries when the casting loss was low, but few have records showing the condition of the sand at that time. A record of the sand properties as obtained by sand control work will, in the majority of the cases, show a marked difference of sand properties between low and high loss periods.

Feeling the Sand

Care and skill required to make good castings with a low foundry loss is materially less when the molding sand used has the feel which tells the foundryman that it is particularly adapted to the special needs. The ability to correlate the various feels of the sand with different casting results is gained only after years of experience. Heretofore, there has been no definite language whereby the foundryman could convey to his subordinates, or record for future reference, the particular results produced by a sand having a definite feel. The various tests adopted by the American Foundrymen's association, and now being used with or without variations in many plants, have given more definite results. Methods of testing sand at the plants of the United States Radiator Corp., Detroit, are described in this paper, which was presented at the Syracuse meeting of the American Foundrymen's association, Oct. 5-9. The authors are connected with the United States Radiator Corp., Detroit. The second section of this article will appear in an early issue.
low the equipment, molding and iron requirements to vary within easy limits. When the sand is off, the chance of losing the casting is increased materially. When we are able to maintain constant conditions in the foundry we may expect constant loss. The foundry loss is directly proportional to the amount of indefinite conditions existing in the foundry. One of the greatest indefinite items existing in the foundry is heap sand condition.

The sand which the molders work should be the same every day for molding processes have become mechanical. A mechanical operation is most efficient when operations are repetitions. Molding sand may be maintained easily at a definite condition by keeping the permeability, strength, moisture and fineness at some chosen values with the aid of sand testing. Every sand heap in the foundry requires individual attention. A heap of molding sand is not a heap of dirt, for dirt is something out of place. Molding sand belongs in the foundry and deserves utmost care regarding to maintain a certain standard. This care of the sand does not become an extra burden when sand testing is incorporated with the work of the sand crew. The elimination of uncertainty gives confidence to the organization, which is so essential to good foundry practice. This has been one of the most beneficial results derived from sand testing work as incorporated in all the foundries of the United States Radiator Corp.

The manner in which this work was incorporated will be discussed in detail. The work may be divided into two parts; namely the control testing of the heap sand and the selection and checking of new sand. The control testing was adopted first to determine by practical comparisons the meaning of test values, and what values are required for our work. With this in view, the control work will be discussed first.

Control Testing of Heap Sand

The type of man found best adapted to test sand has been an ambitious practical man out of our foundry crew; one who appreciates good molding sand and understands shop men. In an eight hour day, one man tests all the molding sand for a 125 ton small casting foundry, calling for some 150 strength, moisture and permeability tests. The sand tester is one of the regular night men and is one of the sand crew. We have found no particular friction in establishing sand control. This is due largely to the fact that the work is made a man’s work and its results are simple and definite.

The apparatus required for testing the sand is located in the foundry foreman’s office or an adjoining room. The foundry foreman uses the results of the sand testing, so he is placed in charge of the sand testing laboratory.

A view of a standard sand testing laboratory is shown in Fig. 1. The floor space required is equivalent to a room 8 feet square. The testing machines are arranged to enable the sand tester to work without unnecessary motions. The name and the use of each piece of apparatus is as follows: A—Special built electric drying oven, 24 x 18 x 18 inches, used for oven moisture test and drying new sand samples; B—Compression strength machine, used to obtain strength of molding sand and of cores; C—strength specimen rammer and mold, used to ram sand samples for the compression strength test; D—sand pan on rammer bench, used as container for sand samples during test; E—permeability machine, used to determine the permeability; F—permeability specimen rammer, used to ram sand sample for compression moisture test and for the permeability machine.

FIG. 1—EQUIPMENT FOR MAKING VARIOUS TESTS IS MAINTAINED BY THE UNITED STATES RADIATOR CORP.
G—balance, two kilogram capacity with one gram rider, used to weigh out definite weights of sand for compression moisture test; H—dispensing tube, used for measuring out amounts of water to temper test samples of new sand. M—sample cans in tray, used for carrying sand sample into laboratory.

The apparatus used for testing sand as shown in Fig. 1 is valued at $225. One sand testing laboratory of the group acts as a central sand testing laboratory, which makes the fineness test on sand grain samples received from each plant every month. This laboratory is equipped with a set of eight sieves and a sieve shaking machine for the fineness test.

Method of Testing

The sand is wet down by hand and cut at night by means of automatic sand cutters. Each floor is wet down to the dry side and cut three times. A man called a sand temperer then sprinkles the sand heap where needed as judged by feel and guidance received from moisture test figures.

The sand cutter then goes to an adjoining floor and starts cutting it. In the meantime the sand tester obtains three representative quart samples from the floor just cut. Samples are taken one foot down into the heap at the front, center and rear sections of the floor. The samples are placed in three separate cans and carried in a screen bottom tray shown at M, Fig. 1, into the sand testing laboratory, Fig. 1.

The sand samples for the front section of the floor are emptied into the sand pan shown at D, Fig. 1.

The permeability specimen tube is filled with the sand and placed on the balance G. Sufficient sand is taken out of the tube until balance comes to rest at 170 grams of sand. The tube with the sand then is placed under the permeability specimen rammer F. The sand in the tube is rammed by dropping the 14 pound weight three times through a distance of 2 inches on the rammer rod stop collar. The moisture of the sample is read on the scale on top of the rammer by the following operation: The indicating needle J is swung over on the rammer rod and the point where the needle comes to rest on the scale is noted. This needle does nothing more than indicate the length of the compressed sand specimen. If the sand is dry, then the needle will show a long specimen portion of the scale. If the sand sample is wet, the needle will come to rest in the lower portion of the scale. Wet sand packs more closely than dry sand. This makes it possible to let each length of sand specimen designate a certain degree of temper or percentage of moisture. The sand tester records the moisture as indicated by the indicating needle.

His next operation is to obtain the permeability reading from the same specimen by attaching the tube I containing the sand specimen to the air pipe of the permeability machine E. He then turns the air valve to the open position and reads the pressure gage. The pressure reading is converted to permeability or volume of air passed per minute by use of the table on the drum of the machine. This permeability reading is recorded on the sand sheet.

The use of moisture readings is obtained by filling the mold shown adjacent to the strength specimen rammer C with sand from the sand pan. The sand is rammed in the mold with one drop of the seven pound rammer, the sand specimen then is stripped free and placed in the strength machine E. Sufficient pressure is created on sand specimen to crush it by turning the oil screw plunger pump. The crushing pressure in pounds is recorded on sand sheet.

The three tests namely moisture, permeability and strength, are repeated respectively on the remaining center and rear samples of the floor.

Every sand heap in the foundry is numbered and is referred to as floor number 10, for example. The moisture, permeability and strength readings for front, center and rear sections of every floor are recorded on the sand control sheet, Fig. 2. The control sheet has two divisions; namely, the sand data space, which is filled out by the sand tester, and the finished casting part, which is used by the foundry foreman in checking results produced.

Use of Moisture Readings

Moisture readings are used by the night sand crew. The sand tester reports the moisture figures for each floor as soon as possible. It is possible to report the three moisture readings of a floor within three minutes. This allows the sand temperer...
STANDARD HOSE CONNECTIONS FOR WELDING AND CUTTING EQUIPMENT

(Concluded from Data Sheet No. 600)

The adoption of this standard is considered an important step in the right direction by those most familiar with welding and cutting equipment and its use, as it will enable the user of such apparatus to connect various makes of equipment quickly and conveniently and to avoid the trouble and inconvenience heretofore experienced when a hose sent out with equipment did not fit properly and could not be attached without special adaptors.

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<th>Hose Size</th>
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<th>C Size</th>
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After Jan. 1, 1926, manufacturers, who have accepted this standard will make all new equipment with connections, which are in accordance with the standard and will provide means by which users of present equipment can connect up with the new apparatus. It is believed that the matter is of so much importance to users of equipment that those who are using a number of makes of apparatus will take advantage quickly of the arrangements made by manufacturers and change over old equipment to the new standard as promptly as it can be accomplished. The saving in time and money in using various makes of apparatus undoubtedly will offset the cost of such changes many times over.

THE FOUNDRY DATA SHEET No. 601, Dec. 15, 1925

STATICAL PRESSURE TABLES

HEIGHT OF WATER COLUMN IN INCHES

Corresponding to Various Pressures in Ounces per Square Inch

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<th>Pressure in Ounces per Square Inch</th>
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PRESSURES IN OUNCES PER SQUARE INCH

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THE FOUNDRY DATA SHEET No. 602, Dec. 15, 1925
Around the World with
The Foundry

Little Journeys to the homes of our readers

Austria-Hungary

The famous blue Danube river traversing central Europe for nearly two thousand miles from Bavaria to the Black Sea, at one time furnished a land mark and a guide, and also, on occasion, a ready means of transportation to the crusaders, palladins and knights with their hordes of retainers on their way to do battle with the Paynim before Damascus, Antioch and Acre. Robber barons occupying castles along the banks developed the art of toll collecting to a legitimate business as thousands of gallant Christian warriors discovered to their cost. Richard Coeur de Leon escaped the perils of flood and field incident to his many campaigns and expeditions only to fall into the hands of Duke Leopold VI who held him chained in a dungeon until the people of England had raised and forwarded the sum demanded for his ransom.

Owing to conditions arising out of recent political events no statistics are available regarding the number of foundries in the country; but it is safe to assume that they are numerous, and judging from the character of the work produced, they are conducted in a highly competent manner. With a multiplicity of languages and dialects spoken and read by the people, it would seem that a magazine printed in English would find no place, but at present five prominent foundrymen of Vienna receive each his copy of THE FOUNDRY twice a month.
to add water or dry sand, if needed, to bring the moisture readings within limits before the sand cutter finishes the first floor. The desired corrections are made and sand cutter makes its final cut on the tested floor. The sand tester checks the floors which have been corrected. For illustration of moisture correction, we may choose floor No. 14, Fig. 2. The moisture reading for the front section read 5.1, center section 6.4, and the rear section 6.5. The sand tester marked this floor Exam. F. Moisture limits are 6 to 7 per cent. The sand temper is given these readings and he immediately knows that the front section is a little dryer than wanted, so he adds a little water to the front section of the floor No. 14. The amount of water that is needed to bring the front section moisture up to the range 6 to 7 is soon gained by experience. The foundryforeman glances over the moisture readings for each floor as recorded on sand control sheet the first thing in the morning. In this manner he gains a fair and rapid knowledge of the temper of every floor. During the day he may find that the sand on a certain number of floors should be worked a little dryer to improve results. That night he will ask that the sand on those floors be tempered between 5.8 and 6.8 in place of the usual 6 to 7.

Loss of moisture in the heap sand varies as weather conditions change. During wet season, the sand is tempered nearer the lower limit and sand with moisture reading a fraction below lower limit is passed while during dry the upper limit is favored. Permeability readings probably are the most popular of the three tests. The value of open sand is not questioned by foundrymen. The question as a rule is how close a sand can be worked safely. The greater the permeability for each class of work, the less care is required in tempering, ramming and gating. Again we have limits between which the permeability of the heap sand may safely vary for each class of castings. The lower limit of permeability for radiators was at 25, which gave freedom from venting losses without undue effort. An upper limit of 35 insures a sand with sufficient openness and yet produces no ill effect on the casting finish. These limits are not so set as the moisture limit. Variation in permeability readings may be out of the limits considerably and not cause any specific difficulty. However, the chances of having difficulty are increased. The larger the number of floors worked with a permeability lower than the limit set for most desirable results, the more pronounced will this chance become. Permeability of the heap sand governs the production of course to fine new sand addition. Under certain adverse conditions, core sand is added to the heap sand to increase the permeability.

The foundry foreman by practical experience may in a short time connect his feel with the strength readings. This will enable him to determine definitely what strength of heap sand will give best results. A record of sand and casting result may be kept over an extended period without taxing his memory.

For radiator castings, a 2.5 to 3.2 pound heap sand has been shown to give the best finish and lowest losses. Every floor running this class of work is kept within these strength limits by daily addition of new sand. Either the omission or addition of excess new sand may be readily detected by noting the control sheet. When a foundry operates with a nonvarying sand of adaptable characteristics, then it is possible to run a low loss. Sand testing will not temper nor mold sand, but will aid in maintaining definite conditions in the heap sand. This is only one of the essentials of the low loss combinations.

Comparison Between Plants

Every foundryman knows the value of visiting other foundries in order to eliminate the isolation tendency by exchanging practices. A discussion always reveals our position and gives us a basis for comparison. The control of heap sand has suffered greatly due to an absence of a basis for comparison. To fill this want, all our plants each week receive a sand control comparison sheet given in Table I, showing the average strength, permeability and moisture of each sand used for various classes of castings at each plant. This enables each plant to know the character of sand used by the other plants. Every six weeks plants also receive a duplicate copy of the other plants' sand control sheet as shown in Fig. 2.

The value of exchanging the sand data among plants may be proven best by noting the remarkable, close duplication of the heap sand used at each plant where the same class of work is made. For example, note the permeability column for Corry, Detroit, Dunkirk, Edwardsville and West Newton radiator sand. Whenever a group of foundries running castings ranging in size from a thousand pounds to plate work, agree on types of heap sand by test figures, then we can say safely that sand test figures do mean the same thing as the foundryman's feel.

An additional point which may be mentioned is that, without sand testing, it almost would be impossible to get a group of foundries to agree on the same openness, bond and moisture of heap sand to use on any certain class of work. This agreement is possible only because sand testing is definite and each foundry came to the same definite conclusion by the comparison of their sand control sheets and their loss. The conclusions are that a definite permeability, strength and moisture on each class of work are essential to produce a first class finish and a low casting loss.

Every plant laboratory washes the clay bond out of a sample of sand from every class of heap sand used the first of each month. The percentage of clay is determined by loss in weight. The cleaned sand grains then are placed in the permeability tube I, Fig. 1. A set of tight fitting screens form ends for the specimen. The sample is rammed under the permeability rammer with the usual three drops. The permeability reading is obtained, and is called the base permeability of the sand. It is called base permeability because it gives the openness of the sand grains of the backbone structure of the heap sand. This is the starting point governing permeability and compares all sand under like conditions, namely, zero clay bond.

The sand grains, base permeability and percentage clay data are mailed to the central laboratory where the sand grains are placed in a set of nine screens. These screens are mechanically vibrated to distribute sand grains on screens which will retain them. The next operation is to express in percentage the amount of sand grains retained on each screen from coarse to fine.

The data, fineness, percentage clay and base permeability are compiled on fineness test comparison sheet, Fig. 3, and a copy is mailed to each plant. In this manner, each plant knows whether their sand is getting finer or coarser, also how their sand compares in fineness with sand used by other plants. For radiator sands, the percentage limits of sand grains retained on the 70 mesh screen is between 30 and 30.40, and the 100 mesh screen between 25 and 30 per cent and on the pan less than 10 per cent.

A standard product is made in our foundry and a particular job may remain in the sand of a floor over an extended period. The order of the various operations, molding, pouring,
shaking out, and tempering, follow in a definite interval of time. The condition of sand changes little, due to the cycles of operations and uniformity of the addition of new sand and facing material. The new sand addition is governed by strength and permeability, while casting allows large quantities of facing material added. The addition of water by estimation and the checking for moisture by test is at best a corrective method. A preventative method certainly is to be desired. The metering of the water to temper a floor may possibly be classed as a preventative method.

At the West Newton plant, a 100 gallon clock meter is attached to the tempering hose to enable the sand weter to place a definite quantity of water on each floor. The quantity of water for each floor was determined by trial. This method is proving satisfactory and appeals to the foundry organization. The regular sand control testing still is carried on simultaneously with the metering process.

This outlines the general system of sand control as practiced in our plants. We have endeavored to show the method in which it is carried out and the types of condition we attempt to maintain. There has been no attempt made to give minute details either of apparatus, construction or operation. For those who care to investigate the details, there is appended a group of reports dealing with the construction of test apparatus and details of operation.

The tests which may be made on new molding sands group themselves into two classes; namely, adaptability tests and quality tests. The adaptability tests are permeability, base permeability, strength, percentage clay and fineness. These tests show whether a sand is suitable for a particular class of work.

The quality tests are moisture working range, lime, gas volume, durability, and clay bake. These tests are used to determine whether a sand possesses properties such as long life and resistance to washing, and also whether a sand will be easy to temper.

Prospective sands are chosen by their feel. Gallon samples are requested from the producer of the sands which seem desirable. Each sample received is placed in an air tight gallon can, correctly labeled and filed.

Strength and permeability of a sand increases as water is added to the sand until it becomes wet, in which state the strength and permeability decreases as the sand becomes wetter. This makes it necessary to test the strength and permeability of a new sand with various moisture contents to determine the maximum strength and permeability.

The first step in this test is to try the new sand sample. Then weigh out a definite amount of sand; for example, 1000 grams (2.2 pounds). With the aid of a water measuring tube add definite percentages of moisture. Wet the sand to the dry side and determine the strength and permeability. Then add another per cent of water and repeat the tests. Continue adding moisture a per cent at a time and testing until the sand is too wet. Tabulate the strength and permeability with the percentage of moisture. Record maximum strength and permeability readings with the corresponding moisture on sand analysis sheet.

The next tests are the percentage of clay determination, base permeability and sieve test. All of these are known commonly as the fineness test, and the procedure is discussed in detail in the second section of this paper which will appear in an early issue.

The percentage of clay as determined by this test enables one to determine definitely the amount of loam or clay contained in a sand and is of value in classifying sands.

The permeability test on certain sands, due to their balling tendency on tempering, gives a false reading. Certain high bonded sands virtually are opening sands, when added to heavy sands, because the bond is scattered. Frequently these high bonded sands show a low permeability due to the excess clay closing up the void space. The grain structure of a sand will determine whether it will open or close a heap sand. The base permeability and determined in the fineness test actually obtains the venting quality of the sand grain structure and compares all sand on the same basis; namely, zero clay content. The base permeability is used to determine the effect of the new sand in the heap with reference to the permeability. The results of the sieve test as determined from the sand grains in the last part of the fineness test are used to determine whether the new sand contains a larger percentage of fine or coarse sand grains than found desirable by comparison of sands used in the foundry. The base permeability may be used to express the average fineness of a sand and is undoubtedly more suitable than the numerous mathematical expressions.

Certain molding sands have a property which make them easy to temper, while there are others that require extreme care in tempering. The latter type of sand is sensitive to water and is called short moisture working range sand. The strength and permeability change rapidly with a small variation in moisture. The readings of the strength and permeability test are used to determine whether a sand has a short or a long moisture working range.

Tests are of the most practical value when they more nearly approach or duplicate actual conditions. A molding sand is said to have long life when it has the ability of regaining its molding properties by taking up moisture and retempering readily after it has been subjected to a severe drying process.

The durability test subjects new sand to this condition. A tempered sample of the new sand is placed in a furnace at 600 degrees Fahr. for two hours and is allowed to cool in the air. The sand is then tempered and left to stand for 12 hours. The strength and permeability then are determined, the loss in strength being expressed in percentage. A desirable sand is one in which the loss will not exceed 20 per cent.

The manner in which the clay bond in a sand bakes when the molten iron flows over the surface of the mold governs to a large extent iron washing the sand. Some sands contain clay bond that dries firm upon baking while others have a bond which dries to a powder. In considering the life of a sand and its resistance to cutting the manner in which the clay bond bakes is an important factor.

The relative amount of gas which is determined by the addition of hydrochloric acid to a small quantity of the sand in a test tube. Sands which bubble appreciably are rejected. The amount of gas which a new molding sand will form upon heating is being investigated. The practical value of this test is not known at the present time.

Every car of molding sand received is tested for strength and permeability. These test values are compared with those of the sample of sand furnished by the producer. Rejection of car lot shipments is not practiced, for a greater mutual gain may be obtained by cooperation. If the solid sands test low in strength, the sand producer is advised of the exact condition, thus enabling him to correct conditions on future cars. In case the sand tests low in permeability, a more open sand is requested in future shipments. This procedure is definite and finds the variation from the desired sand before the condition becomes serious. The manner in which each car is tested will be discussed in an early issue.
PART II

With a Straight Accurately Fitted Spindle Molds May Be Swept Up to 6 Feet Height Without Stay Rods

OCCASIONALLY the statement is made that loam work is more expensive than dry sand on account of the tackle required. This may be true if new tackle is made for each job, but it must be admitted that dry sand work also is costly where new boxes have to be made. Where molds are swept in loam in the ordinary manner, the initial cost of the equipment eventually is spread over a great many jobs. Ordinary work made in loam involves the preparation of no more special tackle than the same class of castings made in dry sand molds.

The spindle and socket are the most important part of the equipment. The spindle should be accurate to size and perfectly straight. The most convenient sizes are 1½ and 2 inches diameter for small molds. A 3-inch spindle is satisfactory for medium and large molds except where the sweep and other equipment are extra heavy when a 4-inch spindle will give greater rigidity.

Foundrymen hold conflicting viewpoints as to whether the spindle should remain stationary or revolve with the sweep arm. With the first arrangement the end of the arm is machined to a free working fit on the spindle and is held in place, usually above one, but sometimes between two collars held to the spindle by screws.

In the second method illustrated in Fig. 2, Part I and the one most freely used the arm is held in place by a stud or set screw. To dispense with the use of a wrench many loam molders prefer a stud with a hole drilled through it. The point of a tommy bar, the tang of a file or any convenient piece of small rod may be used as a lever to lock or unlock the spindle arm. A type of arm popular in American foundries is open at the back and is held in place by a steel wedge key driven through slots in such a manner that it grips the spindle closely. In addition to providing a means for rapid adjustment, this type of arm may be placed on the spindle or removed without lifting it over the top. This is an important consideration in many instances particularly where the spindle is steadied at the top with stay rods.

Opinions differ respecting the best method for holding the spindle in accurate vertical position. Some foundrymen insist on the necessity of wall braces or stay rods at the top. We are not in favor of these devices and believe they are unnecessary except under exceptional circumstances. A great deal of additional labor is involved in changing sweeps or in the re-setting the arm for various parts of the mold. Also they curtail the scope of the work that otherwise might be handled.

The style of spindle shown in Fig. 2, Part I is used more than any other. It is provided with a long taper which fits in a correspondingly tapered hole in a socket. The surfaces in contact should extend for at least 6 inches to afford firm support and the spindle should be greased before it is inserted. A straight spindle set vertically will maintain its position without the aid of top braces. Molds 6 feet high may be swept accurately with a spindle of this type. The socket is attached either to a stationary foundation plate or to a plate equipped with wheels. A rectangular shape is the most serviceable for a bogie plate. It is provided with lugs or handles on the sides for lifting purposes and with bearings on the lower side for three or four small wheels.

Flanged wheels are used in foundries where loam molds are made ex-
tensively and where rails are laid from the working floor to the drying ovens. Almost without exception in American foundries the various parts of the loam mold are loaded like cores or dry sand molds on trucks and pulled into and out of the ovens with the aid of one of the cranes. Usually the trucks are mounted on wheels, but in a few instances they travel on balls laid in grooved bearings. Irrespective of the method employed it is essential that the rails should be level to reduce the hazard of the mold sagging.

The building plate on which the mold is erected not only should be thick enough for immediate use but should be cast thick enough to support any job that subsequently might be built upon it. Ample space should be provided for enclosing the mold after it is assembled. The surface of the plate should be covered with short dabbers and numerous holes should be provided to furnish a way of escape for steam and gas.

Sweep Is Bolted

The spider or sweep arm may be straight or made with a jog off center so that the working face of the sweep will lie in a true radial line with the center of the spindle. In some foundries clamps are depended on to hold the sweep board against the arm, but they are not reliable. The better type of arm is provided with a number of slotted holes through which the sweep board may be adjusted and bolted securely to the arm.

When the building plate has been leveled either on the bogie or other suitable foundation the spindle is erected and the sweep arm or spider is attached at a convenient height to receive the sweep board. Sometimes the bolt holes in the board are bored in the pattern shop and at other times only is necessary on exceedingly large jobs where the weight of the arm and sweep constitute a factor which must be reckoned. In the great majority of cases the combined weight of the arm and sweep will not affect the accuracy or rigidity of the spindle and therefore balancing is not necessary.

