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APPARATUS FOR CONDITIONING MOLDING SAND

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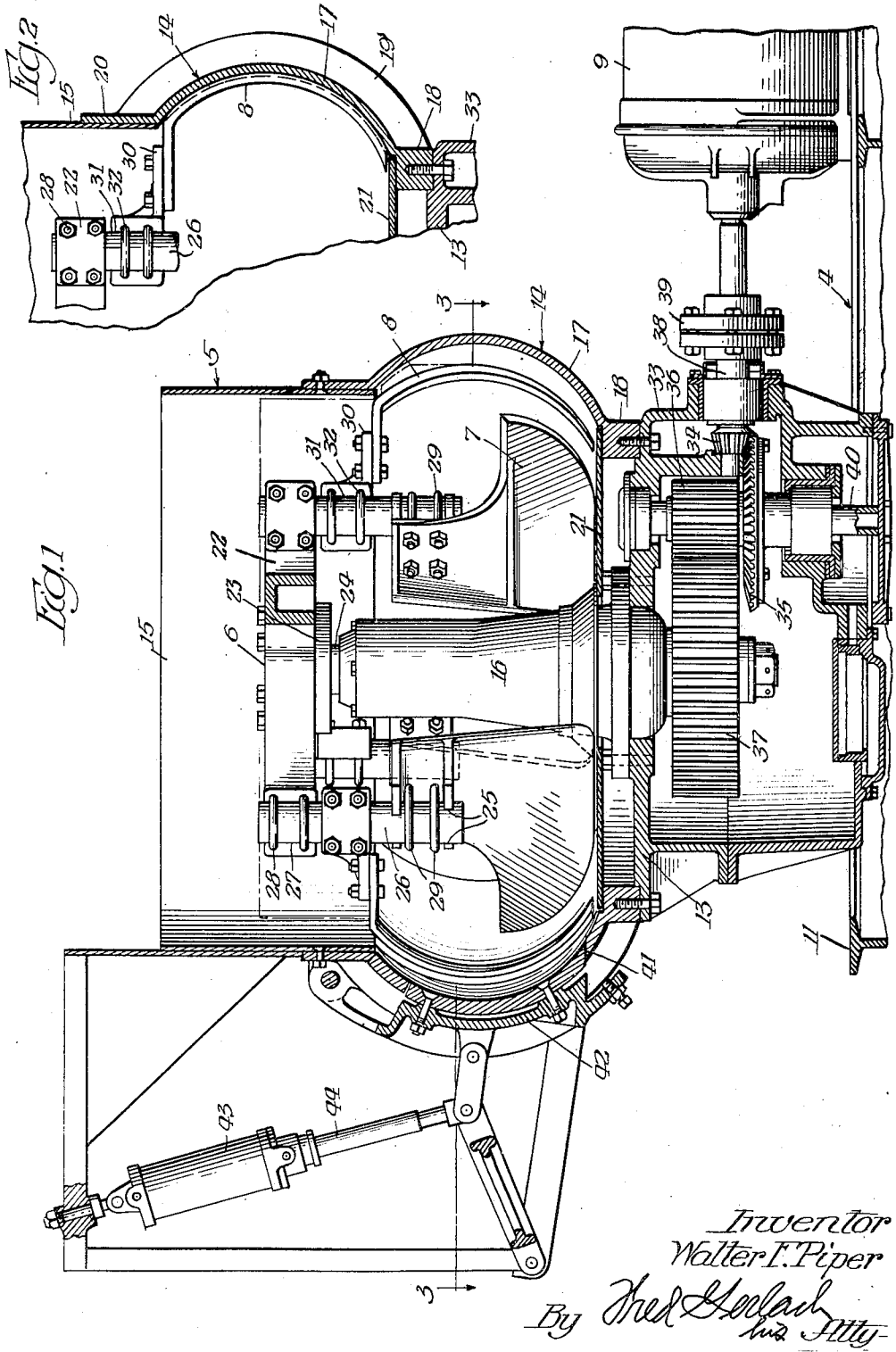


