May 11, 1943. W. F. PIPER 2,318,797

MULLING APPARATUS

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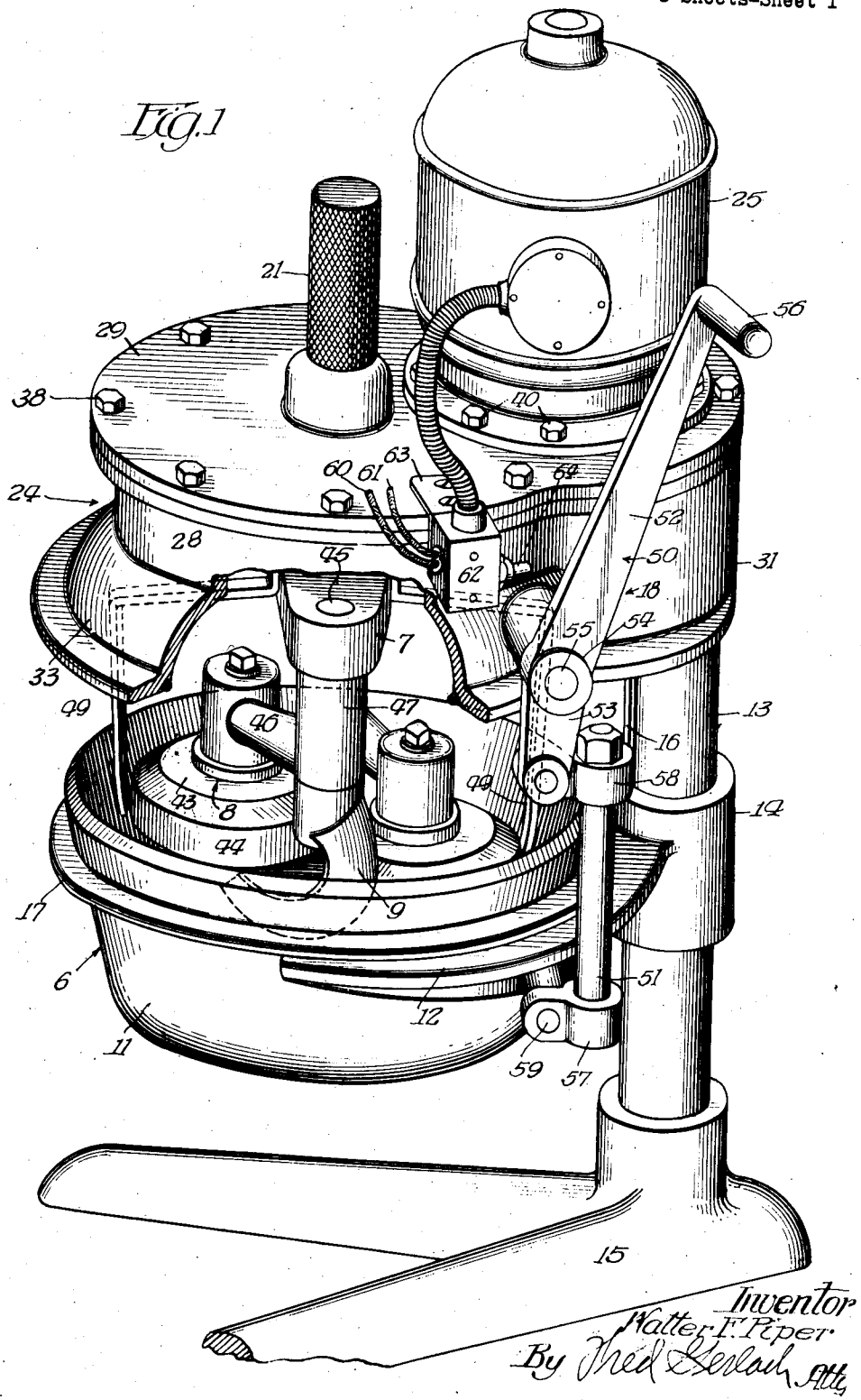
Fig. 1