Mold Is Vented

Several features incident to the sweeping of a loam mold are illustrated in Fig. 9. The building plate first is claywashed and then covered with a coating of building loam before the first layer of bricks is laid. As the building of the mold progresses proper measures must be taken to insure a free escape of gas and steam from the finished mold. Particular attention is required in those isolated parts of the mold between the ribs. These islands eventually are surrounded by molten metal on all sides except the bottom and therefore liberal provision must be made for escape of the gas on that side. Fine cinders laid in the interstices or a layer of straw laid between the
courses of brick render the mold porous and provide all the venting facilities required in the average run of work. In special places, typified by the islands referred to in the preceding paragraph it is advisable to fill the interior with coke or cinders and then insert a pipe to carry the gas and steam from this chamber to the outside of the mold. Bricks should be spaced liberally to insure a well-vented mold and at least a ¼-inch thickness of loam should be laid on the brickwork on the face of the mold.

The first part of the mold to be swept is the bearing for the rib patterns. The piece attached temporarily to the sweep for this purpose then is removed. With a pair of trammels set to the radius of a ring representing the outer end of the ribs the position of the ribs is stepped off and a mark made at each step for a guide in locating the outer end of the rib. The gage stick is employed to locate the inner end of the rib on a true radial line with the outside.

Under certain conditions it may be advisable to make a parting on that mold so that part of the mold originally swept as a bearing for the rib patterns. Pieces of dried loam worked into the face will expedite the drying of the surface and allow the work to go on with little or no delay. A grid is required to lift that part of the mold between the ribs. Each block might be lifted individually, but usually they are lifted together and after they are dried they are returned to place easily and accurately.

Setting the Grid

The style of grid shown in Fig. 8 usually is employed. The bars connecting the sections pass through the ribs and in a manner become part of the casting. This feature does not interfere with the appearance or usefulness of the casting. The grids easily are broken and removed during the process of cleaning the casting. These grids are provided with dabbers around the outside and with staples at convenient points so that they may be lifted readily.

After a dusting with parting sand the surface of the mold is covered with a thickness of loam. The ribs then are removed temporarily while the grid is being lowered into place. Suitable gaps are cut in the ribs to clear the openings in the grid and then the staples are returned to place. Loam is used to cover the dabbers, build up the shape and form a chamber for the cinders or coke. A thickness of about 2 inches of loam is built over the chamber filled with ashes.

Usually the strip for sweeping the thickness over the steamway clearance is removed until the main part is swept. Then it is attached to complete the job. The recess covers two spaces with one of the ribs in the center. Thin loam is employed for the final coating to produce a good surface. A space for a hook is cleared around the top of each staple while the loam still is soft. In a few districts all loam is known as 

![Diagram](image)

**FIG. 13—PLAN VIEW OF THE BOTTOM PART OF THE MOLD SHOWING THE RELATIVE POSITION OF THE VARIOUS COMPONENT PARTS**

...
The principal point of difference is that suitable openings must be provided for runners and risers. A part section of the cover showing the position of the principal is shown in the accompanying Fig. 10.

After the face of the cope has been swept to the desired shape the template Fig. 3, Part I is used for a guide to the extremities of the steamway clearance. The temporary piece then is removed from the sweep and the shape completed. The ends of the raised part are finished with the hand tools and filleted. A center line is marked accurately on the joint to correspond with the line on the lower part of the mold. Pieces of clay can be placed at certain points in the mold the first time to indicate the thickness and, in the present instance, the length of the small center core. Whiting, chalk, flour, parting sand, blacking or any other powder is spilled over the runner to verify the position of the gate cut in the mold. Proper care must be observed to see that the center marks of the upper and lower parts coincide when they are assembled.

A section of the closed mold is shown in Fig. 10. The parts are clamped securely before the metal is introduced. Many small and medium sized jobs are cast without removing the mold from the bogie. However, the majority of foundrymen prefer to sink loam molds in a pit and ram sand around them as a precautionary measure. In many instances the mold is placed on the floor and enclosed in a casing made of cast iron sections or of steel plate in one or in many sections depending on the circumference of the mold. Sand is rammed between the casing and the outer wall of the mold. Shallow molds are poured without these precautions.

Foundrymen who are not accustomed to loam molding practice will doubt whether a loam and brick faced plate can be turned. The practice is quite safe for shallow molds provided the plate is equipped with dabbers and the mold is dried thoroughly before the rollover is attempted. Where a considerable amount of brickwork is built on the plate a plate or grid attached to the cover plate by bolts is required to support the load. In some instances long dabbers are provided on the plate to support brickwork.

THE FOUNDRY

December 15, 1925

The chief point of difference is that suitable openings must be provided for runners and risers. A part section of the cover showing the position of the principal items is shown in the accompanying Fig. 10.

After the face of the cope has been swept to the desired shape the template Fig. 3, Part I is used for a guide marking the extremities of the steamway clearance. The temporary piece is then removed from the sweep and the shape completed. The ends of the raised part are finished with the hand tools and filleted. A center line is marked accurately on the joint to correspond with the line on the lower part of the mold. Pieces of clay are placed at certain points in the mold the first time to indicate the thickness and, in the present instance, the length of the small center core. Whiting, chalk, flour, parting sand, blacking or any other powder is spilled down through the runner to verify the position of the gate cut in the joint. Proper care must be observed to see that the center marks of the upper and lower parts coincide when they are assembled.

A section of the closed mold is shown in Fig. 10. The parts are clamped securely before the metal is introduced. Many small and medium sized jobs are cast without removing the mold from the bogie. However, the majority of foundrymen prefer to sink loam molds in a pit and ram sand around them as a precautionary measure. In many instances the mold is placed on the floor and enclosed in a casing made of cast iron sections or of steel plate in one or in many sections depending on the circumference of the mold. Sand is rammed between the casing and the outer wall of the mold. Shallow molds are poured without these precautions.

Foundrymen who are not accustomed to loam molding practice will doubt whether a loam and brick faced plate can be turned. The practice is quite safe for shallow molds provided the plate is equipped with dabbers and the mold is dried thoroughly before the rollover is attempted. Where a considerable amount of brickwork is built on the plate a plate or grid attached to the cover plate by bolts is required to support the load. In some instances long dabbers are provided on the plate to support brickwork.

Material

Is

Unit Piled

THE supply department of the Illinois Central railroad inaugurated the unit piling system at all storehouses in 1924. A review at the end of the year shows that considerable good has been accomplished, according to an article appearing in a recent issue of the Illinois Central Magazine. Where the material is piled properly, an accurate count may be obtained by the storekeeper in the monthly inventory. In addition, there is a saving of 50 per cent in the time required to take the annual inventories. About 30 per cent of the floor space is saved. Another advantage of unit piling of materials is the orderly appearance of storehouses and platforms.
The air service, United States army regularly uses the six alloys shown in Table I in its foundry at McCook Field. Alloys of different composition but of suitable properties, may, be substituted for any of the six indicated, particularly with reference to alloys 3 and 4. Some of the other casting alloys used by air craft manufacturers and by the navy are the 95 aluminum—5 silicon, 97 aluminum—2 copper—1 manganese, and the 72 aluminum—25 zinc—3 copper alloy.

For aircraft castings primary aluminum ingot of grades A and B may be used. Whether the purer grade A or the less pure grade B is to be selected is not only a question of cost but one of the effect of the impurities in the aluminum ingot in the alloy of which it is to form the base. High copper content in grade B ingot is not ordinarily of consequence because most of the alloys to be made are intentionally copper-bearing. In certain copper-free alloys, however, copper in appreciable amounts might impair the resistance to corrosion. A high percentage of iron in the ingot would not generally vitiate an alloy which was to contain a large quantity of iron, but in others it might diminish corrosion-resistance and response to heat treatment. If the silicon content in the ingot were high, it would possibly affect the machineability adversely; or, if magnesium and copper were to be simultaneously present in the final alloy, it might destroy the strength-ductility ratio. On the other hand, silicon may help to neutralize the harmful effects of iron. Grade B ingot as a rule is suitable for alloys 1, 2, 4, and 5, but it has not been used for alloys 3 and 6. Only lake or prime electrolytic copper may be used in the manufacture of hardeners. The copper content must
## Table I

### Alloys Used at McCook Field

<table>
<thead>
<tr>
<th>Reference No.</th>
<th>Chemical Composition</th>
<th>Uses and Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>92 Aluminum—8 Copper</td>
<td>For general use of foundry casting.</td>
</tr>
<tr>
<td>2</td>
<td>88.5 Aluminum—10 Copper</td>
<td>For parts subjected to elevated temperature.</td>
</tr>
<tr>
<td>3</td>
<td>91.75 Aluminum—2.5 Copper</td>
<td>For parts requiring good strength and ductility.</td>
</tr>
<tr>
<td>4</td>
<td>94.0 Aluminum—5 Copper</td>
<td>For highly stressed parts subjected to shock.</td>
</tr>
<tr>
<td>5</td>
<td>91.0 Aluminum—4 Copper</td>
<td>For complicated castings with abrupt changes.</td>
</tr>
<tr>
<td>6</td>
<td>92.5 Aluminum—4 Copper</td>
<td>For parts subjected to elevated temperature.</td>
</tr>
</tbody>
</table>

## Table II

### Air Service Specifications for Three Grades of Aluminum Ingot

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage Composition</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Aluminum—Iron—Silicon—Manganese—Copper</td>
</tr>
<tr>
<td>B</td>
<td>Aluminum—Iron—Silicon—Manganese—Copper</td>
</tr>
<tr>
<td>C</td>
<td>Aluminum—Iron—Silicon—Manganese—Copper</td>
</tr>
</tbody>
</table>

## Table III

### Chemical Composition and Mechanical Properties for Alloy No. 1

### Chemical Composition

<table>
<thead>
<tr>
<th>Element</th>
<th>Per Cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum</td>
<td>90.0 (min.)</td>
</tr>
<tr>
<td>Copper</td>
<td>7.0—8.5</td>
</tr>
<tr>
<td>Zinc</td>
<td>0.20 (max.)</td>
</tr>
<tr>
<td>Others</td>
<td>1.70 (max.)*</td>
</tr>
</tbody>
</table>

### Mechanical Properties

<table>
<thead>
<tr>
<th>Type of Test Specimen</th>
<th>Ultimate Strength in lb./sq. in.</th>
<th>Elongation in 2 in., %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cast-to-size</td>
<td>17,000 (min.)</td>
<td>1.5 (min.)</td>
</tr>
<tr>
<td>Machined</td>
<td>14,000 (min.)</td>
<td></td>
</tr>
</tbody>
</table>

### Table IV

### Tentative Chemical Composition and Mechanical Properties, Alloy No. 2

### Chemical Composition

<table>
<thead>
<tr>
<th>Element</th>
<th>Per Cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum</td>
<td>87.5 (min.)</td>
</tr>
<tr>
<td>Copper</td>
<td>7.5—10.75</td>
</tr>
<tr>
<td>Zinc</td>
<td>0.20 (max.)</td>
</tr>
<tr>
<td>Iron</td>
<td>1.0—1.1</td>
</tr>
<tr>
<td>Magnesium</td>
<td>0.15—0.35</td>
</tr>
<tr>
<td>Others</td>
<td>0.75 (max.)*</td>
</tr>
</tbody>
</table>

### Mechanical Properties

<table>
<thead>
<tr>
<th>Type of Test Specimen</th>
<th>Ultimate Strength in lb./sq. in.</th>
<th>Elongation in 2 in., %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cast-to-size</td>
<td>22,000 (min.)</td>
<td>0.5 (min.)</td>
</tr>
<tr>
<td>Machined</td>
<td>18,000 (min.)</td>
<td></td>
</tr>
</tbody>
</table>

### Table V

### Tentative Chemical Composition and Mechanical Properties, Alloy No. 3

### Chemical Composition

<table>
<thead>
<tr>
<th>Element</th>
<th>Per Cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum</td>
<td>94.0 (min.)</td>
</tr>
<tr>
<td>Copper</td>
<td>2.5—4.0</td>
</tr>
<tr>
<td>Iron</td>
<td>0.1—1.5</td>
</tr>
<tr>
<td>Magnesium</td>
<td>0.25—0.5</td>
</tr>
<tr>
<td>Others</td>
<td>1.0 (max.)*</td>
</tr>
</tbody>
</table>

### Mechanical Properties

### Table VI

### Desired Composition and Mechanical Properties, Alloy No. 4

### Chemical Composition

<table>
<thead>
<tr>
<th>Element</th>
<th>Per Cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum</td>
<td>92.0 (min.)</td>
</tr>
</tbody>
</table>

### Mechanical Properties

<table>
<thead>
<tr>
<th>Type of Test Specimen</th>
<th>Ultimate Strength</th>
<th>Elongation in 2 in., %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cast-to-size</td>
<td>29,000 (min.)</td>
<td>4.5 (min.)</td>
</tr>
</tbody>
</table>

### Table VII

### Some Normal Properties of Alloy No. 4 as Sand Cast and Heat Treated

<table>
<thead>
<tr>
<th>Condition</th>
<th>Ultimate Strength in lb./sq. in.</th>
<th>Elongation in 2 in., %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sand-cast</td>
<td>21,000</td>
<td>3.5</td>
</tr>
<tr>
<td>Heat-treated</td>
<td>15,000</td>
<td>5.0</td>
</tr>
</tbody>
</table>

### Table VIII

### Specifications for Alloy No. 5

### Chemical Composition

<table>
<thead>
<tr>
<th>Element</th>
<th>Per Cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum</td>
<td>92.0 (min.)</td>
</tr>
<tr>
<td>Copper</td>
<td>3.5—4.5</td>
</tr>
<tr>
<td>Silicon</td>
<td>5.5—6.5</td>
</tr>
<tr>
<td>Others</td>
<td>1.0 (max.)*</td>
</tr>
</tbody>
</table>

### Mechanical Properties

<table>
<thead>
<tr>
<th>Type of Test Specimen</th>
<th>Ultimate Strength</th>
<th>Elongation in 2 in., %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cast-to-size</td>
<td>18,000 (min.)</td>
<td>1.5 (min.)</td>
</tr>
<tr>
<td>Machined</td>
<td>16,000 (min.)</td>
<td></td>
</tr>
</tbody>
</table>

### Table IX

### Analysis and Properties of Alloy No. 6

### Chemical Composition

<table>
<thead>
<tr>
<th>Element</th>
<th>Per Cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copper</td>
<td>7.75—4.0</td>
</tr>
<tr>
<td>Nickel</td>
<td>1.25—2.25</td>
</tr>
<tr>
<td>Magnesium</td>
<td>2.5—3.5</td>
</tr>
<tr>
<td>Iron</td>
<td>0.75 (max.)</td>
</tr>
<tr>
<td>Silicon</td>
<td>0.50 (max.)</td>
</tr>
<tr>
<td>Others</td>
<td>0.25 (max.)</td>
</tr>
<tr>
<td>Aluminum</td>
<td>0.10 (max.)</td>
</tr>
</tbody>
</table>

### Mechanical Properties

<table>
<thead>
<tr>
<th>Type of Test Specimen</th>
<th>Ultimate Strength</th>
<th>Elongation in 2 in., %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cast-to-size</td>
<td>32,000 (min.)</td>
<td>90 (min.)</td>
</tr>
<tr>
<td>Machined</td>
<td>29,000 (min.)</td>
<td>90 (min.)</td>
</tr>
</tbody>
</table>

The specific gravity should not exceed 2.90.
be not less than 99.88 per cent, silver being counted as copper. Nickel may be introduced into the hardener either as metallic nickel of a minimum purity of 99.50 (plus cobalt) per cent or through the agency of 50-50 cupro-nickel of highest purity. Either simple aluminum-iron (90-10) or aluminum-copper-iron (65-25-10) hardeners serve as the source of iron.

Silicon is added to aluminum as a hardener rather than as the pure metal. At McCook Field the preference is for an 89 aluminum—11 silicon hardener, made from pure materials. It is possible to obtain such satisfactory intermediate alloys (hardeners) as 80 aluminum—20 silicon and 50 aluminum—50 silicon, commercially. Magnesium is added in solid form as the metal, at least 99.85 per cent pure, to the final alloy just before the latter is to be poured.

In manufacturing the 50 aluminum—50 copper, the 55 aluminum—30 copper—15 nickel, the 65 aluminum—25 copper—10 iron, and the 89 aluminum—11 silicon hardener, which are readily dissolved in aluminum to form the final alloy, the following procedure is used at McCook Field:

50 Aluminum—50 Copper: 50 parts (by weight) of copper are melted under charcoal, skimmed, and poured slowly and with stirring into 30 parts of molten (1500 degrees Fahr.) aluminum, 20 parts of solid aluminum being added gradually to the molten bath to check the rise in temperature. The hardener is then stirred, skimmed, and pigged.

55 Aluminum—30 Copper—15 Nickel: This hardener is prepared by melting together 15 parts of copper and 30 parts of 50-50 cupro-nickel with 5 parts of aluminum, which speeds up the fusion. This mixture is then poured slowly and with stirring into 30 parts of molten aluminum. Twenty parts of solid aluminum are gradually added to keep down the tempera-
ture of the bath. The hardener is stirred, skimmed, and then pigged. It will be noted that the ratio of copper to nickel is 2:1 as in alloy 6, for which it may be conveniently used without the necessity for a second hardener.

65 Aluminum—25 Copper—10 Iron: Twenty-five parts of copper are melted under charcoal, skimmed, and poured slowly and with stirring into 45 parts of molten aluminum in which have been dissolved or nearly dissolved 10 parts of iron, 20 parts of solid aluminum being added to check the rise in temperature. The hardener is stirred, skimmed, and poured into shallow ingots.

89 Aluminum—11 Silicon: This eutectic material is alloyed by melting aluminum and by plunging beneath its surface metallic silicon. The silicon, protected from oxidation by its coating of aluminum, dissolves fairly slowly in it at a temperature of about 1500 degrees Fahr. The resulting hardener is not brittle like those already described and it should be poured in shallow ingots to prevent segregation.

Preparation of Final Alloys

In making the final alloys the requisite quantities of aluminum and of hardeners are melted together. For accurate work the constituents both in the aluminum ingot and in the hardener are calculated in the charge. If magnesium is a component, it is thrust quickly below the surface of molten aluminum-hardener mixture to prevent oxidation. The bath should then be stirred thoroughly, skimmed, and pigged.

Air service specifications demand that castings shall be made only from the best grades of virgin metals or from virgin metals and scrap of known and approved composition. Proper control of melting and of pouring temperature, generally about 1300 degrees Fahr., is absolutely essential and is secured through the use of a suitable thermocouple and potentiometer or millivoltmeter. Contamination of the melt by iron, dross, or by iron scale should be avoided. It is not necessary to employ fluxes to provide clean alloy.

Complete foundry records of raw materials and their production and disposition are invaluable. At the McCook Field foundry the analysis of purchased and of home-prepared ingot is incorporated on cards. Each melt is given a number and assigned a log sheet (Fig. 14) on which are indicated the metallic materials and the quantity used, the furnace, the fuel, the time consumed in melting, the maximum furnace temperature, the pouring temperature, the number and pattern mark of the castings made, the number of molds of test specimens poured, the tests to be made, a sketch of the method of gating, etc.

Characteristics of Alloys

A description of the properties of the various air service alloys follows. Alloys 3 and 5 are the outcome of experimentation at McCook Field, as are the specific heat treatments which are mentioned.

Alloy 1: 92 Aluminum—8 Copper

This is the aluminum alloy most commonly used in the foundry. The chemical composition and mechanical properties specified are listed in Table 3. It gives very little trouble in casting and machines freely. As sand-cast in standard TB1 (separately cast) test specimens, shown in Fig. 13, the 92 aluminum—8 copper alloy has approximate properties of 21,000—1.0—60. That is the ultimate strength in pounds per square inch, the per cent elongation in 2 inches and the brinell hardness number with a 10 millimeter ball and a 500 kilogram load. As machined, its strength is about 16,000 pounds per square inch. Its proportional limit is about 7000 pounds per square inch, and its tension modulus about 9,500,000 pounds per square inch. Its specific gravity averages 2.85.

The structure is portrayed in Fig. 4. The constituents are a CuAl, network, traversed by needles of the iron-bearing constituents, in the matrix of the aluminum-rich solid solution.

![FIG. 13—AIR SERVICE TENSION TEST BARS AS THEY APPEAR ON LEAVING THE MOLD](image)

![FIG. 14—EACH MELT IS GIVEN A NUMBER AND ASSIGNED A LOG SHEET](image)

Large or important castings often are stamped with the melt and serial number. In fact, every precaution is taken so that any matter in connection with a casting may be traced long after it has left the foundry.
How and Why in Brass Founding

By Charles Vickers

Wants Smooth Surface on Castings

We are having considerable trouble getting a smooth surface on castings made in French sand. We are using % old French sand with % new sand, and store dry the molds thoroughly, but the castings are not up to standard. The casting sand is blacked, after being run through a hair sieve, and the moisture is sufficient to warrant tight ramming against the pattern. We use the best of metals and alloys.

Roughness, in the case of a brass casting is due to the fluid metal running between the several sand grains comprising the mold, which leaves little protuberances on the castings. Some alloys are more searching than others as no oxide film is carried on the surface. Compare the way in which a phosphor bronze will flow in a mold with the manner in which an alloy containing aluminum flows as shown by castings of the respective alloys.

The phosphor bronze carries no surface film to mention and it eats in between the sand grains comprising the mold, while the aluminized alloy because of its tough surface film, bridges the minute crevices. The one casting is rough, the other smooth cast in similar molds. As far as we can see in the case presented, either the facing used is too tough to pack closely against the patterns, and thus leaves minute crevices here and there, into which the metal flows, or if packed closely the metal is of the searching nature and sinks into the face of the mold like water would do. It will be necessary to get at the root of the trouble and discover what causes it.

We suggest that someone is given the job of exploring the beams or other ledges in the upper part of the foundry for beam dust then put it in fine bags such as used for flour, and use it on a few molds for printing back.

Make a mold of ordinary heap sand, which we presume is of fine grade, spray well with molasses water after the patterns have been drawn, then dust thoroughly with the dry beam dust, next dust over a uniform coating of lycopodium not any so-called substitute, then replace patterns, close the mold and after digging out half the sand, reram both cope and drag. Reopen the mold, draw patterns and finish, then store the two halves. When a mold so made is poured and produces a rough casting, something is wrong with the metal. If the latter is phosphorized it will be practically impossible to get the finish desired on artistic castings.

Seeks Aluminum Alloy for Pattern Plates

We are looking for a formula for an aluminum alloy that will not shrink too much and cause trouble in making satisfactory pattern plates. Can you suggest such an alloy?

We suggest an alloy of aluminum and silicon, such as aluminum 90 per cent, silicon 5 per cent and copper 5 per cent. Should the alloy just given appear to shrink too much the silicon can be increased to 7 per cent and the copper decreased to 3 per cent. The advertising pages of THE FOUNDRY will offer suggestions as to where the alloys of copper and aluminum, and copper and silicon can be obtained.

Wants Good Bearing Alloy

We wish to learn if the alloy known as eighty-five, three five, can be used as a bushing metal? Also what is a good alloy for bushings and bearings?

The alloy copper 85 per cent, tin 5 per cent, lead 5 per cent and zinc 5 per cent is not generally considered a bearing metal, although it can be used for small bushings and bearings. A good bushing and bearing alloy is copper 80 per cent, tin 10 per cent, and lead 10 per cent with a little phosphorus added to deoxidize.

Another good bearing alloy is copper 77 per cent, tin 8 per cent, and lead 15 per cent. No particular precautions are necessary in making the alloy to insure that the lead will be held in after the castings solidify, although some makers believe it necessary to blow steam or hydrogen through the lead to ensure that it will not separate from the copper. The highly leaded alloys appear to be best for bearings and no difficulty is encountered in making them with a lead content up to 30 per cent.