Fig. 2



Fig. 1

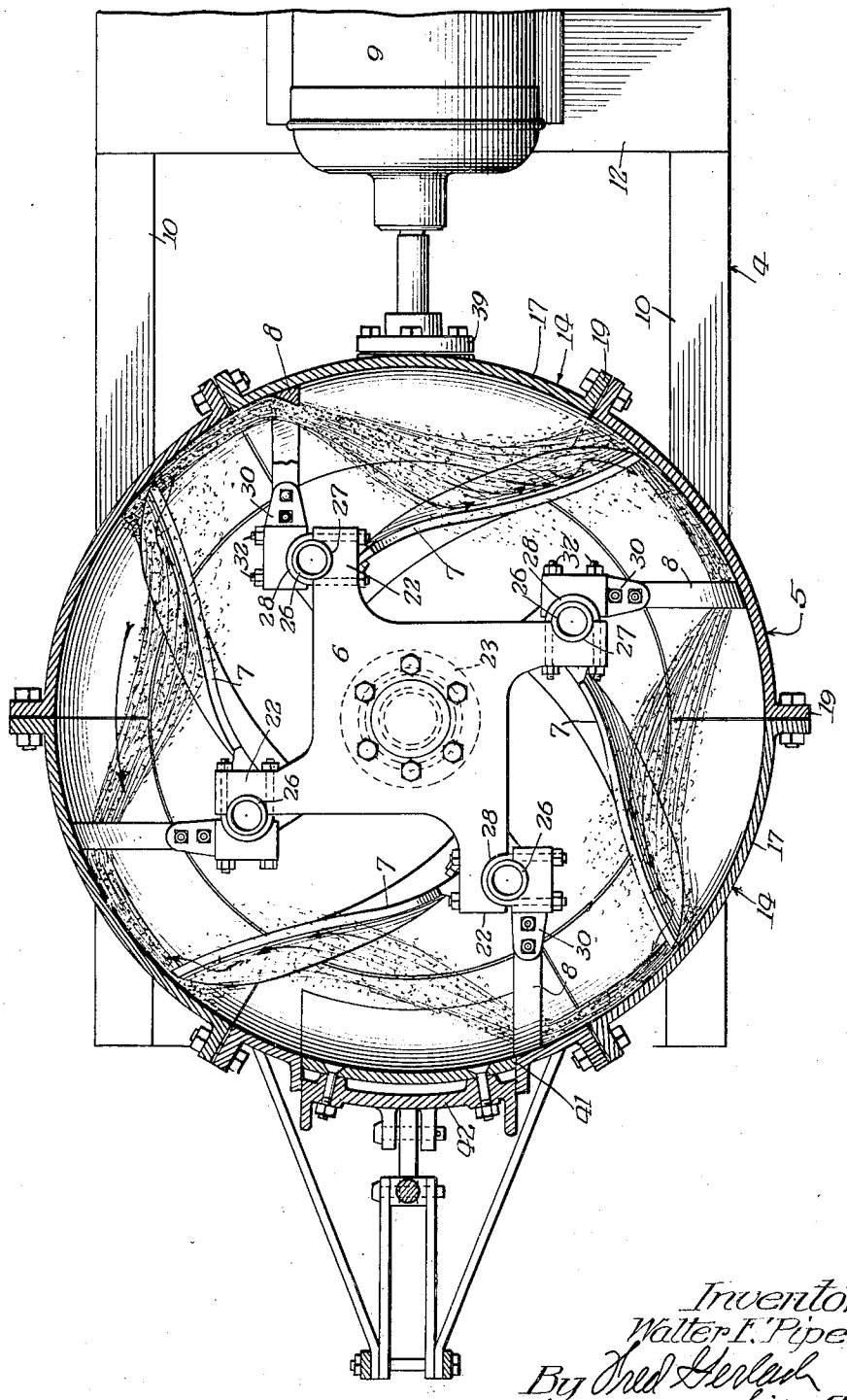
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Fig 3




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2,213,716

## APPARATUS FOR CONDITIONING MOLDING SAND

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2 Claims. (Cl. 259—108)

The present invention relates generally to apparatus for use in a foundry or like establishment in conditioning or treating molding sand such, for example, as core sand. More particularly the invention relates to that type of sand conditioning apparatus which operates to mix a bonding material with the sand and comprises as its main parts an open top sand retaining receptacle with a circular bottom and an annular upwardly extending side wall, and a deflector and scraper equipped rotary power driven crosshead in the receptacle.