Gives Mixture for Ornamental Slush Castings

We would like to obtain the composition of a good metal for making ornamental slush castings.

Slush castings are made usually from a good grade of spelter. Some authorities claim it is necessary to use the highest grades of spelter, and others claim the addition of a small amount of aluminum assists materially in getting castings free from cracks. About five thousandths of one per cent aluminum is added to the zinc. A rich alloy of aluminum and zinc is prepared and a small amount of this is added to the bath of zinc.

Lead-antimony alloys are also used for slush castings and one formula is lead 87 per cent and antimony 13 per cent.

Desires to Clean Castings

We would like advice as to the best method of cleaning miscellaneous brass castings and bronze bushings. These vary in weight from pound to about pounds each, and at the present time we are rattle them in our gray iron tumbling barrel, but this gives the castings a coating of iron and we desire to give our customers good, clean, bright castings. We do not have a sand blast machine in our foundry, and cannot consider this method of cleaning.

We hesitate to say which is the best method of cleaning brass castings, but in this particular case we would install a wet brass tumbling barrel. These barrels are lined with wood blocks set with the grain outwards, and water is supplied to the barrel as it rotates. Below the barrel is a shallow trough to catch and convey away the water and also to retain the small particles of brass that fall from the barrel.

Such a barrel can be obtained through advertisers in THE FOUNDRY and it will clean the brass castings to the bright, clean appearance thought desirable. The barrel has to be almost entirely filled with castings, and it is a good plan to throw in a couple of shovelfuls of skimmings from the hearth where the brass pots are skimmed. These skimmings clean the castings and brighten them also.

1007
SECRETARY OF COMMERCE HOOVER recently predicted that the American public would spend a record amount of money for Christmas presents this year, due to sound industrial conditions and large bank deposits, and from early indications this prediction rapidly is materializing into fact. The heavy sale of merchandise undoubtedly is having a stimulating effect among certain classes of foundries, and will be a great boon to the manufacturers of cast iron toys. This industry has shown substantial growth during the past few years.

This class of foundry product is distributed mainly through retail stores and mailorder houses. Not content with the policy of waiting for the buying public to become acquainted with the various products through seeing the toys on display in stores, several manufacturers have undertaken an educational campaign, telling prospective buyers of the merits of the particular line through advertisements, carried in popular magazines having a nationwide circulation.

One of the advertisements reproduced in the above illustration appeared in a weekly magazine recently, while the other was published in the December issue of a monthly publication, both of these magazines going into the homes. In addition to this campaign, some advertising is done directly by the manufacturer through catalogs and bulletins showing a complete line of products, and in the case where a cartoon is provided for each toy, the advertising material is included in each package. Considerable advertising also is undertaken by the larger distributors.
MAKING good steel in the electric furnace has been considered a simple process by many. The acid electric furnace has been thought of as little more than a melting pot where the scrap is charged, the power turned on, the heat melted, final additions made and the steel is ready to pour. This misconception has caused many serious difficulties which have been costly to the foundryman. In a shop making castings for its own use, the requirements may not be high. However, a different problem confronts the jobbing and foundryman, where castings are sold according to analysis and strict specifications must be met. Constant laboratory control must be maintained to safeguard the steady uniform quality of the steel.

The customer will analyze the castings, and if they are not within the limits, they will be rejected. Tests also are made for hardness, tensile strength, elongation, and the castings are inspected in the machine shop. A rough cut generally will reveal the soundness of the metal. The foundry making castings which comply with such rigid specifications knows that making electric steel castings is not simply a process of melting, as many important factors must be watched.

Requirements for steel castings made by this process generally are as follows:

<table>
<thead>
<tr>
<th>Element</th>
<th>Per Cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon</td>
<td>0.20 to 0.25</td>
</tr>
<tr>
<td>Manganese</td>
<td>0.60 to 0.70</td>
</tr>
<tr>
<td>Silicon</td>
<td>0.20 to 0.25</td>
</tr>
<tr>
<td>Sulphur and phosphorus</td>
<td>0.05 and under</td>
</tr>
</tbody>
</table>

The scrap charge must be figured to melt down at about 0.18 per cent carbon and in the neighborhood of 0.20 per cent manganese. This will be an easy matter if the scrap contains these elements uniformly. However, this is not the case as the analysis of outside scrap varies, or the foundry may produce several grades of steel, thus varying the analysis of returned scrap. If the foundry produces other than soft grades, it is advisable to add iron ore to the charge, the quantity ranging from three to six scoops to a 3-ton heat, depending largely on previous experience. A good melter will see that the heavy scrap is charged to the bottom and the light scrap to the top, thus securing a good contract and lessening the danger of electrode breakage.

MELTING down begins when the high voltage is turned on, in some furnaces this being as high as 180 to 200 volts. This voltage will melt down a three ton heat in about 45 minutes to 1 hour, the first heat taking longer. The doors are kept shut at the beginning of the melt, but as soon as sufficient metal is melted down and the top of the charge begins to cave in toward the electrodes, the working door is raised and the remainder of the acid electric furnace has been-connected with the Reed Foundry & Machine Co., Kalama- zoo, Mich., the St. Louis Steel Foundry Co., St. Louis, the Lima Steel Casting Co., Lima, O., and the Mathews Steel Casting Co., Cleveland.
taken after each addition. When the last test pours smoothly and after about 30 seconds the iron starts to rise in the mold, the silicon content is about 0.10 per cent. The slag has been under a reducing influence, and its appearance will change rapidly with the rising temperature, finally becoming greenish gray with a solid fracture. Care must be taken that the slag does not become too thick, or more lime must be added. The use of crushed coke in the electric furnace is not general.

When the temperature of the metal is correct and the slag right, five pounds of ferrosilicon is added, and the heat is ready to tap. Just before tapping, an additional five pounds of ferrosilicon is added together with six pounds, or two pounds per ton, of aluminum. The heat should be tapped as soon as the final additions are made and stirred, for the metal will pick up silicon rapidly at the high temperatures. A snowing during the finishing period must be stopped immediately with lime.

Analyses of preliminary tests show that under normal conditions no silicon is picked up until after the final additions. For example, a heat of 6700 pounds is melted down with 0.035 per cent silicon. Several additions of ferrosilicon totaling 0.16 per cent should bring the silicon content to 0.195 per cent. Final analysis will show a silicon of 0.28 per cent, so that 0.085 per cent has been picked up between the final addition and the tapping. A heat made in this manner may be finished in about 20 minutes after the first test. Much importance may be attached to watching the slag at all times during the finishing period.

The meaning of lime slag is relative and should not be misconstrued for a basic slag. Immediately after the heat is melted down the slag is composed of about 50 per cent silicon dioxide (SiO₂), 30 per cent ferrous oxide (FeO) and 20 per cent manganese oxide (MnO). The slag is thin, dark brown and strongly oxidizing, the latter characteristic being caused principally by the high percentage of iron oxide. For this reason the iron oxide must be lowered to prevent further migration of the oxides of the metal, and to enable the oxides of the metal to go into the slag. Little ferrous oxide will be reduced in the acid slag under reducing conditions, and therefore it must be reduced by substituting a stronger base.

In this case lime is used which will form a monoxidizing silicate. Sufficient lime is added to the slag to reduce the percentage of iron oxide from 30 to 15 per cent. Too much lime will corrode the lining. The slag becomes lighter with a decrease in the FeO content, the final color is gray or greenish gray, providing the manganese oxide is not excessive. Some furnacemen throw powdered ferromanganese on the slag, while some use ferrosilicon as a deoxidizer.

A certain equilibrium exists between the ferrous oxide in the metal and that in the slag. As the oxide in the slag is reduced by the lime, some of the ferrous oxide in the metal goes into the slag, thus maintaining the equilibrium. The final deoxidizing of the bath is due to some extent to the carbon and to the silicon reduced from the slag, while the remainder is taken care of by the final additions.

When the slag has the correct color and physical properties, the heat is brought to the proper temperature and about five pounds of ferrosilicon added, this being followed by an addition of ferromanganese. As soon as the additions are well stirred, the heat is poured into the ladle.

Some melter may be interested in an experience the writer had with a new bottom in an electric furnace. Some furnacemen advocate burning in the bottoms, while other advise ramming and subsequent drying. Several months ago the writer wished to put a new bottom in a 3-ton furnace. After some deliberation it was decided to burn in the bottom. After preparations had been made, it was decided to ram the bottom in dry. The bottom was rammed with a bench hammer for two hours. Instead of drying slowly, orders made it necessary to start the first heat after the ramming operation was completed, so that only five hours elapsed from the start of making the bottom to pouring the first heat, which was a weak heat. After several hundred heats this bottom still is in good condition.
YESTERDAY the rain fell steadily from morning until night and it still was coming down mournfully when I stepped out on the back porch for a moment to park my one and only cuspidor before retiring for the night. This last little finishing touch to the activities of the day is the result of a lamentable weakness on my part in early housekeeping days. Looking back now and comparing notes with other husbands, down trodden and otherwise, I can see quite readily that if I had displayed the proper degree of firmness at first I might have escaped this duty. Actuated by the most knightly motive I had apologized for bringing this homely little friend into the house and with a further desire for preserving the domestic peace I had volunteered to remove it each night before retiring.

Strange as it may appear my apology and offer were accepted freely and as a matter of course. In fact to smoke a filthy pipe in the house. I really had to smoke a pipe why move it each night before retiring. Wonder was expressed that I did not apologize and offer were accepted freely lucky dog in having permission to smoke a genteel cigar or cigaret, or most knightly motive I had apologized for bringing this duty. Actuated by the state-ment that before retiring for the night I had parked the cuspidor on the back porch and found the rain still pouring down, as the saying goes, on the just and the unjust. Apparently I am in neither class for most assuredly it was not pouring on me. On a rainy night I remain in the house. I am not prepared to admit that I am related even distantly to the cat family, but I have a healthy aversion to getting wet.

Bill does not share my sentiments in this respect. He came in last night with the water dripping off his hat brim and the tail of his coat. To my surprised inquiry what in the name of Noah and his ark brought him out on such a night he remarked that he did not mind a little mist.

"You don't know what rain is" said Bill. "If you want to see rain as is rain you should spend a season down in the north end of Nova Scotia. Sometimes it rains harder than at other times, but you will be treated an exhibition at any season. I knew a bessemer superintendent who came from Alabama and who summed the situation up rather neatly after a year's sojourn. 'This is a unique country' said he 'Whereas other sections of this North American continent enjoy four seasons per year, this place only has three, July, August and Winter!' As an after thought he added pessimistically that it usually rained in July and umbrellas enjoyed a wide sale in August.

"By a curious coincidence I had a letter recently from an old friend down in that country relating among other things some of the high points in a motor trip between his home and another town in the Province. If you kindly will bend one of your long ears in this general direction I will read the document. I might say that this lad handles his car as if it was an army tank. Where roads are available he sticks to the road, but when he is in a real hurry he hurdles straight across the country. Up to the present, fox hun-
ing has not been established as a popular sport down that way, but if it ever is introduced I am willing to bet he will follow the jolly old hounds in the machine. If he cannot jump the fences he will plow through them. What chance Reynard will have. Eh, what?"

In company with two other hardy lads we drove into the worst rain storm we had had for years. I started last Saturday for New Glasgow. The car was along in great shape and we arrived at the conclusion that I had my entire attention to the problem of bailing and therefore could devote less telephone and after many in- out (perhaps about the age of the relic and the remains of the first wreck I found no change in the patient. The rescue arrived about 9:30. We changed wheels and things and got away under our own power and the next time we drove into the mud I had to stop to wake up the owner of the Ford and break the sad news that the wagon was injured slightly but still in the ring. I was overcome with grief, shed many tears and confided in me that the collection of junk was a family heirloom descended in a straight line from Sitting Bull or maybe it was Gunga Din and therefore priceless. I have no reason to doubt this. However, the lad with the machine who had viewed the incident with mild interest now for the past three weeks steadily and without intermis- sion. It is coming down again today but I may have over- looked some of the best. The rain has been plentiful enough to be picked up by a good Samaritan in a passing car who carried me the remainder of the distance.

And the rain it kept on raining. When I found the telephone it was out of order. Probably the poles supporting the wires had been washed out by the roots. The instrument was dead and I was so nearly drowned that I was almost in the same condition. There we were, as you might say in a manner of speaking, stranded. However, the lad with the machine promised solemnly if he ever floated into Sydney to call a garage and have a wrecking crew sent out to the rescue.

I had intended to say a few words about pride going before a fall? I carelessly neglected to keep accurate count—the remainder of the works and the engineer followed the fire in the general direction of the fence and peacefully turned paws up. Every part of the Rattle above the main deck was swept clean. The hold was flooded and all lights were out in the engine room. I remained quiet for a judicious interval, partly be- cause I was jammed in the mud and my clothes were sticking too tightly, but I was feeling reasonably elated. The engine coughed a few times deprecat- ingly at a trifle under 60 and I s an earnest affairs of life. I think I am keeping within conserva- tive bounds when I say that we are full and running over. I have not decided whether to put the car in storage until we struck a snag in power about 1 a.m. On December 15, 192

December 15, 1925

To return to my own car and re- port progress I borrowed a flivver roadster from the owner of the use- less telephone and after many in- out (perhaps about the age of the relic and the remains of the first wreck I found no change in the patient. The rescue arrived about 9:30. We changed wheels and things and got away under our own power and the next time we drove into the mud I had to stop to wake up the owner of the Ford and break the sad news that the wagon was injured slightly but still in the ring. I was overcome with grief, shed many tears and confided in me that the collection of junk was a family heirloom descended in a straight line from Sitting Bull or maybe it was Gunga Din and therefore priceless. I have no reason to doubt this. However, the lad with the machine who had viewed the incident with mild interest now for the past three weeks steadily and without intermis- sion. It is coming down again today but I may have over- looked some of the best. The rain has been plentiful enough to be picked up by a good Samaritan in a passing car who carried me the remainder of the distance.

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I had intended to say a few words about the rain, but I may have over- looked that point. The rain has been coming down now for the past three weeks steadily and without intermis- sion. It is coming down again today as hard and apparently as fast and may go a long way. The experience may prove the truth of the old saying that with reasonable patience one may go a long way. The experience also illustrates the joy of motoring. I merely mention this in passing to prove the truth of the old saying that with reasonable patience one may go a long way. The experience also illustrates the joy of motoring. I had intended to say a few words about the rain, but I may have over- looked that point. The rain has been coming down now for the past three weeks steadily and without intermis- sion. It is coming down again today as hard and apparently as fast and may go a long way. The experience also illustrates the joy of motoring. I had intended to say a few words about the rain, but I may have over- looked that point. The rain has been coming down now for the past three weeks steadily and without intermis- sion. It is coming down again today as hard and apparently as fast and may go a long way. The experience also illustrates the joy of motoring. I had intended to say a few words about the rain, but I may have over- looked that point. The rain has been coming down now for the past three weeks steadily and without intermis- sion. It is coming down again today as hard and apparently as fast and may go a long way. The experience also illustrates the joy of motoring. I had intended to say a few words about the rain, but I may have over- looked that point. The rain has been coming down now for the past three weeks steadily and without intermis- sion. It is coming down again today as hard and apparently as fast and may go a long way. The experience also illustrates the joy of motoring. I had intended to say a few words about the rain, but I may have over- looked that point. The rain has been coming down now for the past three weeks steadily and without intermis- sion. It is coming down again today as hard and apparently as fast and may go a long way. The experience also illustrates the joy of motoring. I had intended to say a few words about the rain, but I may have over- looked that point. The rain has been coming down now for the past three weeks steadily and without intermis- sion. It is coming down again today as hard and apparently as fast and may go a long way. The experience also illustrates the joy of motoring. I had intended to say a few words about the rain, but I may have over- looked that point. The rain has been coming down now for the past three weeks steadily and without intermis- sion. It is coming down again today as hard and apparently as fast and may go a long way. The experience also illustrates the joy of motoring. I had intended to say a few words about the rain, but I may have over- looked that point. The rain has been coming down now for the past three weeks steadily and without intermis- sion. It is coming down again today as hard and apparently as fast and may go a long way. The experience also illustrates the joy of motoring. I had intended to say a few words about the rain, but I may have over- looked that point. The rain has been coming down now for the past three weeks steadily and without intermis- sion. It is coming down again today as hard and apparently as fast and may go a long way. The experience also illustrates the joy of motoring. I had intended to say a few words about the rain, but I may have over- looked that point. The rain has been coming down now for the past three weeks steadily and without intermis- sion. It is coming down again today as hard and apparently as fast and may go a long way. The experience also illustrates the joy of motoring. I had intended to say a few words about the rain, but I may have over- looked that point. The rain has been coming down now for the past three weeks steadily and without intermis- sion. It is coming down again today as hard and apparently as fast and may go a long way. The experience also illustrates the joy of motoring. I had intended to say a few words about the rain, but I may have over- looked that point. The rain has been coming down now for the past three weeks steadily and without intermis- sion. It is coming down again today as hard and apparently as fast and may go a long way. The experience also illustrates the joy of motoring. I had intended to say a few words about the rain, but I may have over-
bed on which to park my weary bones.

"There y'are" said Bill. "That's what you might call real rain. Talking about rain reminds me that the other day my opinion was requested on the ancient argument whether iron melts better on a dry or a damp day. The seeker after information told me that one of his 72-inch cupolas only melts from 13 to 14 tons an hour and he always had trouble in securing uniformly hot iron. According to the claim of the maker the cupola should melt 20 tons an hour. Air supplied by an ordinary fan enters the cupola through a single set of tuyeres with an area equal to one seventh of the horizontal area of the cupola. The fan has a rated capacity of 7200 cubic feet of air per minute. Large coke is placed on the bed to a height of 27 inches above the tuyeres and all the charges are weighed carefully in the proportion of 640 pounds of coke to 6000 pounds of iron. Recently he installed a volume meter and discovered that the readings at times ran as low as 5400 cubic feet per minute. He also found that on rainy days or on days when the humidity was high the volume was consistently higher and the iron melted faster and hotter. He knows that the fan is too small to operate the cupola to its full capacity, but he wanted to know how to use it to the best advantage until a change can be made. In the meantime he requested an opinion on why the fan apparently delivers a larger quantity of air on a damp day and if it is possible to get the same result on a dry day.

"Well now," said Bill, "you must admits that citizen asked a pretty full sized question. I told him that to insure maximum results with a cupola all the factors involved, volume and pressure of blast, size and weight of charges of iron, coke and limestone, methods of charging, tapping and slaggling, must synchronize. A 72-inch cupola has a melting capacity of 20 tons an hour and that necessitates an air supply of 10,000 cubic feet of air per minute. Running at that rate a 6000-pound charge is quite reasonable, but with a fan incapable of delivering that amount it is apparent that the charge should be reduced to correspond with the speed. There is a limit above and below which coke is not consumed to advantage. "Considerable controversy has been aroused over the statements sometimes advanced that wet coke and damp weather are favorable factors in melting iron in the cupola. Isolated instances are quoted to prove the statements. As opposed to these statements many competent melters tap hot iron of a practically uniform temperature day after day irrespective of weather conditions and who insist that their coke shall be kept under cover. My opinion is that those who support the damp day theory are operating under conditions similar to those mentioned by this bird, where the fan is not of sufficient capacity to supply the maximum requirements of the cupola. Damp air naturally contains a greater volume of oxygen than air which is perfectly dry and therefore consumes more coke in a given interval of time. On account of the fan operating under capacity the pick-up is apparent. Under other conditions where the fan is capable of supplying air up to the maximum capacity of the cupola the extra amount of oxygen delivered on a damp day passes unconsumed through the fuel bed and is not noticed.

Once upon a time when foundrymen perhaps were more set in their ways right or wrong than they are now, this theory of the superior melting qualities of a wet day frequently formed the basis of a heated and acrimonious controversy. Like many other peculiar beliefs it could not be defended scientifically and for that reason the arguments ran round and around in circles that ended no place. Each party remained perfectly convinced that the other was dumb. Since the interchange of information became more general, this form of belief is not so prevalent. "While we are on the subject of rain and its variations" said Bill as he edged to the door, "how's this for a picture post card message from a hotel in Kansas: 'This hotel fully equipped with automatic sprinklers. Statistics show loss of life never has occurred in a sprinkled building. In case of fire you may get wet but not burned.' The lad who sent me this card." Bill continued, "added a comment of his own: 'Now I lay me down to sleep. Statistics guard my slumbers deep. If I should die I'm not concerned. I may get wet but I won't get burned'."

Lining for Ladies

Question—What is a suitable lining for crane ladles and for shank ladles for pouring basic steel? Answer—Large ladles for basic steel should be lined with silica brick and washed over with a wash of neutral fireclay. A split brick can be used for ladles with a capacity of 500 to 1000 pounds, and for larger ladles whole brick should be used. Hand ladles may be lined with a fireclay mixed with a small amount of sand and molasses water.

Stove Companies Unite

The Detroit Stove Works and the Michigan Stove Co., both of Detroit, have been consolidated, the new concern being known as the Detroit Michigan Stove Co. William T. Barbour, formerly president of the Detroit Stove Co., is executive head of the new organization. Detroit Stove Works was organized in 1870 by Mr. Barbour's grandfather, the late William H. Tefft, who with the late Jeremiah Dwyer put the earlier stove business of J. Dwyer & Bro. into corporate form. There was an early disagreement and Jeremiah Dwyer, in company with M. I. Mills, Charles du Charme, Francis Palms and others, formed the Michigan Stove Co. Under the consolidation the two earliest interests again will be united. The Detroit Stove Works recently purchased the Art Stove Co., Detroit.
Patternmaker Uses Various Types of Braces

By Walter C. Ewalt

A MAN is considered impractical, a dreamer, a foolish fellow, if he makes a pattern, a painting, an engine, a book, or anything into which he puts more study and work than he may ever expect to realize out of it, providing, of course, that the result of his labor does not benefit the world. However, if the results are of benefit to the human race through some material advance or by appealing to the mind, and he gives more than he receives, he is considered a benefactor, an artist. While this does not much to do with patternmaking, it is sort of leading up to how and why some of the holding tools of patternmakers were invented at various periods.

Some time ago, in fact so long ago that it is supposed to be in that period in the old stone age called upper paleolithic, a race called the Aurignacian or Loess lived. Nobody knows just how long ago this was, but at that time some fellow had a toothache, and since there were no tooth carpenters to pull out his tooth, other members of the race knocked him in the head because he howled too much.

A few years ago somebody was digging in a gravel pit and found the skull of the ancient sufferer. The skull appeared to be all bone, and since the discovery the well known expression bone head has appeared. Upon further digging other things were found which led to a further examination of the skull, and it was found that the cephalic index was 73.41, this being the ratio of the breadth of the head to the length, and the skull was dolichocephalic. To save the trouble of looking up this word, we will state that it means the same thing the Irishman said to the Scotchman who wanted to commit suicide and went to the neighbor's house to use the gas from the neighbors stove—"He's long headed."

It does not make much difference to us if the ancient was a Grimaldi or a Cromagnon. He was an artist, nevertheless, for the remains of shell, bone and flint implements were found. These had holes bored in them, and for this reason we may assume that the ancient sufferer was the inventor of the bow drill.

Some scientists think that the Aurignacians used the bow drill because they had bows and arrows. The bow and arrow closely resembles the bow drill, shown in Fig. 1. The bow is worked back and forth in the manner...
of playing a bull fiddle, while the spindle is revolved by the string.

Another type of drill which still is used by the Indians in the Southwest, is shown in Fig. 2. This drill is operated by moving the cross beam up and down. Perhaps the bow drill may be used in some patternshops throughout the world, although the writer has seen only one outside of a museum. About 15 years ago, while engaged in boring a large number of small holes, a fellow workman stated that he had a bow drill. He had worked in a piano factory and had used the drill to bore holes in the sounding boards. He brought the bow to the shop and it became quite a curiosity. It was much superior to anything we used in the way of hand tools in the shop to bore small holes rapidly. This tool perhaps would be in general use today if it could bore large holes and the cutting action were continuous. The bow drill also is the forerunner of the lathe.

Once upon a time a fellow got an idea on a holder for cutting tools. He bent a piece of wood, and later iron and steel, so that it had a head on one end and a socket to hold bits and drills on the other, with a crank handle in the middle. Somebody then called it a brace, and the name has remained. It is difficult to understand why this tool was called a brace, for brace means the length between the extended two arms. However, the word brace also means something which connects two arms.

This discussion leads to the holding tools used by the patternmaker, one of which is the brace. Many of the holding tools, including the brace, do not perform the actual work of cutting, but hold or drive the tool which does the work. Others hold or support the work on which the cutting is done, for example clamps, sawhorses, etc. Another type of holding tool includes the magnetic brad point, which holds the Brad. Among the numerous tools which hold the material are included the bench, the bench hook, the vise, the layout table, the surface plates, the shoot board and the wood trimmers, all of which have been described in previous issues of The Foundry.

The brace, commonly called the bit brace, is used to hold the bit while drilling great numbers of holes. Various styles and sizes may be had, so that it is hard to determine which is best for the patternmaker. The brace should have a ratchet so that it may be used in restricted places and in corners. If only one is to be used for both hard and soft woods and all sizes of holes are to be bored, a sweep of at least 10 inches is best. However if soft wood is worked and most of the holes are 1-inch or under, a brace with an 8-inch sweep will be satisfactory.

The popular ratchet brace is shown in Fig. 3, while the different constructions of the head, the ratchet and the jaws are shown in Fig. 4. The concealed ratchets are shown at D and E. The mechanism of the ratchet is enclosed to keep out the dirt and moisture, to retain the lubricating oil, to protect the teeth and the ratchet and to protect the hands of the operator. All three heads are screwed onto the spindle, but the under portion of A is encased completely with metal while B and C are encased only partly. Ball thrust bearings are used in A and B. The form of ratchet shown at D is convenient to handle, the piece clutch being backed by a spring as shown. Ten teeth are locked when the ratchet is made up, and five teeth used when the ratchet is used. All of these ratchets work either right or left, so that they may be used to drive a screw into the wood or to take it out. A box ratchet is shown at E, the teeth being cut on the spindle. Universal jaws are used at G, which will hold round shank drills from ¾ to 1-inch as well as taper shanks. Interlocking jaws are shown at H, which are considered best for taper shanks. Alligator jaws are shown at I, which will hold ordinary size taper shank bits and medium round shank bits and drills. All of the jaws are made of hardened drop forgings. The names of the various parts are shown in Fig. 4.

### Specifies Aircraft Alloys

(Continued from Page 1006)

The 8-per cent copper alloy is not heat treated.

**Alloy 2:** 88.5 Aluminum—10 Copper—1.25 Iron—0.25 Magnesium

The tentative analysis and properties of this alloy may be described in the terms of Table 4.

In airplane engines this material, in the sand and chill-cast condition, has been used for parts needing strength and hardness at elevated temperature, such as pistons, cam- followers, intake and exhaust manifolds, bearing surfaces, etc. During the war the Liberty-12 engine pistons were cast from this alloy in permanent molds, from which it emerged much denser than when sand cast. The material machines to a better finish than alloy 1, but is more brittle and consequently undesirable for crankcase castings.

As sand-cast in TB1 bars, this alloy will develop 25,000—1.0—80. It is susceptible to aging at room temperature, and in 6 months it may have attained 27,000—0.0—95. Its strength at 500 degrees Fahr. is comparable with that at room temperature.

Figs. 5 and 6 illustrate the structure of this alloy as sand and as chill-cast. The network is chiefly CuAl, crossed by iron-bearing needles, and with a lesser amount of iron-bearing skeletons. A moderate amount of Mg, Si is present, often in filigree with CuAl.

Sand-cast pistons may be heat treated to a brinell hardness of 120 by soaking them at 950 degrees Fahr. for 5 hours, quenching in boiling water, and aging at 400 degrees Fahr. for 2 hours. Accompanying TB1 test specimens will show 37,000—0.5—120. Chill-cast material may be heat treated to a brinell hardness of 150.

**Alloy 3:** 95.75 Aluminum—2.5 Copper—1.25 Iron—0.5 Magnesium

This material sand-cast, gives a combination of strength and ductility lying between the characteristic of the 92 aluminum—8 copper alloy and of those of alloy 4 and similar materials, supplied in the heat treated condition. Its tentative constitution and tensile and hardness properties may be thus broadly indicated as shown in Table 5.

Because of its excellent mechanical attributes, this alloy finds considerable application in small parts postulating good strength and shock resistance, where it is desired to save the expense of heat treatment. Some of its uses have been for generator adapters, yoke guides, brackets, levers, housings, and camera mounts. The alloy is not handled so easily as the 8 per cent alloy, but it machines well. The structure is that shown in Fig. 8.

Given a short heat treatment involving soaking at 975 degrees Fahr. for 2 hours, quenching into boiling water, and aging at 300 degrees Fahr. for 2 hours, this material in TB1 test specimen will show 31,000—3.0—68. In this condition it is often substituted for alloy 4, when the requirements permit. The alloy, as sand-cast or as heat-treated, has a fair degree of stability in tensile properties.

**Alloy 4:** 94 Aluminum—5 Copper—1 Silicon

This proprietary alloy, usually containing not much over 0.75 per cent of iron and no magnesium, is one of the more important of high strength and ductility alloys supplied in the heat-treated condition to the
For from 24 to 96 hours, quenching, and aging at 300 degrees Fahr. for 2 hours. Some of its normal properties, obtained from TBI specimens, are given in Table 7.

The structure of this material as heat-treated is shown in Fig. 10. The formation of the skeletons, which are composed of two iron-bearing constituents, is superinduced by the addition of silicon.

Alloy 5: 93 Aluminum—4 Copper—3 Silicon

For superior casting properties, which are endowed by the addition of silicon, probably few alloys are better than this composition. It does not readily crack on non-yielding cores and can be used where there are abrupt changes in cross-section or possibilities of warpage or misruns in very thin sections. It may be used in many cases in the place of alloy 1, although it is more difficult to machine. Camshaft housings, supercharger casings, intake manifolds, and a number of other parts are being cast in alloy 5. The specifications for this material are listed in Table 8.

As sand-cast in TBI bars alloy 5 has properties of about 21,500—2.0—55, similar to those of alloy 1, whose proportional limit, however, is higher by some 2000 pounds per square inch.

Its metallographic structure is shown in Fig. 11. The aluminum-rich matrix contains more or less filigreed CuAl, the Al-Si eutectic, a moderate amount of needles of the (X ?) constituent, and cubes of a blue-gray constituent, probably Si10. Often CuAl, is associated intimately with particles of silicon, which suggests a ternary eutectic with aluminum.

Alloy 6: 92.5 Aluminum—4 Copper—2 Nickel—1.5 Magnesium

This alloy, employed as a substitute for alloy 2, is attaining increasing importance as a light material to be used at elevated temperature, such as for aircraft engine pistons, cylinder heads, and bearings. Pistons cast in green sand, with dry-sand core and chilled crown, have been quite satisfactory; and permanent molds have also been utilized. Air-cooled cylinder heads Fig. 3 are cast in dry-sand molds. Bearings are chill cast. The machineability of the castings, which are all heat treated, is excellent. The analysis and properties of this alloy must be as given in Table 9.

The foundry technique is fairly simple. The alloy should be melted under cover to prevent freezing. Castings must be gated so that the metal does not drop long distances directly into the casting and so that it is chocked as it enters the mold cavity. Chill are necessary to prevent sponginess in heavy sections. The alloy can be made extremely sound, even in sand castings. In fact air-cooled cylinder heads must withstand a water pressure of 600 pounds per square inch.

Alloy 6 as sand-cast in TBI specimens gives results of 26,000—0.5—80, but after 6 months of aging at room temperature these become 28,200—0.5—95. Its strength at 500 degrees Fahr. is about 23,000 pounds per square inch. Tests at 600 degrees Fahr. have indicated even greater
PROBABLY if the original maker of the so-called Dover style of mixer or egg beater were presented with a birthday cake decorated with the requisite number of lighted candles, the heat would suffocate him. Hardly a man is now alive who does not recall times when the satisfying whirl of the spinning blades aroused in his ever hungry boyish soul, the anticipated delights of fluffy meringue on grandmother's lemon pie or whipped cream that would melt on his ecstatic tongue. Remember, too, how that same tongue explored each hidden recess of the mixing blades when you were given the coveted privilege of licking the beater?

A GENTLEMAN whose trained powers of observation recently have been directed along the lines of castings uses, and if not why not, presented me with two varieties of the well known mixer shown at the extreme left and right of the accompanying illustration. He had seen the former displaced by the latter in its important place in the mechanical equipment of his wife's kitchen. True, the veteran at the left probably was entitled to retirement on pension, after long years of service; but the point raised was the wider use of stamped sheet metal in preference to cast parts, on beaters of this type. It was suggested that the appearance of weight, the uninviting color of the cast frame and gears of the old beater might have prejudiced the lady against that device, while the subconscious pleasure in the glittering cleanliness of the new one really effected the sale. The inference that castings are supplanted by sheet metal parts in many classes of culinary utensils, perhaps is justified. But are castings, in truth, banished from favor in the spotless kitchens of the land? Are they to occupy the position of the despondent darky, hanging about the door of the house from which issued the sounds of mourning. He was asked why he did not go inside and take part in the funeral ceremony, and rejoined most solemnly, "Ah cahn't, Ah's the crepe." In truth, I thought so in this case until the buyer of the household department of a large city store announced that the beater second on the left was his leading seller.

THIS may or may not constitute a point in the contest of castings vs. rolled materials, but it is a most interesting lesson in sales ability. The beater is made as attractive as possible to the spick and span housewife. Its cast tinned, its handles white blades glisten like silver. Packed in the box shown immediately at the right it is something distinctive. This package sets forth the fact that the beater contained within is endorsed by the laboratories of three different publications in which its advertisements have appeared. Further, a long list of testimonials adorn one side, while on the other are such statements as the following:

The frame of this beater being made of IRON does not give, bend or pull out of shape; As the working parts are thus held firmly in their relative positions, the beater improves with use.

Can you wonder that when milady contemplates this splendid example of sales initiative, she buys. As Barnum would say, CAN YOU BEAT IT?
What Is Education?

One swallow does not make a summer and one story in a newspaper does not prove that an industrial revolution is at hand or that the deep seated habits, customs and traditions of a country are to be changed over night. However, when taken in connection with hundreds of other stories of a different character that filled the papers during the recent football season, this particular item appearing in a prominent mid-western daily presents a certain significance. “Over 1500 people including prominent local and national figures attended the graduating exercises last night in technical high school where some 70 young men received diplomas attesting the completion of a four years apprenticeship at various trades.”

COLUMNS after column of newspaper space has been devoted to the activities of a single young man who was a student at one of the great universities in the middle west. The activities of the remaining 9000 odd students were completely ignored. Brief reference was made indirectly to the young man’s immediate colleagues on the team. But, apparently he was not interested in the curriculum. If he was, the newspaper writers carefully concealed this weakness in the hero. The flood light of publicity revealed practically everything about him except the course of study he was pursuing. That was the least important of many unimportant features.

Time was when apprentices finished serving their time without attracting any attention. Every trade carried its regular quota, a number determined by mutual agreement between the parties interested, or in many instances determined solely by the ability of the employer to keep them busy. Not so long ago young men went to college to obtain a broad liberal education together with specialized training in the arts and sciences or in one of the so-called learned professions. Commencement exercises were of a sufficiently impressive character to merit columns of space in the newspapers and to leave a lasting impression not only on the students immediately interested, but also on the spectators. Now we have a large body of important men who devoted an evening to celebrating the advent of a crowd of apprentices into the ranks of journeymen. Commencement exercises at the universities attract little attention from the general public, but the newspapers roll out columns and pages of material describing the prowess of a football expert whose regular line of study was ignored and who threw up his college career without even going through the formality of graduating. What does it all mean?

Lower Research Cost

The idea of co-operative industrial research while not new has progressed to a large extent in the past few years. According to the chamber of commerce of the United States, 79 different trade associations now are engaged in co-operative research. The research covers a multitude of fields and is of a practical nature. It involves the common interests of all and is for the advancement of the industry. Definite specifications today are the rule rather than the exception. Rule of thumb and guess work are being abolished from industry.

This method of research through its co-operative feature has enabled many small manufacturers to better their products, find new markets, and receive the advice of experts in their particular field. The cost to each individual firm is not great as the expense is distributed among many. Duplication is eliminated by pooling resources and correlating effort.

Many foundries due to their size cannot maintain research laboratories because of the heavy expense, but through co-operative research, this situation may be remedied. Local and state associations offer the logical vehicles for such advancement. Through such a plan many of the present problems in sand, melting, cost finding and selling that are the foundrymen's bugaboo could be approached without any great expense to any one of the firms that may be interested.
Trade Outlook in the Foundry Industry

With December holding up the record of the preceding two months in industrial activity, early 1926 promises continued prosperity. Production in metal working lines is increasing, while in those businesses which ordinarily are restricted by the winter months, a strange lack of seasonal decline is noted. Evidences indicate that the principle of hand-to-mouth buying is being abandoned in many industries and forward contracts are being placed in anticipation of higher prices. Building construction continues at a high rate. The agricultural situation is favorable according to all available reports.

With a Christmas buying movement never excelled, retail mail order and chain store sales at a peak and the extension of time payment plans to practically all commodities sold to the ultimate consumer, business is brisk. Automobile factories, steel mills, machinery builders and the lesser industries are working practically at capacity. Automobile production has reached unprecedented levels for this period of the year. According to the department of commerce, the production of motor cars and trucks for the United States and Canada totaled 452,392 in October. Of this figure, 406,569 represented passenger cars. Early estimates for November indicate that the total output of this class of automobiles will be in the neighborhood of 515,000 units. According to the present outlook the total manufacture of both passenger cars and trucks in 1925 will exceed 1924 by more than a half a million. The total for the first ten months of this year is given as 3,618,654 compared with 3,198,219 for last year, with practically no evidence of slackening demand and in the face of increased production schedules put into effect by large manufacturers.

November orders for railway cars were the heaviest for the year. A total of 6,866 cars gave the past month the record, exceeding the October total by 541. However, the average monthly awards last year were 12,035, while this year, including November, the average is 5475. Unfilled orders for locomotives advanced in November. Malleable foundry operation in October stood at 61.3 per cent of capacity, making the highest rate of the year for 130 identical plants reporting to the department of commerce. Orders booked by these plants totaled 61,778 tons against 55,795 tons shipped, and with a production of 64,216 tons. September figures show the rate of operation at 51.7 per cent capacity. Continued high rate of automobile manufacture and the activity in farm implement lines is contributing to the brighter outlook for malleable castings sales.

Pig Iron

Gains

According to statistics compiled by the Iron Trade Review, the total blast furnace production in November amounted to 3,018,598 gross tons, compared with 3,017,889 tons for October. On a daily average basis, the gain is more apparent, since the rate of operation during November was 100.620 tons, compared with 97,351 tons for the past month. October, in turn, registered an advance of 7.1 per cent over the previous month. The total production of merchant iron in November was 613,927 tons, compared with 606,092 tons for October. On a daily average basis, November shows 20,464 tons per day, compared with 19,951 tons for the preceding month. A net gain of two merchant stacks is reported for November.

Awards of cast iron pipe were exceptionally heavy in November. Pipe makers are booked through the present year on practically all sizes, while in a number of specifications they can handle no shipments until February. Steel foundry operations continue to improve with the greater activity in railway lines. According to R. P. Lamont, president, American Steel Foundries, the outlook is better than has been noted for some time. In the iron trade of the company at present are working slightly ahead of 50 per cent. Coal consumption figures prepared by the National Association of Purchasing Agents indicate that October showed an increase of 26 per cent over the September totals. The tonnage mined is falling below that which is being used. Foundry operations in Ohio stood at 92.5 per cent of normal, according to a statement of the Ohio State Foundrymen's association. This compares favorably with the September rate of 84.3 per cent and the 64.5 per cent rate of October, 1924. Stocks of metal on hand have increased to 91.9 per cent in November.

Prices on nonferrous metals, according to the Daily Metal Trade Nonferrous Prices of Dec. 9 follow: Casting copper, 13.40c; electrolytic copper, 14.05c; Straits tin, 63.50c; lead, 9.25c; antimony, 20.25c; nickel, 38.00c; aluminum, No. 12 open market, 27.50c and remelt, 25.00c to 25.50c. Zinc is 8.75c E. St. Louis, Ill.

Average monthly prices for November follow:

Silver 21.75c;lead, 9.50c; tin, 29.00c; antimony, 99.99; zinc, 8.75c; aluminum, 56.25c.

New York Prices

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Comings and Goings of Foundrymen

W. J. NUGENT, formerly vice president and general manager of the Nugent Steel Castings Co., Chicago, has been elected president succeeding Charles Piez. Prentiss Cooley has been elected vice president and C. A. MacDonald secretary, will fill the vacancy on the board of directors. Mr. Nugent has been associated with the company since 1918 when the present plant was erected. He served as vice president from 1918 to 1921, and in 1921 became general manager as well. During this period the company has enjoyed a steady growth. The interest of Mr. Piez has been taken over by Mr. Nugent and others.

Noble Dean, head of the Dean Hill Pump Co., Anderson, Ind., has changed his residence from Indianapolis to Anderson.

C. B. Tibbetts, formerly metallurgist with the Chicago Steel Foundry Co., Chicago, recently has been appointed manager of the Los Angeles Foundry Co., Los Angeles.

Leo H. Moir, recently sales manager of the steel division of the Mc Cord Mfg. Co., Chicago, has joined the sales department of the Los Angeles Foundry Co., Los Angeles.

J. H. Hagerty, formerly connected with the Oklahoma Steel Castings Co., Tulsa, Okla., has been appointed foreman of the Los Angeles Foundry Co., Los Angeles.

Roy Covert, formerly connected with the Washington Iron Works, Los Angeles, has been appointed superintendent of the Liberty Foundry Co., that city.

Max Fisher, until recently connected with the Joshua Hendy Iron Works, San Francisco, has been made foreman of the Vernon Foundry Co., Los Angeles.

C. E. hopping, Hopping Bros. Foundry, Pasadena, has been in charge of the Alhambra Foundry Co., Alhambra, Calif., since the latter plant took over the Southern California Foundry Co., Alhambra.

William H. Woodin, president of the American Car & Foundry Co., has been elected president of the American Locomotive Co., succeeding the late Andrew Fletcher. Mr. Woodin also is a director and member of the executive committee of the American Locomotive Co.

A. Beiersdorf, executive manager of the Charlottenburger Werk of the Siemens-Schuckertwerke at Berlin-Charlottenburg has returned to Germany following a visit of six weeks in this country. He was accompanied by Dr. Estorff, research engineer, and Mr. Kohn, production manager at the Charlottenburger Werk.

W. C. Furnas has been appointed superintendent of the maintenance department of the Allis-Chalmers Mfg. Co., Milwaukee, succeeding C. O. Barrie. After graduation from Purdue university, Lafayette, Ind., in 1908, Mr. Furnas served with the Ft. Wayne & Wabash Valley Traction Co. for two years, becoming connected with the Allis-Chalmers company in 1910 in the railway motor department. In 1915 he entered the maintenance department as maintenance engineer and in 1920 he was appointed assistant superintendent of the electrical department. He recently returned from a trip to England, Scotland and the Continent where he spent four months studying European shop methods.

H. P. Kreulen, foundry expert with the Bethlehem Steel Co., Bethlehem, Pa., and Mrs. Kreulen will sail on Dec. 16 from Vancouver for New Zealand and Australia. They expect to return to San Francisco the latter part of March.

Hubert C. Smith, formerly superintendent of the foundry department, Union Iron Works, Spokane, Wash., now is superintendent of the foundry department of Layne & Bowler Corp., Los Angeles.

Newark Association May Change Name

A recommendation to change the name of the Newark Foundrymen's association to the New Jersey Foundrymen's association was submitted to the executive committee of that body at its regular meeting Nov. 19. This change was proposed as a result of the extent to which foundries elsewhere in the state have joined the organization. Seven new members were added to the roll at this meeting, only one of them being located in Newark. The new members include Cyrus Currier & Sons, Newark; The Somerville Stove Works, Somerville; The Barnes Foundry, Jersey City; the Watson Machine Co., Paterson; the Benjamin Eastwood Co., Paterson, the Raritan Radiator Co., Raritan, and the Delano Coal Co., New York City.

E. T. Runge, cost consultant for the American Foundrymen's association and for the Ohio State, Tri-State and Quad-City foundrymen's associations addressed the meeting on the subject of uniform cost systems. F. W. Stickles, Capitol Foundry Co., Hartford, and president of the Connecticut Foundrymen's association told the Newark meeting that 80 per cent of the members of the Connecticut association are using a uniform cost system. A. E. Howell, Somerville Stove Works, past president of the American Foundrymen's association also addressed the meeting.

No change in officers of the Driver-Harris Co., manufacturer of special alloys, will be made as a result of taking over the works and business of the Electrical Alloy Co., Morris-town, N. J. Officers are: F. L. Driver, chairman of the board; F. L. Driver Jr., president; William P. Martin, first vice president; H. D. McKinney, second vice president and general sales manager; Miss M. C. Harris, secretary; S. M. Tracy, treasurer.
To Consolidate Activities at Mishawaka

The American Foundry Equipment Co., New York, recently has purchased the Dodge Mfg. Corp. plant No. 4 at Mishawaka, Ind., and will combine the Chicago and the York, Pa., factories and the New York executive office at Mishawaka. The move into the new plant will start about Jan. 1, 1926. With the consolidation of all activities at one plant, the following reorganization of the company will be effected. E. A. Rich Jr., will be vice president in charge of sales, Fred Graf, formerly foundry engineer for Frank D. Chase, Inc., Chicago, has been elected vice president in charge of production, development and engineering. O. A. Praff will continue as treasurer, also becoming comptroller.

G. E. Wyatt has been appointed assistant sales manager and advertising manager. Harry A. Schwartz, active in the development of the process of making castings in permanent molds, as described in the Oct. 1 issue of THE FOUNDRY, will be associated actively with the company in the further commercial advancement of the process.

Charles D. Steinmeier, who has been in charge of the plant at York, Pa., will be in charge of and devote all of his time to the commercial development of the permanent mold process. James Rigby, formerly sales manager, will continue with the company as eastern district sales manager.

Fred Graf, who has been elected vice president, was born in St. Louis, and attended the Manual Training school of Washington university, completing his technical training in mechanical engineering at Purdue university, Lafayette, Ind. His experience practically has been confined to the foundry industry, covering operating, engineering, management and consulting work. He has been connected in turn with the following companies: Commonwealth Steel Co., Granite City, III., engineering department; Southern Wheel Co., St. Louis, engineering, sales and operating departments of four plants; American Steel Foundries, Chicago, co-ordinating casting design and foundry practice at five plants; Frank D. Chase, Inc., Chicago, associated engineer in charge of foundry design, development and management.

Mr. Steinmeier, who will be active in the development of the permanent mold process, was born at Indianapolis and received his technical training at the Winona Technical institute, Winona Lake, Ind., being graduated from the school of engineering and foundry superintendence in 1908. After a short period, during which he was employed as a molder with the Allis-Chalmers Co., Chicago, he returned to the institute for post graduate work, and as an instructor in foundry practice. After acting as instructor for one school term, he returned to the practical foundry field, working in various capacities from molder to general superintendent during a period of about 15 years. He was employed by the Nordyke & Marmon Co., Indianapolis as a molder, later becoming general foundry foreman. He left this position to become connected with the Enterprise Iron Works, Indianapolis, as superintendent of foundries. Two years later he returned to the Nordyke & Marmon Co., in the capacity of general superintendent. Five years later he was made manager of the York plant of the American Foundry Equipment Co.