One object of the invention is to provide a sand conditioning apparatus of this type which effects the desired or proper distribution of the bonding material with respect to the grains of sand without the use of rotary sand squeezing mulling balls or wheels, and in addition, operates effectively and efficiently to aerate the sand and break up all clusters or lumps.

Another object of the invention is to provide a sand conditioning apparatus of the type and character under consideration in which the crosshead carried and driven deflectors and scrapers operate alone to effect the desired mixing of the bonding material with the sand and also aeration of the sand, and are arranged and designed so that during operation of the apparatus they maintain the entire mass or batch of sand within the receptacle in suspension adjacent to the annular side wall of the receptacle and successively deflect the sand outwardly in a scattered manner against the side wall for packing or compressing purposes, and project the sand inwardly in a finely scattered manner.

A further object of the invention is to provide a sand conditioning apparatus which is generally of new and improved design, consists of but a minimum number of parts, and may be manufactured and produced at a low cost.

Other objects of the invention and the various advantages and characteristics of the present sand conditioning apparatus will be apparent from a consideration of the following detailed description.

The invention consists in the several novel features which are hereinafter set forth and are more particularly defined by claims at the conclusion hereof.

In the drawings which accompany and form a part of this specification or disclosure and in which like numerals of reference denote corresponding parts throughout the several views:

Figure 1 is a vertical longitudinal sectional view of a sand conditioning apparatus embodying the invention;

Figure 2 is a fragmentary sectional view illustrating in detail the design and construction of the scrapers and the manner in which the scrapers are connected for drive by the rotary power driven crosshead; and

Figure 3 is a horizontal sectional view taken on the line 3—3 of Figure 1 and showing the arrangement and design of the deflectors and scrapers and the manner in which they coact to effect the desired aeration of the sand and distribution of the bonding material and also to maintain the entire mass or batch of sand in the receptacle in suspension adjacent to the side wall of the receptacle.

The apparatus which is shown in the drawings constitutes the preferred embodiment of the invention and is adapted primarily for use in a foundry or like establishment. It serves or operates, as hereinafter described, to condition molding sand such as core sand and as the main parts thereof comprises a frame structure 4, an open top receptacle 5, a rotary crosshead 6, a set of plow-type deflectors 7, a set of scrapers 8, and an electric motor 9.

The frame structure 4 serves as a supporting medium for the receptacle and the various other parts of the apparatus and is adapted to rest on the floor of the foundry in which the apparatus is used. It is rectangular, as shown in Figure 3, and consists of a pair of laterally spaced parallelly arranged horizontally extending side beams 10, a pair of transversely and horizontally extending cross-beams 11, and a bed plate 12. The side beams 9 are in the form of I-beams and are held in laterally spaced relation by the cross-beams 10. The bed plate 11 is located at one end of the frame structure 4, as shown in Figure 2. It extends across and is secured to the top flanges of the side beams and serves as a pedestal or bed for the electric motor 9.