To Hold Exhibit

The convention and exposition of the American Oil Burner association will be held in the Book-Cadillac hotel, Detroit, April 6-8, 1926. The exhibits will include all types of equipment entering into the manufacture, installation and use of oil burners.

L. E. Gregory has been appointed representative of the Milwaukee Foundry Equipment Co., in the Detroit district. He also will continue to operate the Detroit Pattern Plate Co., 6304 Epworth Blvd., and will carry a stock of molding machines at that address.

A. F. A. Executive Board Meets in Detroit

At a recent meeting of the board of directors of the American Foundrymen's association held in Detroit, Dec. 8, the following officers elected at the convention in Syracuse, N.Y., were installed: A. B. Root Jr., Hunt- Spiller Manufacturing Corp., Boston, president; S. Wells Utley, Detroit Steel Casting Co., Detroit, vice president; H. S. Simpson, National Engineering Co., Chicago, and Jesse L. Jones, Westinghouse Electric & Mfg. Co., East Pittsburgh, are new directors, while L. W. Olson, Ohio Brass Co., Mansfield, O., former president of the association; Fred Erb, Erb-Joyce Foundry Co., Vassar, Mich., and C. E. Hoyt, Chicago, secretary-treasurer of the association, were re-elected to the board of directors for a three-year term.

Plans for the second international foundry congress and the thirtieth annual convention of the American Foundrymen's association, to be held simultaneously in Detroit next September, were discussed at the meeting. Between 5000 and 6000 American and Canadian foundrymen and from 150 to 200 experts of the industry from practically every foreign country will attend the convention next year, according to C. E. Hoyt, secretary of the association.

The Carolina divisions of the Southern Metal Trades association met at Winston-Salem, N. C., Wednesday, Dec. 9, the meetings were held at the Robert E. Lee hotel.
British Foundry Future
Bright
(Concluded from Page 1010)
agement lies in ability to get the most from the foundry, at the lowest possible cost; to insure the product being produced at a figure which will yield a fair margin of profit, and still insure a market.

A fair margin of profit is an ambiguous term, and capable of many interpretations, for what would be a fair profit in one case would be a low one in another. One trouble of the British foundryman in prewar days was that he had to produce and sell at a price that yielded scarcely any profit at all, yet with his faulty organization he was unable to determine the figure which would yield a fair profit. Happily for all concerned, the buyer as well as the seller, this state of affairs is over. It is recognized that the foundryman, like everyone else, must make a profit if he would continue in business, and by means of a more or less efficient cost system the foundryman is able to quote the figure which will give him the profit desired.

Whether that figure will secure for him a market is another matter, for in spite of modesty on his part, it is possible for the figure to be too high to attract many customers. However he may content himself with a comparatively small range of business, or he may take steps to secure a larger turnover by increased production. Thus in one case 20 per cent would be regarded as a fair profit, while in the other 7½ per cent would bear the same interpretation.

The more or less efficient cost system alluded to is to be found in most British foundries, but it is pleasing to state that efficiency is becoming more and more pronounced. It has been hard to convince the foundryman that a cost system could be devised especially for the foundry business—that is, a system inexpensive enough to be within reach of the smaller man, yet efficient enough to give reliable information, but now that he knows that the possibility does exist, he is prepared to make use of it.

Perhaps the most noticeable characteristic of the British foundryman is his unfailing belief in his own product. It is this belief that has done more than anything else to give the foundryman the quality of dourness and inflexibility, and especially when things are going wrong. Many of us, alarmed at what appeared to be the apathy of the foundryman, have from time to time urged that if he did not wake up to the needs of the present, he would one day find his occupation gone, but he was not perturbed.

"There will always be a market for castings," says he "for there is no product so cheap and effective."

Apparently he is right, for today he is obtaining more business and a better price than ever before, and, what is more to the point, he is satisfying his customers better than ever before. It certainly looks as though his attitude is justified.

Like the tortoise, the movements of the foundrymen are slow but undoubtedly sure. He is hard to start but more difficult to stop—and he likes to go his own way at his own pace. He is without doubt exasperating to those who wish him well, but whose advice he flouts, but he compels admiration for his tenacity of purpose, once a decision is reached. There is not the slightest fear that the British foundry industry will go under, or even descend below its present level. It has touched bottom, but is now upon the up grade.

New Publication Assists the Investigator

Investigators on chemical or metallurgical problems have considerable reference work to do. To lessen the tedious nature of this work, the new bibliography published by the National Research council will be found useful. This book is a compilation of bibliographies published as separates, or at the ends of books or magazine articles or as footnotes on the numerous aspects of pure and applied chemistry. Each entry gives the name of the author or compiler, title and place of publication. The entries are classified under the proper subject headings, alphabetically arranged.

An approximate analysis shows about 2400 subject headings, 7500 author entries and a total of 10,000 individual bibliographies.

Copies of bulletin No. 50 may be obtained by addressing publication office, National Research council, Washington, D. C. The price of the bulletin is $2.50.

A. H. McDougall, vice president and construction engineer of the Whiting Corp., Harvey, Ill., addressed the members of the Quad-City Foundrymen's association at the regular meeting held Nov. 16 at Davenport, Iowa. The subject of his talk was "Cupola Construction and Operation." Sixteen men from the Walworth Mfg. Co., Kewanee, Ill. were present at the meeting.
Loads Sand on Trucks

A device for loading sand into a hopper dump truck recently has been designed by the Allis-Chalmers Mfg. Co., Milwaukee. This device consists of a bucket elevator driven by an electric motor, the current for which is supplied through conveniently located plug-in-boxes. A guide projecting from the rear of the device fits into a coupling bracket mounted on the truck, the truck being coupled to the sand elevator automatically when in the proper position. The loader is mounted on 10-inch casters, facilitating easy movement to any desired position by the truck. The nose of the loader is forced into the sand by the motive power of the truck, and when in the desired position, the operator starts the motor driving the loader by pulling the starting lever. The loader is fed continuously into the sand pile until the truck is loaded. The operator then pulls a lever at the side of the truck releasing the loader and leaving it in position at the sand pile while the sand is being hauled to the mixing room. A side view of the loader coupled to the truck is shown in the accompanying illustration.

THE FOUNDRY

Preheats Fuel Oil

Efficient combustion of fuel to a certain extent depends upon maintaining constant fluidity of the oil at the burners. Fluidity in turn is governed by the temperature of the oil. Two electrically heated oil heaters are used for preheating fuel oil at the plant of the Phoenix Rolls Co., Pittsburgh. Each of these heaters consists of a cylindrical tank, 10 inches in diameter and 96 inches high. Thirty-two space heaters made by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., heat the oil. The temperature is controlled by a bimetallic thermostat mounted on the side of the oil tank and operated through a motor operating snap switch contactor. The oil, which is circulated by a motor driven pump, enters the heater at the bottom and is removed at the top. Each heater will heat 100 gallons of oil per hour to 180-210 degrees Fahr.

Plan 1925 Census

The bureau of census is making plans for the next biennial census of manufactures, which will cover the year 1925, as provided in the act of congress approved March 3, 1919. In deciding upon the items to be covered by the census, the bureau has consulted with the representatives of various manufacturers’ associations to secure, as far as practicable and without making the schedule too elaborate, information which will be of value to the representatives of the several industries concerned, and at the same time furnish a record of the progress of manufactures generally throughout the United States.

The blank forms upon which reports should be made will be mailed by the bureau to all manufacturers about Jan. 1, and a report will be required from each manufacturer whose gross products are valued at $5000 or more for the year 1925.

Controls Peak Load

The Pittsburgh Electric Furnace Corp., Pittsburgh has developed a new device for controlling and limiting the power-demand, peak-load or readiness-to-serve charges on large power loads automatically.

The operating mechanism consists of two induction elements mounted on a common shaft suspended from a wire. The torsion on the wire is varied by a rotating dial, indicating the secondary watts, so that any predetermined load setting may be obtained. When the power in the circuit reaches the amount indicated by the dial, the contacts act and close the relay of the furnace control panel and reduce the power input. The auxiliary clock mechanism operates a demand-period cam, permitting the integrated load over any predetermined demand period to be secured.

The advantages claimed for the device are a reduction of cost of power and a regulation of fluctuating loads. The device is said to require little attention and to be strongly constructed.

Open Sales Office

The Harnischfeger Sales Corp., Milwaukee, distributor for the Harnischfeger Corp., has established a sales office at Charlotte, N. C., Trust building. W. J. Henry is district manager in charge.

At a recent election of the Warman Steel Castings Co., Los Angeles, Chas. J. Wild, former vice president and treasurer was elected president succeeding G. B. Warman. F. D. Wild was made vice president while J. P. Arnoldy, formerly secretary, was elected secretary and general manager.
While the holiday season and the inventory period are causing a slackening in the buying of foundry equipment in several quarters, a substantial movement of equipment up to the first part of December; many inquiries coming from plants which appear about ready to increase production or make extensive replacements, and a much higher operating rate among many foundries throughout the country, all indicate that the trend is toward substantial business.

The volume of foundry equipment sold in 1925 exceeded the total for 1924 by a comfortable margin, but was slightly under the business closed in 1923. In January, February and April, the volume of sales fell below the total for the corresponding month in 1924, while in all other months more business was closed than in the corresponding months of last year. August was the peak month of the year with March in second place. After the record month of August, sales fell off, buyers waiting for the convention of the American Foundrymen's association at Syracuse, N. Y. However, the business closed at the exhibition and the sales immediately after placed October in third place for the year.

Exports of foundry and molding equipment in October showed a decided gain over the value for September, the value of exports being $78,388 as compared with $49,658 in September and $32,825 in October, 1924, according to a recent report of the department of commerce. The exports for the nine months ended Oct. 31 was $582,892 as compared with $438,948 for the corresponding period last year.

Prospects Bright for 1926 Business

Selling of foundry equipment in the Chicago district is feeling the heavy hand of the inventory period, and promises to close on equipment after the turn of the year are obtained more easily than actual orders. Sales for 1925 probably ran 20 to 25 per cent ahead of 1924, and were not far below 1923, which holds the record for the past ten years. This volume of selling was well distributed over gray iron, malleable and nonferrous foundries, those plants identified in some way with the building industry probably being the heaviest buyers. The third quarter and the opening weeks of the fourth quarter saw business at its highest point. Equipment makers look for a good first quarter of 1926 and believe that the year as a whole will average up well with 1925. Sand mixers have been purchased by the Elizabeth Street Foundry, Chicago, and the International Harvester Co., Chicago, from the National Engineering Co., Chicago. The Lenox Furnace Co., Marshalltown, Iowa, has secured dust arrestor equipment and the Winslow Boiler & Engineering Co., Galesburg, Ill., has taken sandblast equipment from the Pangborn Corp., Hagerstown, Md. Tumbling mills have been sold to the American Range Corp., Shakopee, Minn., two sandblast mills to the Link-Belt Co., Indianapolis, and one each to James B. Clow & Sons, Chicago, and the Saginaw Products Co., Saginaw, Mich., and sandblast equipment to the Holmes Foundry Co., Port Huron, Mich., by the W. W. Sly Mfg. Co., Cleveland. The Studebaker Corp., South Bend, Ind., has secured a core knockout machine and two shakeout bails from the Stoney Foundry Engineering & Equipment Co., Cleveland, while the Griffin Wheel Co., Council Bluffs, Iowa, Holmes Foundry Co., Port Huron, Mich., the Waterloo Gasoline Engine Co., Waterloo, Iowa, and the Marshall Furnace Co., Marshall, Mich., have purchased vibrators and shakeout equipment from the same manufacturer. The Fulton Iron Works, St. Louis, has ordered a 15-ton helical geared crane ladle, the Almont Mfg. Co., Almont, Mich., has taken a cupola, the Ajax Motors Co., Racine, Wis., has taken a 30 x 48-inch tumbling mill, and the Universal Foundry Co., Oshkosh, Wis., has contracted for core oven equipment from the Whiting Corp., Harvey, Ill. A molding machine has been ordered by the Warman Steel Casting Co., Los Angeles. The Muncie Foundry & Machine Co., Muncie, Ind., has bought a hand power crane, two small cranes and three hoists from the H. D. Conkey & Co., Chicago, while the Tarrant Foundry Co., Chicago, has taken one 15-ton 3-motor and one 3-ton 3-motor crane from the Whiting Corp. The American Spiral Pipe Co., Chicago, has closed on a 74-ton handpower crane from Alfred Box & Co., Philadelphia.

Pittsburgh Buying Slower

With the possible exception of June and July, monthly sales of foundry equipment in the Pittsburgh territory in 1925 represented large aggregates. Early in the year, inquiries were heavy and sales numerous of various types of equipment, but this period was exceeded by the fall and winter months when the ordering rate improved measureably, covering practically everything used by foundries. October was entered by molding machine manufacturers with the biggest order books of their histories. That month proved to be the largest month on record for the development of new business. Most of the orders were for single units of the large rollover type, numerous foundries turning gradually to machine molding practice. Orders for four or five units at a time from larger users were scattered here and there throughout the year. Just prior to the American Foundrymen's association convention and exhibit at Syracuse, N. Y., there
December 15, 1925

THE FOUNDRY

1025

came a lull in the buying of equipment generally, but the measure of success attending sales efforts at the show more than made up for this dull period. Following the Fairmont Foundry Co., both of Philadelphia, as well as several tumbling mills to the Florida East Coast Railroad Co., St. Augustine, Fla. Late in December something in the way of a letdown came in the buying of molding machines. The Herman Pneumatic Machine Co., Zelienople, Pa., however, continued to operate full throughout that month, carrying over from November a full month's business. Numerous projects requiring one to five molding machines are being worked on which no doubt will turn into orders in the near future. Recent orders include one each large roller type molding machine from the Pittsburgh Plate Glass Co., Pittsburgh; Antorg Trading Corp., New York for shipment to Russia; the Daimon Steel Casting Co., New Brighton, Pa.; and the Gould Coupler Co., Dupew, N. Y.

Several more are expected to purchase groups of molding machines shortly, including the American Car & Foundry Co. and the Southern Wheel Co., Pittsburgh. The Richmond Radiator Co., Uniontown, Pa., has ordered a vibrator and shakeout equipment from the Stoney Foundry Engineering & Equipment Co., Cleveland, and ventilation equipment has been secured by the Vulcan Mold & Iron Co., Latrobe, Pa. Several cupolas, sand mixers and other equipment inquiries are still are before the trade, action on which is deferred until after the holidays. The number of inquiries and orders are fair, the Ellinesays, having recently awarded two overhead cranes, one 50-ton with 10-ton auxiliary and one 20-ton with 5-ton auxiliary to the Niles-Bement-Pond Co., New York. The General Electric Co., Schenectady, N. Y., is in the market for a 3-ton 43-foot 6-inch span low headroom crane for Fort Wayne, Ind., a 3-ton 23-foot span low headroom crane for Schenectady, and two 2-ton cranes for West Philadelphia.

New York Buy Dull

FOUNDRY equipment sellers in the New York metropolitan district are winding up a rather dull year. Greatly restricted operations throughout practically the entire period, combined with a conspicuous lack of new construction enterprises, have kept buying at as low a point as at any time within the past three or four years. For only a short period this fall, following the foundry exhibit at Syracuse, N. Y., did there appear to be anything resembling brisk demand. Sellers of cupolas and other heavier equipment have been particularly affected. Current trading is proving no exception to that for the year. In fact, trading has been made slower, according to leading sellers, by holiday influences. The navy department is a recent buyer, closing on a cupola and accessories for its torpedo station at Newport, R. I., with the Whiting Corp., Harvey, Ill. Several cupolas have been sold to foundries in Philadelphia. The Richmond Radiator Co., New York, has purchased a 5-ton handcrane crane, 20 foot span for its Uniontown, Pa., plant, the order going to the Whiting Corp. Sand mixers have been purchased by the Elmira Foundry Co., Elmira, N. Y., from the National Engineering Co., Chicago, and the Southern Wheel Co., Rochester, N. Y., has ordered vibrator and shakeout equipment from the Stoney Foundry Engineering & Equipment Co., Cleveland. Tumbling mills have been purchased by the Delvin Mfg. Co., Burlington, N. J. and sand blast mills by the A. P. Smith Mfg. Co., Bloomfield, N. J., from the W. W. Sly Mfg. Co., Cleveland. Sandblast equipment has been sold to the Kennedy Foundry Co., Baltimore, and dust arrester equipment to the E. C. Serrins & Co., Inc., Syracuse, N. Y. The American Cast Iron Pipe Co., Birmingham, Ala., has closed on two 5-ton electric cranes, 40-foot span, from the Niles-Bement-Pond Co., New York. The DeLaval Steam Turbine Co., Trenton, N. J., has recently closed on 300 tons of structural steel for a foundry addition, and will likely be in the market shortly for new equipment. The United States Cast Iron Pipe & Foundry, Scottsdale, Pa., is expected to close soon on a 15-ton electric overhead crane. A prospective buyer is the Atlas Foundry Co., Irvington, N. J., which is starting work shortly on a new addition. The American Locomotive Co., has bought some scattered items, including molding machines for its plant at Chester, Pa. Some further purchases for that plant are contemplated for after the first of the year. The Florence Pipe, Foundry & Machinery Co., Florence, N. J., is expected to close on some sand handling equipment this month. An export order calls for two tumbling barrels for Russia, this business being placed through the Amthor Corp., 165 Broadway, New York, with the Whiting Corp. Export buying of foundry equipment for this year has improved over 1924. However, it is still restricted. Sellers of ladles report fairly good business.

Buying Lighter in New England

NEW ENGLAND foundries are more cautious in their buying of equipment as the holiday season approaches. The rate of melt in the district continues high and equipment inquiry is encouraging, but such sales as have been made during the past ten days have been mostly for delivery and billing after the first of the year. The year closes with foundry equipment sales in the district slightly in excess of the total for 1924 despite the fact that the first six months of this year were noticeably behind the first six months of last year. Several important electric annealing furnaces have been installed during the year. Sales of cupolas and of major equipment such as heavy cranes have been few and far between with the year's total about on a par with 1924 and below that of 1923. A leading melting machine manufacturer reports sales in New England during the last four months of 1925 heavier than for any four consecutive months in two years. Prospects for equipment sales in 1926 are decidedly favorable, and inquiry has shown improvement recently even during a gradual decline in sales. Prices are firm. A Hartford, Conn., foundry has bought a sand throwing machine, three molding machines and some other equipment while a Providence, R. I. foundry has secured several molding machines. The Farrell Foundry & Machine Co., Ansonia, Conn., has purchased sand mixers from the National Engineering Co., Chicago. The E. & J. Fairbanks Co., St. Johnsbury, Vt., has secured tumbling mills from the W. W. Sly Mfg. Co., Cleveland. Sandblast and dust arrester
equipment has been purchased by the General Electric Co., for its West Lynn, Mass., plant, from the Pangborn Corp., Hagerstown, Md.

Cleveland Market Active

SALES of foundry equipment in the Cleveland territory have held up well during the latter part of the year, and business during the first two weeks of December was highly satisfactory in most cases. Practically all manufacturers in this district have closed more business during 1925 than in 1924, the increase depending somewhat on the line of equipment manufactured. Business was good during the first part of the year, with the high point reached in March. Sales declined during the early summer months, but August witnessed a revival in buying. Several firms secured more business during August than any other month of the year, this buying movement affecting particularly molding machines and sand handling equipment. The Ferro Machine & Foundry Co., Cleveland, has closed on core knockout machines and nine molding machines from the Stoney Foundry Engineering & Equipment Co., Cleveland. The Cleveland Co-Operative Stove Co., Cleveland has purchased a vibrator and shakeout equipment from the same manufacturer. Numerous sales of cleaning room equipment are reported, including tumbling barrels purchased by the Treasure Stove Co., Gallipolis, O., sandblast mills secured by the Ford Motor Co., Detroit, and sandblast equipment by the Delco Light Co., Dayton, O., and the Hudson Motor Car Co., Detroit, this equipment being placed with the W. W. Sly Mfg. Co., Cleveland. Sandblast equipment has been purchased by the Toledo Stove & Range Co., Toledo, the Buckeye Porcelain Enameling Co., Cincinnati, and Moffats, Ltd., Weston, Ont., from the Pangborn Corp., Hagerstown, Md. The Florida East Coast Railway Co., St. Augustine, Fla., has closed on a sandblast installation and ventilation equipment from the Pangborn Corp. Several sales of sand handling and conditioning equipment are reported. The Advance Rumley Co., Battle Creek, Mich., the Fulton-Harwood Brass Foundry Co., South Bend, Ind., and the H. S. Lee Foundry & Machine Co., Plymouth, Mich., each have purchased sand mixing machinery from the Standard Sand & Machine Co., Cleveland, while the Florida East Coast Railroad, St. Augustine, has taken a small mixing machine with motor from the same manufacturer. The Erie Forge Co., Erie, Pa., has placed a repeat order with the Mayor Fuel Saving Furnace Co., Cleveland, for one furnace to be attached to an oven now being built. The W. S. Tyler Co., Cleveland, has purchased four helical worm geared ladles from different capacities from the Whiting Corp., Harvey, Ill. The Pratt & Letchworth Co., Buffalo, has purchased a crane ladle of 11,000 pound capacity and the James B. Clow Sons Co., Cohooset, O., has taken three 5-ton helical worm geared ladles from the Whiting Corp. The Florida East Coast Railroad, St. Augustine, has taken several tumbling barrels from the same manufacturer. Repair business continues brisk.

What the Foundries Are Doing

Activities of the Gray Iron, Malleable, Steel and Brass Shops

Atlas Foundry Co., 517 Lyons avenue, Irving-
town, N. J., has filed plans for a 1-story addition.

George L. Menker & Co., 100 North First street, Evansville, Ind., gray iron castings, will build a 1-story foundry addition 50 x 150 feet. Arizona Iron Works, Phoenix, Ariz., is having preliminary plans made for a steel foundry in addition to its present works.


Enterprise Brass Works, Munkegon, Mich., has having plans made for a foundry addition to be built at once.

Southern Malleable Iron Works, 3702-16

nue and Twenty-first street, East St. Louis, Ill., is building a foundry addition.

The DeLaval Steam Turbine Co., Trenton, N. J., has awarded 200 tons of structural steel for a foundry addition to the McClintic- Marshall Co.

Colorado Fuel & Iron Co., Denver, is having plans made for an addition to its cast iron pipe foundry to increase production from 25 to 200 tons per day.

American Radiator Co., West main street, Springfield, O., J. B. Orbison manager, will build an addition, including coke storage, sand bins and machinery.

Summit Brass & Bronze Co., Akron, O., will have been incorporated with $10,000 capital by John Zimark, John Metzler, Richard A. Huber, Karl M. Patterson and Mrs. Russell Patterson.

The Bay City Electric Steel Castings Co., Bay City, Mich., has completed the installation of a new 45-foot span 4-ton crane made by the Northern Engineering Works, Detroit.
METAL losses, always a large factor in foundry costs, are often uncontrollable because they show up only at inventory time—too late to be remedied.

These losses are naturally greatest in high-zinc alloys. Unavoidable in ordinary practice, they are reduced to the absolute minimum by the Ajax-Wyatt Electric Furnace. Nearly ten years’ experience in plants melting a combined total of over 4,600,000 pounds of brass per day amply proves the statement that Ajax-Wyatt Furnaces will cut these metal losses to a minimum.

Ajax-Wyatt Electric Furnace performance is far better than the most careful fuel-fire practice can show. In several instances, particularly where large batteries of Ajax-Wyatt Electric Furnaces have been used and operation records are most accurate, the losses have proved so slight that the usual custom of adding a layer of charcoal has been discontinued as entirely unnecessary.

In low-zinc mixes the losses are naturally always lower whatever the melting methods employed, but here again the Ajax-Wyatt Electric Furnace shows an appreciable reduction in melting loss.

This is only one advantage of the Ajax-Wyatt Electric Furnace. Others are described in a catalog which is yours for the asking.

THE AJAX METAL COMPANY
ESTABLISHED 1880
PHILADELPHIA
NEW YORK CHICAGO BOSTON CLEVELAND
Not by Rule of Thumb
Linoil cannot be made by Rule of Thumb—

and

It should not be used by Rule of Thumb

STANDARDIZE

We have standardized every detail of our formulae, our raw materials and our methods of treatment in manufacture. All that practical and scientific knowledge can do is being done in making Linoil. Accuracy almost equaling that of a pharmaceutical laboratory marks the making of every gallon of Linoil. The result is not only a perfect oil, but a dependable oil of uniform strength and constant characteristics.

Users of Linoil, knowing their core oil is a fixed and not a variable factor, simply establish once and for all their ratios on different work and erase core oil worries from their minds. Scientific accuracy is replacing rule of thumb methods in metal mixing. Scientifically made Linoil permits replacing rule of thumb methods in cores and mixing.
Durable Steel Buildings for Foundry Service

You can get a Building from Truscon that to the slightest detail will answer your exact requirements. You can get it in much less time than you would have to wait for any other permanent construction — days instead of the usual months. And, further, regardless of the amount you have set aside for your building you can still save money by coming to Truscon. We do not give you just a building, you get a far-reaching service that frees you from the details of design, delivery and erection. Truscon does it all — at no extra cost to you.

You know the total price at once — You know the date of completion, far in advance — and on that day Truscon turns over to you a complete, fireproof, copper-steel Building up and ready for use. It will be worth your while to consult Truscon even if you are not quite ready to build.

Return coupon for catalog and information.

TRUSCON STEEL COMPANY, Youngstown, Ohio
Warehouses and Sales Offices in Principal Cities.
Specialized Steel Flasks for Superior Casting Work

Truscon Alloy Steel Foundry Flasks measure up to the most exacting demands of practical foundry men. They are designed by Pressed Steel specialists who know what a flask has to stand and are durably built for the special job required of them. Their sturdy rib construction fits them for the dependable service you need to keep production high. And that rib design not only reinforces—it is designed to form a sand shelf at the bottom and to facilitate shaking out at the top. Such details make up the superiority of Truscon Alloy Steel Flasks. You simply can’t go wrong on Truscon Flasks. Let us tell you the whole story of their economical service. No obligation to you.

Return coupon for catalog and information.

TRUSCON STEEL COMPANY, Youngstown, Ohio
Special Flask representatives in New York, Philadelphia, Chicago, Pittsburgh, Cleveland, Buffalo, Detroit, Boston, St. Louis and Cincinnati.
KELLOGG'S CORE OILS

Kelloil          Gold Bond XX          Cylinder Core Special
Gold Bond        Radiation Special     Skasco
No. 10

All these are linseed base core oils. We are the only manufacturers of core oils who make linseed oil.
The Season’s Greetings

The year that now draws to its close has seen renewed activity in American foundries. The outlook for 1926 is full of indication of continued national prosperity.

Under these hopeful circumstances we take pleasure in giving the season’s greeting of good wishes to our friends, the foundrymen.

Core Oil Department
Spencer Kellogg and Sons, Inc.
Buffalo, N. Y.

Minneapolis  Cleveland  Kansas City
Cincinnati  Buffalo  Philadelphia
Detroit  Boston  St. Louis
Chicago  New York City  Grand Rapids
Columbus, O.  Springfield, O.  Milwaukee
Are You Overlooking the Second Way to Make More Profit?

The first way most people think of trying to increase profits is by jacking up the price. That is easier said than done. Even a small advance in the price of your foundry products may disrupt your market and lose you friends. But there is a second and simpler way to increase your

The Pangborn Type "EH-1" Hygienic Cabinet

Showing how the operator works outside free from dust; with clear vision and flexible nozzle control that reaches all surfaces, pockets and recesses of the casting perfectly and speeds production.
production dividends. Make your cleaning equipment add to your bank roll. Install a Sand-Blast that will save its cost in a year, thereafter adding all velvet in profits.

Take, for instance, this Pangborn “EH-1” Hygienic Cabinet installed by a Toledo foundry in 1922. Figure what it must be doing for the bank roll! 148 pieces of gray iron castings, ranging from 40 to 1,100 lbs. each; total tonnage of 25,786 lbs. cleaned by operator and helper in 7 hours.

For smaller pieces, the Pangborn Rotary Table Sand-Blast will give the same sort of dividends. Here is the production on the Table illustrated above: 150 intricate cast lawn-mower gears perfectly cleaned per hour. Both inside and outside teeth and all corners so thoroughly cleaned as to have the bright appearance of aluminum castings.

These Pangborn Tables are constantly cleaning all classes of gray iron, steel and malleable castings, frequently as fast as two men can load and unload them. There can be no breakage and the operator works in the open with safety and convenience.

If you want higher dividends from your production, write us your cleaning conditions. We can refer you to plants where they once had that problem.
Greatly reduced prices on all sizes and types, plus better construction, lower upkeep, larger production, better value. Note these new features—

Send today for complete specifications, revised price list and list of users who swear by the old reliable Standard as the batch mixer they can and have depended upon day in and day out for years—many of them for a quarter of a century.

You cannot go wrong on a Standard. It's a money maker for you from the day you install it.
The Standard''

ANDARD BATCH MIXER
REduced PRICE

No. 3 Standard Complete With Screen
Capacity per Batch 9 1/2 Cubic Feet
Weight 3200 lbs.

$429.00 F. O. B.
CLEVELAND

& Machine Company
CLEVELAND, OHIO
American Foundry Equipment Co.,
368 Madison Ave.,
New York, N.Y.

Gentlemen:

You, no doubt, will be interested in receiving an expression of our experience with the American Down Draft Sand Blast Room which we have been using for the past eight months.

After overcoming the unavoidable childhood sicknesses, such as clogging of sand on account of water in the compressed air pipe, too low air pressure at the sand blast, etc., the equipment has given us entire satisfaction, especially since we have adopted steel grit as abrasive instead of sand. Silica sand has also given us good results.

There is one thing we want to mention especially which is the splendid ventilation the Down Draft principle gives. The dust is not given a chance to rise higher than about four feet above the floor and the head of the operator is always in clean air. If it would not be for flying particles of abrasive, the operator would not need to use his helmet.

The cost of upkeep up to now was negligible.

Very truly yours,

COPPUS ENGINEERING CORPORATION

Vice President
After 27 months service

“We are pleased to be in a position today to repeat what we said in that letter about the ventilation given by the down draft principle. The Sand Blast Room is working now as satisfactorily as when it was installed.

“The cost of upkeep is, in our opinion, quite reasonable. Our records show that during the 27 months we have had the Sand Blast Room in operation the total amount paid for repair parts was $68.77.

“We also want to mention the adaptability of this sand blast equipment to any kind of abrasive. We have used steel grit and silica sand with equally satisfactory results. At the present time we have adopted a mixture of steel grit and silica sand.” — Coppus Engineering Corporation, November 25, 1925.

The American Foundry Equipment Co.
368 Madison Avenue, New York, N. Y.
Direct representatives in principal foundry centers

Write for catalogue describing American Down Draft Sand Blast Rooms.
SLY Equipment

has been sold to

3582
Foundries in the past 51 years

There can be only one Reason for such unqualified acceptance.—perfect satisfaction.

Sly Positive Pressure Sandblast Mill

Tilted position of the barrel (a patented feature) insures a mixing action of the load which cannot be duplicated in a horizontal barrel. For efficiency, production, stability, and convenience this mill is a master in its class. Built in three sizes.

No. 8 Turntable Cabinet

Eight-foot turntable cabinet with partition. One half of table inclosed in cabinet, the other half open for loading and unloading. Permits continuous operation with positive pressure blast. Any kind of abrasive. Well ventilated and an abundance of light affording clear vision of work to be cleaned. Adapted for use in grey iron, malleable, steel and non-ferrous foundries.

SLYBLAST equipment is the result of years of experience, research, designing and the building of foundry equipment.

Sly engineers have studied the needs of the foundryman from every angle in an effort to produce equipment which is economical and efficient. The Sly Line is the only complete line of cleaning room equipment. Included in the Sly line are Slyblast Rooms, Cabinets, Tables, Barrels and Tanks, Dust Collecting Equipment, and all types of Tumbling Mills.

We solicit your inquiries and assure you our unbiased recommendations.

THE W.W. SLY MANUFACTURING CO.

CLEVELAND, OHIO

WE SELL

SLYBLAST

for Sandblast, Shotblast, Gritblast

WE SELL

STEEL Grit

SAMSON
A grain of Samson Steel Shot or Angular Steel Grit discharged from a Sand Blast nozzle, under 80 pounds pressure, travels at tremendous speed. The impact at such speed produces a striking force that disintegrates sand into dust.

Because they have two and a half times the specific gravity of sand they clean better and quicker—without disintegration and without dust—and last indefinitely.

“Certified” Steel Abrasives are TESTED for Crushing Resistance and must withstand a strain of many times the striking force.

Your safety and economy in buying Steel Abrasives need no longer be “guess work”. You are entitled to know—and can know—if you specify “Certified” Steel Abrasives and accept no substitutes or imitations. A certificate is issued with every shipment if it is “Certified” Steel Abrasive.

“CERTIFIED” STEEL ABRASIVES

ANGULAR STEEL GRIT
SAMSON STEEL SHOT

Manufactured only by
PITTSBURGH CRUSHED STEEL CO., PITTSBURGH, PA.
STEEL SHOT & GRIT CO., AMESBURY, MASS.

Steel Abrasive is recommended by the leading Sand-Blast Manufacturers
WESTINGHOUSE Research Laboratories have found mica to be the best insulation material obtainable. It has moisture and temperature-resisting characteristics, as well as high dielectric and mechanical strength, to a greater degree than any other known insulating material.

This mineral is the most expensive, yet Westinghouse uses it generously for all coil insulation to add years of life and reliability to all Westinghouse motors.

Mica is that added touch of quality, characteristic of Westinghouse practice to build better motors by the use of the best materials obtainable.

WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY
EAST PITTSBURGH - PENNSYLVANIA
Sales Offices in All Principal Cities of the United States
and Foreign Countries

Divide Their Cost
By the Years They Last
Perfect patterns from this genuine white pine

Pattern makers who use California Sugar Pine have no annoyance from pattern stock improperly dried.

For California Sugar Pine is thoroughly seasoned, in a climate ideal for lumber drying, and under conditions which have, from years of experience, proven best for the pattern trade.

Furthermore, California Sugar Pine may, if necessity demands, be kiln dried. In fact, the excellent characteristics of this wood is evidenced by its good seasoning qualities, without checking or warping.

There are abundant stores of California Sugar Pine pattern lumber now and for many generations to come. Large production and convenient and ample stocks assure the pattern maker a continuous supply of this genuine white pine.

Write for Information Sheet No. 13—full of interesting and instructive details about California Sugar Pine. Also, put any specific questions or problems up to our wood technologist.

U. S. Forest Service classes California Sugar Pine as a true white pine. (See Technical Note No. 215.) Its characteristics are identical with those of the old northern pine. Below, at the right is microscopic photo of the cellular structure of California Sugar Pine. At the left is one of Eastern White Pine. Scientists cannot distinguish between the two. (Photos by Forest Products Laboratories.)

It's True White Pine

California White and Sugar Pine Manufacturers Association

662 Call Building · San Francisco
SECURELY FOUNDED ON THE
BED ROCK OF QUALITY

From sand pit to storage bin, from facing mill to mold, the outstanding function of George F. Pettinos Products is Quality and Service. Behind each product, whether it be facings, sand or supplies, is the experience of an organization whose sole purpose is to furnish you with materials that will prove efficient and economical. There is a George F. Pettinos Product for Every Foundry Purpose—and each one will help towards making better castings and more profits.

George F. Pettinos Plumbago is really fine. You should specify it on your next order.

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<td>Albany, North River,</td>
<td>Plumbago Facings, Armor Core Blacking, Hifracto Furnace, Cement, Snowflake Parting, Soapstone, from Mine to Mill to You — a facing for every purpose and each one guaranteed to do satisfactory work.</td>
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GEORGE F. PETTINOS

Foundry Supplies and Equipment


Boston Newark Erie Pittsburgh San Francisco Montreal
Reduce Your Fuel Bills!

Are you paying for the heat that you are not getting? This condition exists in numerous foundries, and other one story industrial buildings. Sometimes it is due to the quality of the fuel, but invariably the cause is traceable to the inefficiency of the heater which allows the heat to be wasted upward instead of keeping it near the floor where the employees can get the full benefit of it.

The Sturtevant Mechanical Hot Blast Heater keeps fuel bills at a minimum by uniformly heating every corner of the building. The Multivane Fan connected to the rear of the furnace properly circulates the heat by forcing it horizontally near the floor where it is needed. The extended surface fins on the fire-pot and the thin rings on the tubes provide a maximum heat radiating surface.

This heater will burn either hard or soft coal, oil, coke or gas with great economy. Probably you need such a heater in your plant now. We can send one to you immediately upon receipt of your order, or if you prefer to investigate further before buying, we will gladly send you our bulletin 306 and with it a list of some of the plants in your territory where the Sturtevant Mechanical Hot Blast Heater is installed.

B. F. STURTEVANT COMPANY

Plants Located At

<table>
<thead>
<tr>
<th>Location</th>
<th>State</th>
<th>Address</th>
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<tbody>
<tr>
<td>Hyde Park</td>
<td>Mass.</td>
<td>1479</td>
</tr>
<tr>
<td>Sturtevant</td>
<td>Wash.</td>
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<td>Berkeley</td>
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<td>Framingham</td>
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Sales Engineering Offices

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<tr>
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<td>Buffalo, N. Y.</td>
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Foreign Representatives

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<tr>
<td>Tokyo</td>
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<td>Sydney</td>
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<td>Hoonti, T. H.</td>
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<td>A. E. Barker</td>
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1479
A Foundry Necessity that assures Quality and Economy

What It Is:

KORDELK is the highest grade dry vegetable core bond. Great binding strength, combined with utmost reliability makes it extremely economical. You will find it, always, absolutely uniform and 100% efficient.

What It Does:

KORDELK produces castings of the highest grade with the smallest percentage of blowholes and imperfections—

makes cores that have sharp edges and keep them—

bakes in the shortest time—

bakes at the lowest temperature—

increases in strength while baking—

stands up when metal is poured—

leaves a clean core box—

breaks out of castings with greatest ease—

gives off the least smoke and gas—

may be mixed in large quantities, and used as needed—

CORN PRODUCTS REFINING CO.
17 Battery Place
New York, N.Y.
Lift yourself by your boot straps

Throughout the past year these advertisements have told you about Linde Process Service for Linde users. They have shown how it can help you, whether you have only a comparatively simple job, or whether you want to make the oxy-acetylene process part of your production work with all the managerial and engineering problems that this involves.

Linde Process Service goes even further. Under the title of Procedure Control, instructions are being assembled for every application of the oxy-acetylene process. So, when you ask for help, we shall be able to send you a set of instructions for your particular job. They will tell you how to select your materials, how to instruct your welders, how to set up and carry out the work, and how to test the finished job.

So you can, in reality, lift yourself by your boot straps. Linde Service men will always be available when needed, but, with the aid of Procedure Control alone, you will be able to apply the oxy-acetylene process to your manufacturing problems.

Next year our advertising will describe some of the outstanding achievements of the oxy-acetylene process in industry—achievements made possible by the use of Linde Process Service.

The Linde Air Products Co.
General Offices:
Carbide and Carbon Building, 30 E. 42d Street
New York, N.Y.

37 Plants 22 District Sales Offices 91 Warehouses

Linde Oxygen
You can depend on the Linde Company
The Superintendent of one of the largest foundries in the country took occasion to express to us his confidence in "K-B" Core Binder and Facing Flour. Along with the letter commending our product for its unusual qualities were photographs of some of the big jobs he has made easier with the application of "K-B". One of these is shown above.

Why don't you investigate "K-B" Core Binder and Facing Flour? Learn why it is out-selling all other dry flour binders. Test it! Compare it!—and we are certain you will regret you haven't benefited from the advantages of "K-B" before this.

Write for trial supply.

Knefler-Bates Manufacturing Co., Indianapolis, Ind.
Rigid Square-Surfaced Partings

The Superiority of Sterling Flasks Is In The Design of The Special Rolled Steel Materials From Which They Are Made.

Light Weight Is The Factor Which Counts Most In Your Production.

Level Partings, And Rigidity Are What You Must Have For Perfect Castings. These Requisites Are Rolled Into Sterling Flask Construction.

STERLING WHEELBARROW COMPANY
Milwaukee Wisconsin
The

"Branford"

Flask Rapper Vibrator

This is the big brother of the well known Branford Pot Rapper. Made in all sizes from 2" piston diameter to 8" piston diameter. Capable of handling a range of flasks from small pressed steel flasks up to heavy cast steel flasks 20" square to 4" in depth. The flask shown in the above cut was shaken out in 55 seconds. A 5" Flask Rapper is shown. The jaw is of such construction that it will take a flask from 1" wall or less up to a flange 5" wide on the 5" Vibrator, without adjustment. We will furnish questionnaire for your specifications on request. Distributors listed below will also furnish information and prices.

Malleable Iron Fittings Co.
Branford, Conn., U. S. A.

Distributors
Cleveland Tramrail cranes are as easily moved when the load hangs from the end of the beam as when it is in the center. No squaring shunt or other evening device is required to keep both ends gliding smoothly over the runway rail. There is no jerking or splashing when handling metal in a ladle—no jarring or breaking of cores or molds. The crane with maximum load can be set in motion with a gentle push.

Here is a selective sand delivery system that places any one of four different mixes of sand on the benches of thirty-two molders. The view shown is of but one of four similar Cleveland Tramrail systems operating in this large automobile foundry. No other type of equipment could be depended upon to deliver a two ton load at two minute intervals—day in and day out. This carrier handles over 500 tons of sand a day and it has been estimated to do as much work as twenty laborers with wheel barrows could do. The savings in wages alone have been computed at approximately $30,000 a year for each system.

Where can you find the background of material handling experience that our Tramrail Engineering Staff has obtained in their contact with thousands of American foundries?

Cleveland Electric Tramrail
Division of
The Cleveland Crane & Engineering Co.
Wickliffe, Ohio

Our 250 page, illustrated catalogue features hundreds of operating Tramrail Systems. Write for a copy or for special information on your particular handling requirements.
Accurate control of the load on the hook is the outstanding qualification of Cleveland Cranes in foundry service.

The Cleveland Crane & Engineering Co.
Wickliffe, Ohio

New York
30 Church Street
Chicago
557 Ry. Exchange Bldg.
Pittsburgh
511 Farmer’s Bank Bldg.
Sandslingers Accomplish The Seemingly Impossible

We cite a few installations where Sandslingers are increasing production, lowering labor costs, prolonging the life of patterns and producing better molds, resulting in less casting loss:

“Six men make 110 furnace castings in 8 hours. Molds average 20 cubic feet of sand. Casting loss less than 4%. A Tractor Sandslinger is used in this foundry.”

“1900 4-cylinder automobile engine blocks made by two stationary Sandslingers in 8 hours. This includes molding, coring and pouring. Casting loss is less than 3%—all castings are made with satin finish.”

“2 stationary Sandslingers make 600 6-cylinder automobile engine blocks—cast with skirt. 26 men mold, core, clamp, pour and shake out in 8 hours. More than 80% of all automobile engine castings made in the United States are produced with the aid of Sandslingers.”

“Locomotive Sandslingers are saving from $1500 to $2000 per month in molding labor alone, in jobbing foundries where miscellaneous castings of various sizes are made. Added to this unusual saving is the saving of floor space and the saving in special facing sand.”

Regardless of your foundry conditions Sandslingers can effect great profits for you. They are made in five types—Stationary, Portable, Tractor, Motive and Locomotive, to suit varying foundry conditions.

Write for catalog—or let us send one of our foundry experts to suggest the correct type of Sandslinger for your work.

THE BEARDSLEY & PIPER COMPANY
2541 N. Keeler Avenue, Chicago, Ill.

Manufactured in Great Britain by Foundry Plant & Machinery, Ltd., Glasgow, Scotland
Manufactured in Germany by Graue-Aktiengesellschaft Langen-hagen-Hannover
Manufactured in Canada by John T. Hepburn, Ltd., Toronto, Ont.
Sold in Australia by Metters, Ltd., Sydney, N. S. W.
Mr. I. Jaderstrom, Hantverkargatan 11-C, Stockholm, Sweden
Fenwick Freres & Co., 8 Rue de Rocroy, Paris, France
ARCADE MOLDING MACHINES AND FOUNDRY EQUIPMENT

ARCADE SAND BLAST BARREL
The corrugated staves turn the castings slowly but constantly

Machines No. 110 and No. 220
Jolt Rollover Squeeze Pattern Draw
Roller Bearings
Also made without Jolt

No. 1 Brillion Pouring Device
CRANES TOO
New Low Prices

Cherry Flasks
MILLED PINS AND EARS

Steel Jackets
No. 10 Gauge
WELL BRACED

No. 81 and No. 91 Jolt Squeezer
Distance between uprights 32" and 36"
Diameter Jolt cylinder 3" and 4"
Diameter Squeeze cylinder 8½" and 10"

Arcade Manufacturing Company
Freeport, Illinois, U. S. A.
Price Soon Returned with Interest

Money spent for a Simpson Intensive Sand Mixer is soon returned to the buyer by the machine itself. The economies it effects in preparing sand for foundry use quickly save its original cost.

Every foundry should have a "Simpson". Labor costs are too high to employ men on sand preparation when it is possible to install machinery that will do the work far more efficiently at a fraction of the cost.

The money-saving features of Simpson Intensive Sand Mixers are available to every foundry regardless of the class of work produced. "Simpsons" are made in four sizes for use in brass, aluminum, steel, grey iron and malleable iron foundries.

The best principles of sand blending are used by the "Simpson" in the preparation of foundry sands. It is similar to the old time "tramping method" so generally used and highly successful in foundries in the past. With a "Simpson" the sand is thoroughly blended. Results are always satisfactory.

The reclamation of refuse sand can best be accomplished in a SIMPSON INTENSIVE SAND MIXER.

The Simpson Bucket Loader shown above feeds the correct amount of sand for one batch, into the hopper at one time—and practically eliminates loss of time between batches.

Write to us for complete details relating to the installation of the "Simpson".

Manufactured in Germany by Graue-Aktiengesellschaft, Langenhagen, Hannover.
Sold in Australia by Horrocks, Roxburgh, Pty. Ltd., Melbourne, Australia.
Sold in Japan by Horne Company, Ltd., Osaka, Japan.

NATIONAL ENGINEERING COMPANY
MACHINERY HALL BUILDING  549 W. WASHINGTON BLVD.
CHICAGO, ILL., U. S. A.
The Three Essentials—

SPEED—POWER—ECONOMY

SPEED—to insure high output and consequent lower molding costs.

POWER—to squeeze the mold to the required density.

ECONOMY—in both operating and maintenance cost.

These three essential features are attributes of

The 10"-32" ADAMS JOLT SQUEEZER

The simple, compact design of this machine and the convenient location of controls assures its success in any foundry making light and medium castings.

Distance between rods . . . . . . 32"
Diameter of squeeze piston . . . . 10"
Diameter of jolt piston . . . . . . 4"
Table size . . . . . . . . . . . . . . 16" x 20"

Made in both stationary and portable types. Full details in Supplement “D”.

The Adams Company

Est. 1883

170 Foster Street

DUBUQUE, IOWA, U. S. A.
How the Rapp >REVIVIFIER< Helps Reduce the Loss of Castings

PERFECT CASTINGS—the pride and joy of every foundry craftsman—are never achieved by accident. Quite the contrary: care and skill must be applied at every step, and especially in preparing and conditioning the molding sand. Too frequently imperfect and rejected castings can be traced to faulty preparation of molding sand—a condition that is easily and surely remedied with a Rapp >REVIVIFIER<.