The receptacle 5 is positioned over and spaced above the other end of the frame structure 4 and is adapted to be charged with a batch of sand to be conditioned for molding purposes. It is circular as far as general contour is concerned and consists of a circular bottom 13, an upstanding outwardly bulged annular side wall 14, a ring 15 at the top of the side wall, and a tubular member 16 in the central portion of the side wall. The bottom 13 is in the form of a casting and embodies supporting means (not shown) whereby it is secured to, and positioned above the frame structure 4. The side wall 14 of the receptacle is

substantially semicircular in cross-section and extends outwardly and upwardly and then inwardly from the marginal portion of the bottom 13. It surrounds the deflectors and scrapers and consists of an annular series of complemental sections 17. The latter are arranged in abutting relation and embody inwardly extending bottom flanges 18, abutting side flanges 19, and upwardly extending top flanges 20. The bottom flanges 18 rest on and are clamped against the outer margin of the bottom 13 of the receptacle, as shown in Figure 1. The side flanges 19 are arcuate and are secured together in abutting relation by means of bolts or other connecting devices. The top flanges 20 extend between the upper ends of the side flanges 19 and define a circular inlet or opening for the receptacle 5. The ring 15 operates to guide the sand to be conditioned through this opening into the receptacle. The lower end of the ring fits within the top flanges 20 and is secured to the latter by means of bolts or in any other suitable manner. The tubular member 16 extends upward from the central portion of the bottom 13 and is of such length that the upper end thereof terminates at substantially the same elevation as the top flanges 20 of the side wall forming sections 14. The lower end of the member 16 projects through a centrally disposed opening in the receptacle bottom and is bolted in place. In addition to the bottom 13, the side wall 14, the ring 15 and the tubular member 16, the receptacle 5 comprises an annular false bottom 21. This false bottom overlies and is spaced a slight distance above the bottom 13 and extends between the bottom of the member 16 and the bottom or lower margin of the side wall 14.

The crosshead 6 is in the form of a one-piece casting and is disposed in the central portion of the ring 15. It is substantially square and has outwardly extending lugs 22 at the corners thereof. The central portion of the crosshead is fixedly connected by bolts to an enlarged head 23 at the upper end of a vertically extending shaft 24. The latter extends through the tubular member 16 of the receptacle 5 and is driven, as hereinafter described, by the electric motor 9 so as to cause the deflectors 7 and the scrapers 8 to travel in a circular course around the outwardly bulged side wall 14 for sand conditioning purposes.

The plow-type deflectors 7 are four in number and as shown in Figure 4, are arranged in an annular series and at equidistantly spaced intervals. They are preferably in the form of metal castings and extend from the tubular member 16 to the outwardly bulged side wall 14. During drive of the crosshead 6 the deflectors come in contact with the entire batch or mass of sand in the receptacle 5 and operate to deflect or fling the sand outwards against all portions of the inner periphery of the side wall 14. The upper portions of the inner parts of the deflectors have integral semi-cylindrical sockets 25 for the lower ends of four vertically extending pipes 26. The upper ends of these pipes fit within semi-cylindrical sockets or recesses 27 in the lugs 22 of the crosshead 6 and are fixedly secured in place by means of U-bolts 28. The deflectors 7 are held in connected relation with the lower ends of the pipes by means of bolts 29. These bolts are carried by the upper portions of the inner parts of the deflectors, as shown in Figure 1, and extend around the lower ends of the pipes. The deflectors 7 extend outwardly and rearwardly at substantially an angle of 45° with respect to the arc of rotation and as a result the sand which is encountered by the leading faces thereof is deflected outwards in the direction of the side wall of the receptacle. The inner and central portions of the deflectors are substantially the same in height as the side wall with the result that the entire batch of sand is urged outwards into contact with the side wall. Because of the specific angularity and shape of the deflectors the sand is flung outwards in a scattered manner and attains such velocity or speed that it becomes packed or compressed as soon as it strikes against the side wall. Because of the scattering of the sand prior to abutment against the inner face of the side wall of the receptacle, aeration takes place. By compressing or packing the sand against the side wall after scattering the sand is so pressed or squeezed together that any bonding material mixed therewith becomes evenly distributed over the grains of sand. The bottom margins of the deflectors are shaped conformably to the top base of the false bottom 21 and the lower portion of the side wall 14. The outer parts of the deflectors are warped or canted, as shown in Figure 3, so that a portion of the sand is directed upwards towards the upper portion of the receptacle side wall. As the result of the specific shaping of the deflectors, the sand in the receptacle is not only deflected outwards in a scattered manner against the inner face of the side wall, but also is deflected in such manner that it packs against all portions of the inner face of the receptacle side wall. By having the outer end parts of the deflectors warped or canted so that a portion of the sand is directed upwards towards the upper portion of the side wall of the receptacle, the sand not only packs against all portions of the side wall of the receptacle but also is subjected to a mulling or rubbing action which produces the desired distribution of the bonding material.

The scrapers 8 are four in number, as shown in Figure 3 and are positioned between the deflectors. They operate during drive of the crosshead 6 to scrape the deflector packed or compressed sand from the inner periphery of the outwardly bulged side wall 14 of the receptacle and direct it inwards in a finely scattered manner against the inner and central portions of the deflectors. As shown in Figure 2 of the drawings, the scrapers are arcuate and conform substantially in curvature to the side wall 14. The lower ends of the scrapers terminate adjacent to the outer margin of the false bottom 21 and the upper ends of the scrapers are connected by brackets 30 to the central portions of the pipes 26. The brackets 30 are disposed directly beneath the lugs 22 at the corners of the crosshead and have semi-cylindrical sockets or recesses 31 in which the central portions of the pipes fit. U-bolts 32 extend around the pipes and through the brackets 30 and serve to secure the scrapers in their operative position. The inner faces of the scrapers are angularly arranged, as shown in Figure 2, so that the sand after being scraped from the inner face of the side wall 14 is deflected inwards towards the inner and central portions of the deflectors. The scrapers are so positioned or arranged with respect to the deflectors that during operation of the apparatus the packed sand is deflected toward the central portions of the deflectors in a suspended manner

and does not come in contact with or fall to the false bottom of the receptacle.

The shaft 24 together with the crosshead 6 and the deflectors and scrapers, is driven by the electric motor 9 through the medium of speed reducing gearing in a cast metal housing 33 beneath the receptacle. The bottom 13 of the receptacle serves as the top of this housing. The speed reducing gearing consists of a bevel pinion 34, a bevel gear 35, a pinion 36, and a gear 37. The bevel pinion 34 is fixedly connected to one end of a horizontally extending shaft 38. This shaft is journaled in a bearing in one of the side walls of the housing 33 and is connected at its other end by a coupling 39 to one end of the armature shaft of the motor 9. The bevel gear 35 meshes with, and is driven by, the bevel pinion 34 and is keyed or otherwise fixedly secured to the central portion of a vertically extending shaft 40. The latter is journaled in upper and lower roller bearings and is located at one side of the shaft 24. The pinion 36 is disposed above the bevel gear 35 and is fixed to the upper end of the shaft 40. It meshes with the gear 37 and serves to drive the latter in response to operation of the electric motor 9. The gear 37 is keyed to the lower end of the shaft 24 and operates to drive the latter together with the crosshead and the deflectors and scrapers.

In order that the sand in the receptacle may be discharged at the conclusion of a conditioning operation, one of the side wall forming sections 17 is provided with a substantially rectangular opening 41. This opening is normally closed by a door 42 which is hinged at the top thereof so that it may be swung outwardly and upwardly into an open position. Mechanism in the form of a cylinder 43 and a piston 44 serves in response to control thereof to open and close the door. When it is desired to discharge the sand in the receptacle after conditioning thereof, the door is swung into its open position. When the door is in such position, the deflectors discharge the sand from the receptacle as they pass by the discharge opening 41.