Breaking up all the lumps in old and new sand, mixing it thoroughly while aerating and cooling it, the Rapp >REVIVIFIER< makes the sand fluffy, in ideal condition for molding. It provides a uniformity and excellence of sand unheard of in the days of the shovel and sprinkling can. It not only cuts down casting losses, but reduces the cost of sand preparation. All this is interestingly explained in Book 690, sent free.
The design of our Jarr Independent Rollover and Pattern Drawing Machines is such that we can furnish these machines to meet your requirements on both large and medium work.

We would be pleased to have you send us your inquiries and let our Service Department advise with you on your molding machine requirements.

Herman Pneumatic Machine Company
GENERAL OFFICES Union Bank Building, PITTSBURGH, PA.
MANUFACTURING PLANT: ZELIENOPLE, PENNSYLVANIA, U. S. A.
TWO IMPORTANT MONEY MAKERS FOR YOUR FOUNDRY

THE UNIVERSAL SAND RIDDLE

AND THE RED ELECTRIC VIBRATOR

THEY MAKE MORE MONEY FOR YOU IN PROPORTION TO THE INVESTMENT THAN ANYTHING YOU CAN INSTALL IN YOUR FOUNDRY!

WRITE OR PHONE YOUR FAVORITE SUPPLY HOUSE FOR INFORMATION REGARDING THE LATEST OF THESE PRODUCTS.

Foundry Supplies Mfg. Co.
2221 Orchard St., Chicago, Ill., U.S.A.
MOLINE MOLDING MACHINES

SIMPLE
RELIABLE
EFFICIENT

No. 1 Stationary Machine

$60.00

One of Many Testimonials of Complete Satisfaction

No. 3 Portable Machine

$85.00

No. 2 Portable Machine

$80.00

MOLINE IRON WORKS
MOLINE, ILLINOIS
U. S. A.
Results Like This Assure Foundry Profits

For eighty consecutive days a full day’s production. “This record has never before been equalled in our shops”, reports a large steel foundry in the middle west. It was made by the crew on a molding unit equipped with continuous sand handling and conditioning machinery designed, built and installed by Bartlett & Snow.

There is no longer a question of the increased profits to be obtained by the use of Bartlett & Snow Sand Handling and Conditioning Equipment and Mold Carrying Machinery. Results like the above demonstrate the reliability of this equipment. Continuous and uninterrupted operation goes a long way toward assuring foundry profits. Records from dozens of foundries prove that continuous molding and pouring equipment gives greater production, lower costs and better labor conditions.

Our new Bulletin No. 56 shows how these results are obtained. It is reliable, accurate, rich in illustration and interesting. Every man concerned with foundry operation should have a copy. Just give us your address on a postal and a copy will be sent you by return mail.

THE C. O. BARTLETT & SNOW COMPANY
6201 Harvard Ave. Cleveland, Ohio

Bartlett - Snow
SAND HANDLING EQUIPMENT
An automobile spring bracket, cast in malleable iron. The photograph to the right shows a half day’s run of molds for this casting. This job was squeezed on a rapid Jolt Squeezer.

**THE JOLTER THAT SQUEEZES DOWN COSTS**

The job pictured above is a simple pattern that is squeezed—not jolted—on a Rapid Jolt Squeezer. In a five and half day week, one molder turned out 1100 molds on this job. Out of this high weekly run, but four molds—\(\frac{36}{100}\) of one percent—were defective.

To maintain such high mold production with such a low percentage of defectives, is bound to effect a decided reduction in molding costs. To be able to handle the more complicated patterns, that require jolting, on the same machine with equal efficiency, means a considerable saving in the original cost—for this one machine really fills the place of two.

**FEDERAL MALLEABLE COMPANY**

WEST ALLIS, WISCONSIN
Foundry Service Eliminates All But the Sturdiest and Most Reliable

To stand up under foundry demands and give continuous, satisfactory, day-in-and-day-out service, pneumatic equipment must have sturdiness and reliability built into it from start to finish.

This is one of the reasons why Ingersoll-Rand Class "ER" Air Compressors and Ingersoll-Rand Pneumatic Tools are so universally chosen by the Casting Industry. These machines are sturdy. They are reliable. They are designed, built, sold, and serviced by an organization with a background of more than a half-century of experience with compressed air equipment.

Class "ER" Compressors and a complete line of I-R Pneumatic Tools are available for prompt shipment from one of the I-R Service Stations near you. Request Bulletins No. 3050 and No. 8000.

INGERSOLL-RAND COMPANY—11 BROADWAY NEW YORK CITY

Orders in principal cities the world over

FOR CANADA: INGERSOLL-RAND LIMITED, 2045 EELLES STREET, MONTREAL, QUEBEC.
"It Takes a Quick Bite"

Is the way one of our customers characterized FLINT SHOT sandblast abrasive.

It does.

It does more work per nozzle, per hour and per unit of air, labor, upkeep and other costs—than any other abrasive we know of.

It does these things because its smooth, round, elastic spheres flow freely thru the line, with minimum frictional resistance; and because its amorphous, non-crystalline, non-splitting formation makes it stand up under repeated use.

All of which explains the freedom from dust troubles where FLINT SHOT is used—as well as the low cost of air and the high earning power of equipment using this unique manufactured mineral abrasive.

Our Liberal Trial Offer

But why multiply words when the proof is so easy? Just take us up on our offer to ship you free, as many bags of FLINT SHOT as will be required for a thorough working test in your own machines.

UNITED STATES SILICA Co.
122 South Michigan Ave., Chicago
A Good Compressor Investment

Every piece of equipment bought is an investment, which brings in returns varying with its cost of operation, and productiveness. For the "long pull," invest in a

Sullivan Angle Compound Air Compressor

It will earn dividends from the day you start it up, and keep on earning them as long as your plant runs.

Angle Compound "earnings" include:

- Smaller floor area.
- Smaller foundations.
- Less installation cost.
- Lower H.P. consumed per 1000 cu. ft. of air compressed.
- Economy of operator's time and labor.
- Minimum repair cost.

Hundreds of foundries have learned the value of an “Angle Compound” investment during the past 15 years.

Sullivan Angle Compound balanced design enables these machines to run without perceptible vibration, hence smaller foundations and higher rotative speeds are permissible. Wafer air valves throughout, and three-pass, counter-current copper intercoolers assure high volumetric efficiency.

The Sullivan automatic load and capacity control proportions the power used exactly to the work done. Single units to 1800 cu. ft., twin units to 3700 cu. ft.

Ask for Catalog 1877-H

SULLIVAN MACHINERY COMPANY
146 SOUTH MICHIGAN AVE., CHICAGO, ILLINOIS U.S.A.
NEW

“FOUNDRY COST METHODS”
contained in the revised and enlarged second edition of

Foundry Cost Accounting

By Robert E. Belt, C. P. A.

Coming off the press January 1.

PURCHASERS of the previous edition methods needed by the makers of malleable castings, steel castings and non-ferrous castings are covered thoroughly.

ADDED FEATURES are Estimates and Quotations, Pattern Shop Costs and Estimates, and the Distribution of Overhead Expense during Periods of Abnormal Production.

A practical method of cost finding that is actually being used and giving satisfactory results. No one working with foundry costs or practicing as a foundry cost accountant should be without it.

SEND FOR YOUR COPY NOW!

Price, Postpaid

$6.00 in the United States and Canada. 30s in all other countries


The Penton Publishing Co.

Book Department
Penton Bldg., Lakeside Ave. & W. 3rd St.
CLEVELAND, OHIO

Enclosed is $5.00 for which please send, all charges prepaid, one copy of the second edition of “Foundry Cost Accounting” by Robert E. Belt, C. P. A.

Name

Address

Date

USE THIS COUPON
After 510,000,000 strokes—FEATHER valve still serviceable

THE Hamilton Foundry & Machinery Company, of Hamilton, Ohio, own two Worthington FEATHER Valve direct motor-driven compressors, one installed in November, 1918, and the other—a larger machine—in January, 1920. The smaller compressor has operated about 17,000 hours (practically 510,000,000 strokes), the other about 14,000 hours.

It has not been necessary to renew or change a single FEATHER in the small machine since its installation. The larger compressor has required only ten new FEATHERS at a cost of $1.50.

These facts speak for themselves. Worthington FEATHER Valves give perfect contact without destructive impact. In the long run the economy obtained with Worthington FEATHER Valve Compressors cannot be surpassed.

No adjustments of the main motor bearings have been required on either machine and only minor adjustments have been necessary in the cross-head bearings.

Let us send you bulletins which describe these compressors in detail.
The Roots Charging Hoist accomplishes with the aid of one man—the hoist operator—the work of many men. Anywhere about the foundry yard where there are lifting jobs to be done quickly and economically, you can depend on your Roots Charging Hoist.

Unloading pig and scrap, sand, limestone, handling castings, flasks, or doing lifting, shifting or placing of any sort. The Roots Charging Hoist is instantly and unfailingly available 24 hours a day.

The work is handled more efficiently than if done by hand. And the cost is less.

Our catalog contains all details of construction and illustrates equipment in actual operation. May we send it?

Cut Handling Costs With a Roots Hoist

The P.H. & F.M. ROOTS CO.
CONNERSVILLE, IND.

Chicago Office
122 S. Michigan Ave.

New York Office
Room 802-120 Liberty St.

Cleveland Office, 1576 Union Trust Bldg.
The Mueller Manufacturing Company, Decatur, Ill., one of the largest producers of brass goods in this country, bakes all of its cores in a battery of Oil Fired Coleman Rolling Drawer Core Ovens.

UNIFORM dependable operation at lowest cost for fuel and labor has made these the most extensively used core and mold ovens in the foundry industry.

Over twenty years of "knowing how" and the experience gained in building hundreds of successful foundry ovens assure utmost satisfaction in every installation.

Exclusive patented features provide an efficiency in operation not available in any other type of oven construction. Every installation is fully guaranteed in every respect.

All types—portable rack, rolling drawer, shelf, car, conveyor, etc. Any fuel—coke, oil, gas, electricity, etc.

Write today for complete Coleman Oven Catalog 22
Other types of G-E Centrifugal Compressors are providing air for every industrial application including distributing gas, exhausting gas, blowing cupolas, agitating liquids, blowing water gas, scavenging Diesel engines, super-charging engines and furnishing air for pneumatic material handling apparatus.

The G-E Blower for fuel-fired furnaces

Users like this Blower because:

It operates over a wide range of load with high efficiency.

Its lubricating system is entirely enclosed.

Sufficient oil is supplied to bearings under pressure from pump built into blower.

This G-E Blower is specially designed for supplying air to cupolas, oil—or gas-fired furnaces. There is an imposing list of satisfied users to testify how well General Electric engineers have accomplished this.

Your nearest G-E sales office can give you complete information.

GENERAL ELECTRIC

GENERAL ELECTRIC COMPANY, SCHENECTADY, N.Y., SALES OFFICES IN ALL LARGE CITIES
Testimony may be interesting but indefinite.—

Evidence is the unalterable proof of an established fact.—

On June 6, 1924, The Canadian Westinghouse Company Ltd.—Hamilton, Ontario, purchased and installed in their Foundry one type L.F.S. 250 lb. Detroit Electric Furnace. After 60 days’ operation of their first Detroit Furnace, on October 10th, 1924 they purchased a duplicate furnace. It is a fact that 62% of our 1924 business was just such repeat orders.—The reason?—Superior Castings, Less Labor Difficulty, Greater Production at a Much Lower Cost Per Ton.

Ask The Man Who Uses One.

DETROIT ELECTRIC FURNACE CO.

2231 Park Blvd., Detroit

419 Call Bldg., San Francisco
Control of Air

Guarantees Uniform Results

The easy and convenient regulation of both volume and pressure give the operator absolute control over the air supply, which results in high grade castings throughout the entire cupola run.

However, the quality of service is not the only good reason for using Spencer Turbo-Compressors; the length of service and low operating costs are other factors that make Spencer equipment a very profitable investment.

Low speed. No moving parts in contact. No pulsations or surging.

Investigate! Write for full details.

The Spencer Turbine Company
HARTFORD, CONN.
HOT IRON —at the lowest cost

You will find the most economical melter of the age in

The Paxson-Colliau Cupola

The work of this cupola has never been equalled—(1) in quantity of metal melted in a given time—(2) in quantity melted in a given size of cupola—(3) in economy of fuel used to ton of iron melted—(4) in the ease and certainty of melting—(5) in continuous melting as long as desired—(6) in giving perfect castings to the end of heat—(7) in freedom from clogging or hanging.

Also, Paxson-Colliau Cupolas stand in a class by themse'ves for durability—and low upkeep cost.

OTHER PAXSON PRODUCTS

Sand Blast Machines
Sand Blast Barrel Machines
Tilting Sand Blast Barrel Machines
Sand Blast Table Machines
Sand Blast Rooms and Cabinets
Dust Collectors
Air Compressors
Exhaust Fans
Sand Blast Accessories
Tumbling Barrels
Core Ovens
Cupolas, Tramrails
Geared Crane Ladles
Brass Furnaces
Special Equipment
Sands, Gravels, Supplies

Made in our own Shops in Philadelphia.

Wind Box or Air Chamber

Sectional Base Plate

The Sectional Base Plate is a feature that saves expensive repairs. It provides for expansion and contraction—and is not liable to crack.

All the other important features are fully described in Bulletin No. 41. May we send you one?

J. W. PAXSON CO., Luzerne and D Streets, Philadelphia

Providence Established 1855 Baltimore
A BRIEF HISTORY OF NICKEL CAST IRON

Pressure Castings Improved by Steam Shovel Manufacturer

A prominent manufacturer of steam shovels was experiencing difficulty in producing satisfactory pressure-tight steam cylinder castings. By the addition of 0.60–0.70% Nickel combined with 0.20–0.30% chromium, he not only materially reduced the rejections on pressure tests, but also secured increased strength and toughness of the iron, with consequent improved wearing qualities.

Nickel Increases Wearability of Steam Cylinder Castings

The history of foundry practice furnishes conclusive proof of Nickel Cast Iron's adaptability to many varied service requirements. Men who have used it KNOW! Men who have not tried Nickel in cast iron should learn. They owe it to themselves to discover how a small percentage of Grade F Nickel can improve the quality of gray iron castings.

Foundry experience proves that Nickel added to cast iron provides:

1. A finer, closer grain with reduced brittleness—
2. Increased resistance to hydrostatic pressures—
3. Increased wearability and toughness amounting to 50% to 100%—
4. Fewer hard spots and improved machinability—
5. Consistent, uniform grayness—
6. Maximum hardness, with diminished brittleness—
7. Reduced and regulated chill—
8. Equalized hardness in sections of different dimensions.

The addition of relatively high percentages of Nickel to gray iron castings increases their corrosion resistance and resiliency. This addition also provides a means of controlling their magnetic properties.

Different foundries need Nickel for different reasons. Out of the many advantages found in Nickel Cast Iron there must be at least one that would help solve your problems. Why not write for additional data?

ASK FOR "LIST B" OF NICKEL & MONEL METAL LITERATURE
Substitute Re-orders for Rejections by the use of
Ferro Carbon-Titanium

In the manufacture of these Spindles, Rolls, Pinions and Coupling Boxes, The American Steel Foundries, Chicago, Ill., used three pounds of Ferro Carbon-Titanium per ton of steel treated.

This practice has proven mutually beneficial and satisfactory to the customers and themselves.

The Titanium Alloy Mfg. Co.

General Office and Works: NIAGARA FALLS, N. Y.

New York Office
94 Fulton St.

Pittsburgh Office
Oliver Bldg.

Chicago Office
People's Gas Bldg.

Hand in Hand

advertising and lower sales cost

It is to the buyer's interest to know that goods are sold经济技术ically for he pays the cost of selling just as he pays for the cost of manufacturing.

That's why more and more buyers are scrutinizing sales methods of manufacturers, for they know that excessive sales costs mean either higher prices or shrinking quality.

The seller who clings to antiquated, expensive methods of selling is no more entitled to patronage than one who runs an out-of-date factory.

Machinery has cut costs and standardized products in manufacturing and the machinery of advertising is accomplishing similar benefits in selling, for advertising in publications such as this one, is not an added expense, but an improved means of communication that takes the place of slower and more costly methods.

These are demonstrated facts and thinking buyers are recognizing the advantage to them of encouraging progressive, economical sales methods, such as have been adopted by the companies represented in the advertising pages of this journal.

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"Member of The Associated Business Papers, Inc." means proven circulations PLUS the highest standards in all other departments.

This publication is a member of the A. B. P.
Scouring Pump Cylinder made with a 20% Mayari mixture

Why Mayari Pig Iron Is Universally Used to Make Alloy Iron Castings

Mayari presents the cheapest, easiest and best way to alloy cast iron.
It is a natural nickel-chromium alloy—thus the alloys are always in the correct relation to each other.
Through the use of Mayari Pig Iron the alloying of the cast iron takes place in the cupola where the alloys can thoroughly permeate the metal giving greater uniformity than is possible through synthetic alloying.
Mayari acts as a purifying agent to the metal as well as a strengthening and toughening factor.
With the use of Mayari the hardness of castings can be controlled; a deep chill and close grain can be gotten; and the castings will machine readily.

Booklet "Mayari Pig Iron" Sent on Request

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Baltimore, Continental Bldg.
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Cleveland, Union Trust Bldg.
Cincinnati, Union Trust Bldg.
Seattle, L. C. Smith Bldg.

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for

Brass

The New Jersey Zinc Company
Established 1848
Products Distributed by
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is a stock of raw materials. They guarantee uninterrupted production. But they cost money and it is money saved to carry as small a stock as possible. Electromet Standard alloys can be shipped to you immediately from stock at the nearest Electro Metallurgical Co. plant. And you can carry a smaller stock if you make use of the service that goes with

Electromet Brand

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Standard Ferromanganese 78 to 82%
Low Carbon Ferromanganese
Manganese Metal
Manganese-Silicon
Manganese-Copper
Miscellaneous Manganese Alloys

SILICON
Ferrosilicon 15%
Ferrosilicon 50%
Ferrosilicon 75%
Ferrosilicon 80 to 85%
Ferrosilicon 90 to 95%

CHROMIUM
High Carbon Ferrochrome (maximum 6% carbon)
Low Carbon Ferrochrome (in grades, maximum 0.10% to maximum 2.00% carbon)
Chromium Metal
Chromium-Copper
Miscellaneous Chromium Alloys

Refined Silicon (minimum 97% silicon)
Calcium-Silicon
Silicon-Copper
Manganese-Silicon
Silico-Manganese
Miscellaneous Silicon Alloys

ZIRCONIUM
Ferro-Zirconium
Silicon-Zirconium
Nickel-Zirconium
Zirconium-Ferrosilicon

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When you are ready to equip for

Bigger Profits

Consult a Specialist

We specialize on pouring equipment. The ease and speed of operation of our machines and simplicity of our Overhead System makes profits for their owners.

Modern Pouring Systems work so fast that it is often necessary to chill the iron before pouring. In timing operations in one foundry, the following data was formulated:

POURING TIME

<table>
<thead>
<tr>
<th>Machine Poured Floors</th>
<th>Hand Poured Floors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filling 600 pound Ladle at Cupola</td>
<td>55 Seconds</td>
</tr>
<tr>
<td>Transporting Bull Ladle 150 ft. to furthest Pouring Floors</td>
<td>32 Seconds</td>
</tr>
<tr>
<td>Empty Bull Ladle and return to Cupola</td>
<td>2 minutes</td>
</tr>
<tr>
<td>Pouring Entire Heat of 14,000 pounds</td>
<td>1 Hour 10 Minutes</td>
</tr>
</tbody>
</table>

Pouring Iron from the Distributing Ladle into the Pouring Device Ladle, a simple, practical operation

Complete Light Pouring Unit
$175.00
Crane, Trolley and Pouring Device

Pouring Brass with a Crucible Pouring Device at Dole Valve Co., Chicago

That's the kind of system that will make profits for you.

Every machine from the 150 to the 1000 pound device is a specialist, designed for some particular type of work, iron, brass, and other metals. The question "Will it work?" ceases automatically as we check over your conditions and make our recommendations.

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MODERN POURING DEVICE COMPANY
PORT WASHINGTON, WIS.
Cut material handling costs
with Hyatt roller bearings

CRANES operate rapidly and smoothly with minimum attention when equipped with Hyatt roller bearings. One oiling will last from three to four months. These bearings stand up for years under the most severe conditions of service, outdoors and in, running almost continuously day after day.

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NEWARK DETROIT CHICAGO SAN FRANCISCO
WORCESTER PHILADELPHIA CHARLOTTE
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CORE OVENS
Car, Rack and Drawer Types

Battery of Whiting Drawer Type Ovens. Arranged so any drawer can be loaded or unloaded independent of other drawers.

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Handpower Traveling Crane, Rope-drum Hoist

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Unless your plant is very unusual, the Brownhoist engineering staff can work out some worthwhile, year-in-and-year-out, economies. And a lot of the "unusual" plants have found that Brownhoist had a profitable solution for their problems, too.

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Sand is delivered direct from the mixing machine, as needed, through the entire length of the foundry floor.

This saves floor space and makes it unnecessary for highly paid moulders or helpers to leave their work for a "wheelbarrow of sand."

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Paxson, J. W., Co.,
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Sly, W. W., Mfg. Co.,
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Cleveland, O.
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New York City.

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FOUNDRY BUSINESS MACHINES
National Engineering Co.,
459 W. Washington Blvd.,
Chicago, Ill.

FOUNDRY EXHAUSTERS
American Foundry Equipment Co.,
The, 368 Madison Ave.,
New York City.

FOUNDRY ENGINEERS—See ENGINEERS (Foundry, Mechanical, Electrical, etc.)

FOUNDRY EQUIPMENT
American Foundry Equipment Co.,
The, 368 Madison Ave.,
New York City.

FOUNDRY MACHINES
Metallurgical Sales Corp.,
11 Broadway,
New York City.

FOUNDRY MATERIALS
American Foundry Equipment Co.,
The, 368 Madison Ave.,
New York City.

FOUNDRY MOLDING MACHINES
American Foundry Equipment Co.,
The, 368 Madison Ave.,
New York City.

FOUNDRY SPECIALISTS
Stevens, Frederic B., Inc.,
Third and Larch Sts.,
Detroit, Mich.

FOUNDRY SPECIALISTS—See ENGINEERS (Foundry, Mechanical, Electrical, etc.)

FOUNDRY SUPPLIES
American Foundry Equipment Co.,
The, 368 Madison Ave.,
New York City.

FOUR WALLS
Whiting Corp.,
Harvey, Ill.

FRESCO (Sculpture)
American Foundry Equipment Co.,
The, 368 Madison Ave.,
New York City.

FURNACE BUILDINGS
Whiting Corp.,
Harvey, Ill.

FURNACE LININGS (Graphite)
Dixon, Joes., Crucible Co.,
Jersey City, N. J.

FURNACE LININGS (Graphite, Pyroxylin, etc.)
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Electric Furnace Co., Salem, O.

General Electric Co., Schenectady, N.Y.


FURNACES (Electric for Annealing, Hardening, Drawing, Carburizing)

Electric Furnace Co., Salem, O.


Swindell, Wm. & Bros., P. O. Box 723, Pittsburgh, Pa.

FURNACES (Electric Melting)

Detroit Electric Furnace Co., 2251 Park Ave., Detroit, Mich.

Electric Furnace Co., Salem, O.

General Electric Co., Schenectady, N.Y.


Swindell, Wm. & Bros., P. O. Box 723, Pittsburgh, Pa.

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Whiting Corporation, Harvey, Ill.

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Electric Furnace Co., Youngstown, Ohio.

Detroiter Furnace Co., 8211 Park Ave., Detroit, Mich.

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Letroit Electric Furnace Co.

Pittsburgh Electric Furnace Co.

General Engineering, Inc.

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Schenectady, N.Y.


Swindell, Wm. & Bros., P. O. Box 723, Pittsburgh, Pa.

Whiting Corporation, Harvey, Ill.

GAGGERS (Steel)

Franklin Core Rod & Gagger Co., Franklin, Pa.

Truscus Steel Co., Youngstown, Ohio.

United Company, Buffalo, N. Y.

Gas (Welding and Cutting)

Prent-O-Lite Co., Inc., 20 E. 42nd St., New York City.

Gas BOOSTERS (Rotary Positive Pressure)

Roots, P. H. & F. M., Co., Connersville, Ind.

Sturtivant, B. F., Co., Hyde Park, Brooklyn.

Gas EXHAUSTERS (Rotary Positive Pressure)

General Electric Co., Schenectady, N.Y.

Roots, P. H. & F. M., Co., Connersville, Ind.

Sturtivant, B. F., Co., Hyde Park, Brooklyn.

Gas PUMPS (Rotary Positive Pressure)

Roots, P. H. & F. M., Co., Connersville, Ind.

GAUGES (Welding)

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Strand, N. A., & Co., 4524 North Lincoln St., Chicago, Ill.


(Grinders (Pneumatic Portable) Chicago Pneumatic Tool Co., 6 E. 44th St., New York City.

Chicago Pneumatic Tool Co., 610 S. 78th St., Chicago, Illinois.

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Broadway, New York City.

(Grinding MACHINES)

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(Grinding PANS (Sand)

National Engineering Co., 549 W. Washington Blvd., Chicago, III.


(Grinding WHEELS—See Abrasive Wheels)

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Malleable Iron Fittings Co., Branford, Conn.

GUNS (Sandblast)

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HACK SAWSS—See Hacksaw (Hack)

HAMMERS (Air Forging)

Modern Pouring Device Co., Port Washington, Wis.


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Dock & Mill Company, 126 Main St., N. Tonawanda, N. Y.

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Dock & Mill Company, 126 Main St., N. Tonawanda, N. Y.

MAGNETIC SEPARATORS—See SEPARATORS (Magnetic)

MANIFOLDS (Oxygen)

MILLING ATTACHMENTS FOR MILLING STARS AND JACKS—See STARS (Tumbling Mill)

MOLDING MACHINES (Roll Over)
Adams, The, 175 Foster St., Dubuque, Iowa.


MOLDING MACHINES (Sand)

MOLDING MACHINES (Squeezer)
Adams, The, 175 Foster St., Dubuque, Iowa.


Freepost, Ill.

Mold Mfg. Co., Whitney Power Block, Cleveland, Ohio.

Federal Malleable Co., West Allis, Wis.


Moline Iron Works, Moline, Ill.

MOLDING STANDS
Modern Pouring Device Co., Port Washington, Wis.

MONETAL
Ingersoll and Nickel Co., 67 Wall St., New York City.

MOTORS (Air)

MOTORS (Electric)
General Electric Co., Schenectady, N. Y.


NAILS
Forster Union House Nail Co., 1090 Military Road, Buffalo, N. Y.

NICKEL
International Nickel Co., 67 Wall St., New York City.

NICKEL (Boron)

NITROGEN (Gas)
Linde Air Products Co., 30 E. 42nd St., New York City.

NOZZLES (Sandblast)
Koven, L. O., & Brother, Inc., 154 Oden Ave., Brunswick City, N. J.

Machado Co., 425 W. St., Cincinnati, O.

Pangborn Co., Connersville, Ind.

O. P. B. & F. M., Co., Connersville, Ind.

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Ingersoll-Rand Co., 11 Broadway, New York City.

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UNITED STATES GRAPHITE CO., Saginaw, Mich.

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Modern Pouring Device Co., Port Washington, Wis.

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Dings Magnetic Separator Co., 675 Smith St., Milwaukee, Wis.

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PANS (Steel)
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PANS (Tempering)


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PATTERNS (Wood, Metal)


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Chain Products Co., 3924 Cooper Ave., Cleveland, O.


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PATTERN PLATES (Dry)

PATTERN SHOP EQUIPMENT
Oliver Machinery Co., Grand Rapids, Mich.

PATTERN SHOP SUPPLIES AND EQUIPMENT

PATTERN WAX
United Company Co., 228 Elk St., Buffalo, N. Y.

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Brown Co., Baltimore, Md.

Hanna, M. A., Co., The, Leader-News Bldg., Cleveland, O.


Fiske & Co., 228 East 40th St., New York City.

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Truscon Steel Co., Youngstown, O.

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Truscon Steel Co., Youngstown, O.

PLATES (Core Drying)
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Modern Pouring Device Co., Port Washington, Wis.

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<td>Cape May Sand Co., N. J.</td>
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<td><strong>Pangborn Corporation, 5115 Hagerstown Rd.</strong></td>
<td>Pangborn Corporation, 5115 Hagerstown Rd.</td>
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<td><strong>Pittsburgh, Pa.</strong></td>
<td>Portland Sand &amp; Machine Co., 6151 St. Clair Ave., Cleveland, O.</td>
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<td><strong>Ridgeway Sand Co.</strong></td>
<td>Ridgeway Sand Co., 611 Guardian Blvd., Cleveland, O.</td>
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<td><strong>Sands, Inc.</strong></td>
<td>Sands, Inc., 127 South Michigan Ave., Chicago, Ill.</td>
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| **Cape May Sand Co.** | Cape May Sand Co., N. J. |
| **Globe Steel Abrasive Co., Dept. F, Mansfield, O.** | Globe Steel Abrasive Co., Dept. F, Mansfield, O. |

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| **SANDBLAST TUMBLING BARRELS** | See TUMBLING BARRELS |

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| **Macleod Co., 2225 Rogen St., Cincinnati, O.** | Macleod Co., 2225 Rogen St., Cincinnati, O. |
| **Pangborn Corporation, 5115 Hagerstown Rd., Hagerstown, Md.** | Pangborn Corporation, 5115 Hagerstown Rd., Hagerstown, Md. |

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| **Brown Foundry Mfg. Co., 4403 S. Clair Ave., Cleveland, O.** | Brown Foundry Mfg. Co., 4403 S. Clair Ave., Cleveland, O. |

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Penton Bldg., W. 3rd St. & Lakeside Ave., Cleveland, O.

BACHARACH INDUSTRIAL INSTRUMENTS

Saved THREE TONS of Coke a Day

This is an actual record common to Bacharach P-V Meter installations. In addition to knowing the volume of air to the cupola and obtaining uniform heat, it is possible to determine conditions day after day by accurate knowledge of the facts possible with this meter. Write for Bulletin 2110, with reproductions of graphic charts from actual operation.

BACHARACH INDUSTRIAL INSTRUMENT CO.

7000 Bennett St., Pittsburgh, Pa.
Let's clean out YOUR shop attic

Haven't you a cupola, converter, electric furnace, molding machine, core oven, air compressor, crane or other equipment you no longer need?

Recently a large Foundry Company which had never used classified advertising followed our suggestion and put a “for sale” sign on several pieces of equipment, advertising them in the want-ad columns of THE FOUNDRY.

Here's what they just wrote us.

"We used your columns to good advantage and sold every piece of equipment offered".

They said a lot more but that tells the story of successful results secured by this company and we could mention dozens of other concerns which have sold equipment through classified advertising in THE FOUNDRY.

Now is a good time to sell.

Let's clean out that shop attic of YOURS and hang a “for sale” sign on that equipment YOU no longer need.

It can be done in the December 1 issue if you mail your “for sale” advertisement to reach us by November 20.

TaE FounDRy
Penton Building
Cleveland Ohio
Help Wanted

SALES MANAGER
A manufacturer located in Detroit, who has been in business twenty years, with a very successful record, has a position open for a man experienced in selling mechanical foundry equipment. The man selected for this position will have an opportunity for continued advancement. Give full particulars as to experience, nationality, age, etc. All communications confidential.

Address Box 362,
THE FOUNDRY, Cleveland.

SALES MANAGER
For a large concern having several branches can use a few first class, experienced salesmen after January 1st. Those having experience in polishing and plating supplies preferred. Write fully and give references. Address Box 364, THE FOUNDRY, Cleveland.

SALES MANAGER
OPEN SHOP. We are looking for a top man to try his hand at selling gray and cast iron foundry equipment. Address Box 365, THE FOUNDRY, Cleveland.

FOUNDRY SUPPLY SALESMAN:
Concern having several branches can use a few first class, experienced salesmen after January 1st. Those having experience in polishing and plating supplies preferred. Write fully, giving references, outline of previous selling experience, salary expected. Address Box 334, THE FOUNDRY, Cleveland.

WANTED A WORKING FOREMAN FOR A growing Aluminum foundry. Exceptional opportunity for advancement. Must be able to make all types of match plates and have a knowledge of up to date handling of aluminum alloys. We want a man of good habits who will be able to grow with the business. In reply give experience and salary expected. Address Box 370, THE FOUNDRY, Cleveland.

FOUNDRY MANAGER
For a growing concern in the west, making exclusively castings by the electric furnace want the best man available. Age, nationality, experience, references furnished. Address Box 327, THE FOUNDRY, Cleveland.

BRASS FOUNDRY SUPERINTENDENT wishes to get in touch with representatives of large brass foundries. We are looking for a man who is thoroughly experienced in the operation of large plant running small close-grained core work on a production basis. Address Box 351, THE FOUNDRY, Cleveland.

BRASS FOUNDRY FOREMAN TO OPER- ate large plant running small close-grained core work on a production basis. Must be familiar with bench and machine operation know metal mixtures, understand core and metal chemistry. A knowledge of other non- ferrous mixtures would be of great assistance. Mention age, experience, references, wages expected and full particulars. Address Box 356, THE FOUNDRY, Cleveland.

WE NEED A FOREMAN who has had twenty years experience in sand and loam molding, cupola and mixing by the electric furnace process. A knowledge of modern foundry practice, capable of taking full charge of large foundry making a line of intricate castings, 15 years experience as superintendent, services available at once. Address Box 374, THE FOUNDRY, Cleveland.

Positions Wanted

WANTED BY CALIFORNIA STOVE CON- cern capable capable fabricating head experienced on gas and coal ranges and with thorough knowledge of electric stoves. Should understand all branches of factory production including designing. State full experience, age and salary. Address Box 360, THE FOUNDRY, Cleveland.

HIGH GRADE FOUNDRY SUPERIN- tendent wanted for electric steel foundry in middle west, making exclusively steel castings by the electric furnace process. We want the best man available. Apply stating age, nationality, experience, training and salary wanted. Wonderful opportunity to work up. Strictly confidential. Apply Address Box 371, THE FOUNDRY, Cleveland.

WANTED MALLEABLE FOUNDRY FORE- man who is thoroughly familiar with modern foundry practice. Must be capable of taking inexperienced men into good moulding crew, with good moulding experience, reference and salary expected in reply. Address Box 353, THE FOUNDRY, Cleveland.

WANTED: BY LARGE MANUFACTURING concern to take charge of the Iron Foundry. Must be thoroughly familiar with all methods and machines. Reply stating age, experience and wages expected, also copy of references. Address Box 372, THE FOUNDRY, Cleveland.

POSITION WANTED AS SALESMAN or salesman. No objection to traveling. Have had practical experience as foreman of pattern and foundry department as well as draftsman and estimator. Have had seven years experience selling foundry equipment, gray iron castings, patterns and machine work. Sales have been on a fairly volume and profitable. Age 28 years. References furnished. Address Box 323, THE FOUNDRY, Cleveland.

PRACTICAL BRASS SUPERINTENDENT wishes position. 25 years experience in brass foundry practice, efficiency views, understand metals; have modern methods; can help. Address Box 311, THE FOUNDRY, Cleveland.

PRACTICAL GRAY IRON FOUNDRY SU- perintendent wishes to get in touch with reliable and progressive firm who is in need of practical assistance. Address Box 350, THE FOUNDRY, Cleveland.

IMPORTANT
Six words must be added for box address. Publication Dates: First and Fifteenth of the month. To insure insertion, copy must reach us ten days prior to date of publication. Please have your remittance accompany advertisement.

Help and Position Wanted advertisements should state whether—Gray Iron, Steel, Malleable or Brasses.
Classified Advertisements

Positions Wanted

BRASS FOUNDRY SUPERINTENDENT with a knowledge of all types of gray iron and brass, bronze or aluminum. Production on grey iron and brass foundry equipment. Jobbing and melting. Experienced in all types of gray iron. Also general foundry work. Jobbing and melting. Address Box 346, THE FOUNDRY, Cleveland.

FOUNDRY OWNERS DESIRE SUPERINTENDENTS, WRITE US DIRECT. ALL MEN DESIRE FOUNDRY SUPERINTENDENTS. ALUMINIUM - BUTTONS - ASK TO SEE THE FOUNDRY, Cleveland. McLean's SYSTEM, INC., 865 North Michigan Blvd., MILWAUKEE, WIS.

A-1 BRASS FOUNDRY FOREMAN WITH twenty-six years experience on brass and aluminum die and pattern making. Five years in general foundry, up to date on all latest methods. Jobbing and machine molding. A production getter also very well versed on all kinds of metal. Can furnish list of references. Address Box 346, THE FOUNDRY, Cleveland.

PLANT OR FOUNDRY MANAGER, TECH- nically and practically trained high class executive with a background of years around foundry machine and pattern shops. Metallurgist, Scientist, and good manufacturer. Can handle anything in gray iron and semi-steel. High or low pressure castings. General jobbing or quantity production. Open shop preferred. Address Box 339, THE FOUNDRY, Cleveland.

FOUNDRY MANAGER OR SUPERIN- tendent, young man with six years in jobbing foundry management desires con- nection with a progressive firm engaged in the manufacture of light or heavy gray iron castings. Address Box 322, THE FOUNDRY, Cleveland.

STEEL CLEANING ROOM FOREMAN, fourteen years experience, wishes to make a change about January 15, 1926. Competent handler of men to get the greatest production at a low cost. A-1 references. Address Box 322, THE FOUNDRY, Cleveland.

GRAY IRON FOUNDRY FOREMAN AVAILABLE at once, desires a position with a reliable firm, experienced on heavy, medium, light, green or dry sand jobbing or produc- tion. Thoroughly versed in all classes of gray iron and semi-steel. Address Box 327, THE FOUNDRY, Cleveland.

TELEGRAPHIST WANTED, FOR A POSITION as superintendent of a live electric steel foundry. Must have at least 15 years of experience. Write, giving full details, Address Box 338, THE FOUNDRY, Cleveland.

SALESMAN, MALLEABLE CASTINGS, 15 years experience road and office work, sales and service. Favorable personal ac- quainance with trade. Consistent record of results. Address Box 269, THE FOUNDRY, Cleveland.


POSITION WANTED PATTERNMAKER foreman or assistant to foundry superintendent, gray iron foundry, with 25 years practical experience. Jobbing and general foundry work. Address Box 356, THE FOUNDRY, Cleveland.

WANTED POSITION AS MALLEABLE FOUNDRY. Jobbing, general production, molding machines and rings, mixing iron by analysis. Address Box 372, THE FOUNDRY, Cleveland.


POSITION WITH RELIABLE FIRM BY PROFESSIONAL foundryman. Iron foundry doing extensive line of work. Good fair, and production work. Can give chance. Address Box 341, THE FOUNDRY, Cleveland.

POSITION WANTED AS ASSISTANT SUPER- intendent or foreman in steel or gray iron foundry. Have had twenty years experience in jobbing and general production work. Can furnish references. Address Box 345, THE FOUNDRY, Cleveland.

SALESMAN, know the buyers and supplies from Pittsburgh to the Mississippi. Address Box 339, THE FOUNDRY, Cleveland.

FOUNDRY ENGINEER—BROAD FY- INEND. Highly skilled non-ferrous foundryman with broad experience in jobbing and production work by modern methods, well versed in non ferrous alloys. A proven executive capable of executive and maintaining a first class organization. Have had responsible position with reputable concerns and can furnish A-1 references as to ability. Available January 1, 1926. Address Box 377, THE FOUNDRY, Cleveland.

POSITION WANTED BY A MOLDER WHO CAN MANAGE HIS OWN TIME, KNOWLEDGE AND LACK OF TAXATION. WANTED TO PRODUCE CASTINGS FOR PATTERN. 36 YEARS OF AGE—AMERICAN—ADDRESS BOX 357, THE FOUNDRY, CLEVELAND.


POSITION AS FOREMAN OR SUPERIN- tendent in gray iron foundry doing light, medium and heavy work. Jobbing or all around foundry experience; technical graduate. Take care of the details. Jobbing and production. Available after New Years. Address Box 356, THE FOUNDRY, Cleveland.

Position Wanted

FOR EXPANSION PURPOSES. We will consider any article of foundry equipment that is in good operating condition. Send full details. Harwood Mfg. Co., 593 South Raymond Ave., Pasadena, Calif.

WANTED TO INVEST WITH SERVICES IN live up-to-date non-ferrous foundry. Middle west preferred but will consider good proposition anywhere. Am metallurgist and chemist. With practical experience. Will move as soon as possible. Address Box 309, THE FOUNDRY, Cleveland.

FOR SALE—AT PASADENA, CAL., ONE oil fired furnace with blower and full equip- ment also extra brick and oil pressure tank. Capacity Brass 600 lbs., iron 500 lbs. Price $810.00 complete. Harwood Mfg. Co., 593 South Raymond Ave., Pasadena, Calif.

FOR SALE, BLOWERS: ONE CONNERSVILLE Blower, displacement 2/10 Per. Price $30.00. Two Roots No. 4 Blowers on iron base direct connected to 2 H. P. 220 V. Current Motors, each $125.00. Queen City Electric Co., 1753 Grand Ave., Cincinnati, Ohio.

FOR SALE, BLOWERS. Roots, Connersville, Sturtevant, Piqua, Buffalo.

Dings Magnetic Separator

Type M-3, belt driven, Complete with Generator.

Machinery Dealers Incorporated, 421 Chapel St., New Haven, Conn.

Opportunities

FOR SALE—AT PASADENA, CAL., ONE oil fired furnace with blower and full equip- ment also extra brick and oil pressure tank. Capacity Brass 600 lbs., iron 500 lbs. Price $810.00 complete. Harwood Mfg. Co., 593 South Raymond Ave., Pasadena, Calif.

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FOR SALE, BLOWERS. Roots, Connersville, Sturtevant, Piqua, Buffalo.

Dings Magnetic Separator

Type M-3, belt driven, Complete with Generator.

Machinery Dealers Incorporated, 421 Chapel St., New Haven, Conn.

FOR SALE, BLOWERS: ONE CONNERSVILLE Blower, displacement 3 1/10 cu. ft. Per. Price $30.00. Two Roots No. 4 Blowers on iron base direct connected to 2 H. P. 220 V. Current Motors, each $125.00. Queen City Electric Co., 1753 Grand Ave., Cincinnati, Ohio.

FOR SALE, BLOWERS. Roots, Connersville, Sturtevant, Piqua, Buffalo.

Dings Magnetic Separator

Type M-3, belt driven, Complete with Generator.

Machinery Dealers Incorporated, 421 Chapel St., New Haven, Conn.
FOR SALE

CRANES

- 25-ton NORTHWESTER with 5-ton auxiliary 80' span, Motors 3.5-225-Volt, cranes unused.
- 25-ton P & H with 5-ton auxiliary 40' span, Motors 3.5-225 volt, cranes unused.
- 15-ton SHAW—48' span, 3.5-225 Volts cranes complete with 360° of runway.

1—Panbrough 90° Rotary Table Sand Blast Room, 34 x 10' x 12', 13/4 HP Motor, 100 gpm, complete.
1—Panbrough—Standard Sand Blast Room 12 x 10', 1/2 HP Motor, 100 gpm, complete.
42° x 42° Panbrough Type AG double deck screen, 40 gpm, 3/4 HP Motor.
1—36° x 40° Panbrough Type AG single outlet, 100 gpm, 1 HP Motor.
1—Panbrough AE, size 5, 24° x 30' with separator.
2—Koven 15° x 36' long.
1—16° x 36' Milwaukee Blast Co.
1—Type GI, size No. 1, serial No. 1, complete with elevator, bar 24° x 28', complete with sand elevator.
2—3 x 48 x 14°—tight and loose pulley.
1—Type GI, size 48, 24° x 42', complete with sand elevator.
2—3 x 48 x 14°—tight and loose pulley.
1—Type GI, size 48, 24° x 42', complete with sand elevator.
TUMBLERS
2—3 x 48 x 14°—tight and loose pulley.
2—5 x 48 x 14°—tight and loose pulley.
1—Sty Sand Reclaiming Mill 36 x 14° x 1', core Ecorch perforated plates, arranged for motor drive.
1—Sty Sand Reclaiming Mill 32° x 42' x 11', screen and pump.
COPULAS
1—each Whitting No. 3—6—7, and 9.
1—type of continuous Type 66' overall, NEVER USED.
1—type of continuous Type 66' overall, NEVER USED.
Write for our latest list No. 82 covering complete FOUNDRY EQUIPMENT.
SCULLY-JONES & COMPANY
1913 S. Wabash Ave.
Chicago, Ill.

FOR SALE—ONE SECOND HAND NO. 5-48" x 48" x 48" Paxson Mills with cast base plate arranged for motor drive, in first-class condition.
Franklin Machine Co.
Providence, R.L.

FOUNDRIES

For Sale or Lease

Have professional engineers with extensive plant experience who can therefore better appreciate your requirements, aid you in locating an existing foundry.

TECHNICAL SERVICE COMPANY
Wooster, Ohio


FOR SALE, LEASE OR CONSOLIDATION

modemly equipped gray iron foundry of 10 to 12 tons cast. All practically new. Building 70° x 170° fireproof construction. Has own exclusive line of molding machinery. Good local and nearby markets. Will deal only with prospective parties and can use only the highest grade of men. Address Box 612, THE FOUNDRY, Cleveland.

FOR RENT OR LEASE

Fully equipped gray iron Foundry in finest 60,000 city in South Michigan. Has railroad siding, 10,000 sf. main floor space, two cupolas, electric crane, in fact, complete equipment. Will lease for 5 years of responsible capable party and contract to take our needs. Appraise. Needs continued operation. Good local and nearby markets. Will deal only with prospective parties and can use only the highest grade of men. Address Box 612, THE FOUNDRY, Cleveland.

FOR SALE, FOUNDRY LOCATED IN A town of 18,000 population, well equipped and doing good business. For further information write J. A. COON, BUILDING COMPANY, Cape Girardeau, Missouri.
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ANOTHER CORE PROBLEM SOLVED.

PERFECT CORES
AT THE RATE OF 400 PER HOUR
FOR THE
EUREKA VACUUM CLEANER CO.

An extensive study of core oven performance resulted in the adoption of a Young Brothers Oven.

Today one of our continuous conveyor type ovens is turning out the required volume of perfectly formed, durable cores at costs well under the operating budget.

Young Brothers Company
6508 Mack Avenue, Detroit, Michigan

IT TOOK A YOUNG BROTHERS OVEN TO HANDLE THE JOB

The Eureka Vacuum Cleaner Co. has just installed in the Detroit Plant a new permanent moulding process.

The new process demanded PERFECT CORES.

The new production schedule demanded VOLUME OUTPUT.
Whatever your manufacturing process

If it is done with heat \textit{better} with gas

because

gas is on tap day or night, year in and year out—it never goes on strike

gas is capable of sure automatic control, delivering and maintaining the exact desired degree of heat without human attention

gas is clean, free of waste, eliminates dirt, soot and ashes

gas eliminates storage and handling costs which must be endured with crude fuels

gas is billed to you after you use it; and you pay only for what you actually consume

—no capital tied up in next month’s fuel

gas is the clean, ideal superfuel—the ultimate fuel, the fuel for you.

\textit{Expert combustion engineers will be glad to show you, in your own plant, how gas can improve your manufacturing processes, cut costs, increase output. Get in touch with your local gas company, or write}

THE AMERICAN GAS ASSOCIATION
342 MADISON AVENUE, NEW YORK