The apparatus is preferably driven or operated so that the crosshead 6 rotates at approximately 90 R. P. M. When the receptacle 5 is charged by introducing a batch of sand into it through the ring 15 thereof and the electric motor 9 is started to effect drive of the crosshead, the deflectors 7 and the scrapers 8 move in a circular course around the outwardly bulged side wall 14 and effect not only mixing of any bonding material such as linseed oil with the sand but also aeration of the sand. During drive of the crosshead the deflectors 7 engage the sand within the receptacle and fling it outwards in a finely scattered manner against all portions of the side wall 14 of the receptacle. As soon as the sand impinges or strikes against the side wall it builds up into a compressed layer and this layer is encountered by the scrapers 8. The latter when brought into engagement with the packed sand scrape the sand from the inner periphery of the receptacle and because of their shaping, deflect the sand inwards in finely divided streams towards the inner and central parts or portions of the deflectors. The deflectors and scrapers act upon the entire batch of sand within the receptacle and operate successively to fling the sand outwards in a scattered manner against the side wall and then to scrape the material from the side wall and project is inwards against the deflector. The successive action of the deflectors and the scrapers effects because of the scattering of the sand complete aeration of the sand and in addition an efficient distribution of the bonding material over the grains of sand. Because of the number and position of the deflectors and scrapers and the speed at which the crosshead is driven, the sand during conditioning within the receptacle is maintained in suspension. Because of the scattering of grains of sand disintegration of any and all lumps or clusters results and the sand at the end of its conditioning period within the receptacle is in condition for immediate use in molds or flasks. At the end of the conditioning operation, the conditioned sand is discharged from the receptacle by opening the door 42.

The herein described molding sand conditioning apparatus consists of but a small number of parts and hence may be manufactured at a low and reasonable cost. It effectively and efficiently fulfills its intended purpose and serves to aerate the sand in addition to distributing the bonding material.

The invention is not to be understood as restricted to the details set forth, since these may be modified within the scope of the appended claims, without departing from the spirit and scope of the invention.

This application for Letters Patent is a continuation in part of United States patent application Serial No. 100,630, filed by me September 14, 1936, and United States patent application Serial No. 134,974, filed by me April 5, 1937, patented January 24, 1939, No. 2,144,636.

Having thus described the invention, what I claim as new and desire to secure by Letters Patent is:

1. A sand conditioning apparatus comprising in combination a receptacle adapted to contain a batch of sand to be conditioned and comprising a bottom and an annular upstanding side wall, a set of angularly positioned deflectors adapted to travel in a circular course around the interior of the receptacle side wall and arranged so that they extend from the central portion of the receptacle to said side wall and operate each time they travel around the side wall to deflect in a finely scattered stream the entire mass of sand outwardly against substantially all portions of the side wall and having the outer end parts thereof warped or canted with respect to their central and inner end parts so as to deflect a portion of the sand upwards and outwards against the upper portion of the side wall, a set of scrapers corresponding in number to the deflectors and mounted behind and for conjoint travel with the latter and arranged and shaped to scrape the sand from the side wall and direct it inwards in stream form against the central and inner end parts of the following deflectors, and means for propelling the deflectors together with the scrapers in said circular course and at sufficient speed so that they maintain substantially the entire batch of sand in suspension in the receptacle.

2. A sand conditioning apparatus comprising in combination a receptacle adapted to contain a batch of sand to be conditioned and comprising a circular bottom and an annular outwardly bulged side wall extending upwardly from the outer margin of the bottom, a rotary crosshead in the upper central portion of the receptacle, a set of equidistantly spaced angularly positioned deflectors on the crosshead adapted during drive of the latter to travel in a circular course around the interior of the receptacle side wall and to de-

flect in a finely scattered stream the entire mass of sand outwardly against said side wall, and having the central and inner end parts thereof extending from the bottom to substantially the top of the side wall, and their end parts curved conformably to the lower portion of the side wall and canted or angled with respect to said central and inner end parts so as to deflect a portion of the sand upwardly and outwardly against the upper portion of the side wall, a corresponding set of substantially vertical scrapers curved vertically in conformity to the inner periphery of the outwardly bulged side wall and carried by the crosshead behind the deflectors and arranged and shaped so that they scrape the sand from the side wall and deflect it inwards against said central and inner end parts of the following deflectors, and power means for driving the crosshead at such speed that the deflectors and scrapers operate to maintain the sand in suspension.

WALTER F. PIPER.