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MULLING APPARATUS

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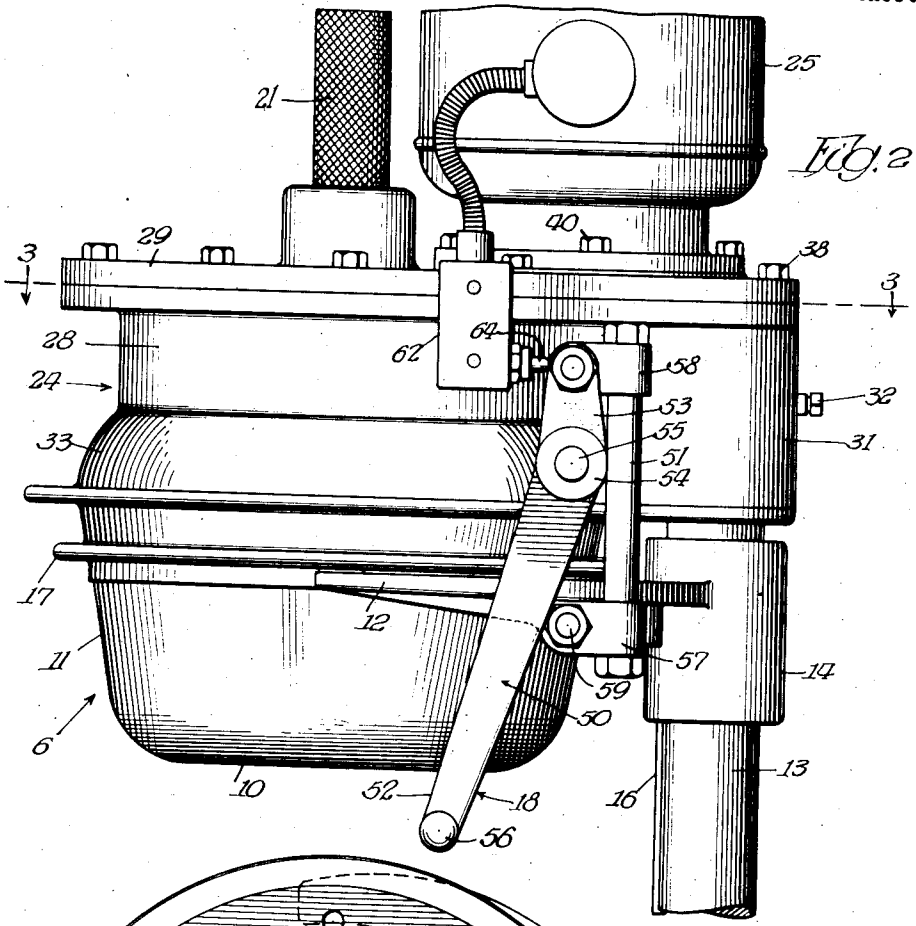

Fig. 2

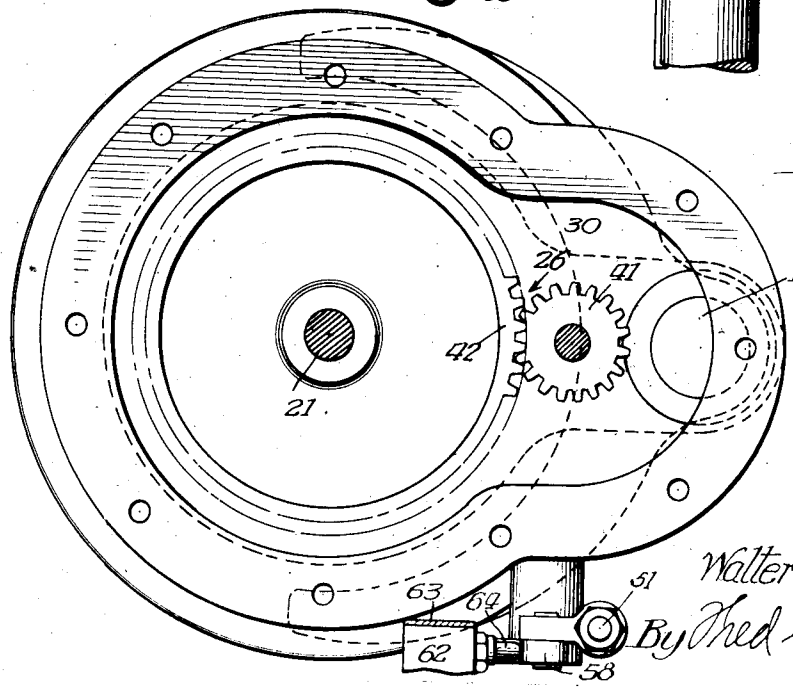

Fig. 3

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MULLING APPARATUS

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Fig. 4

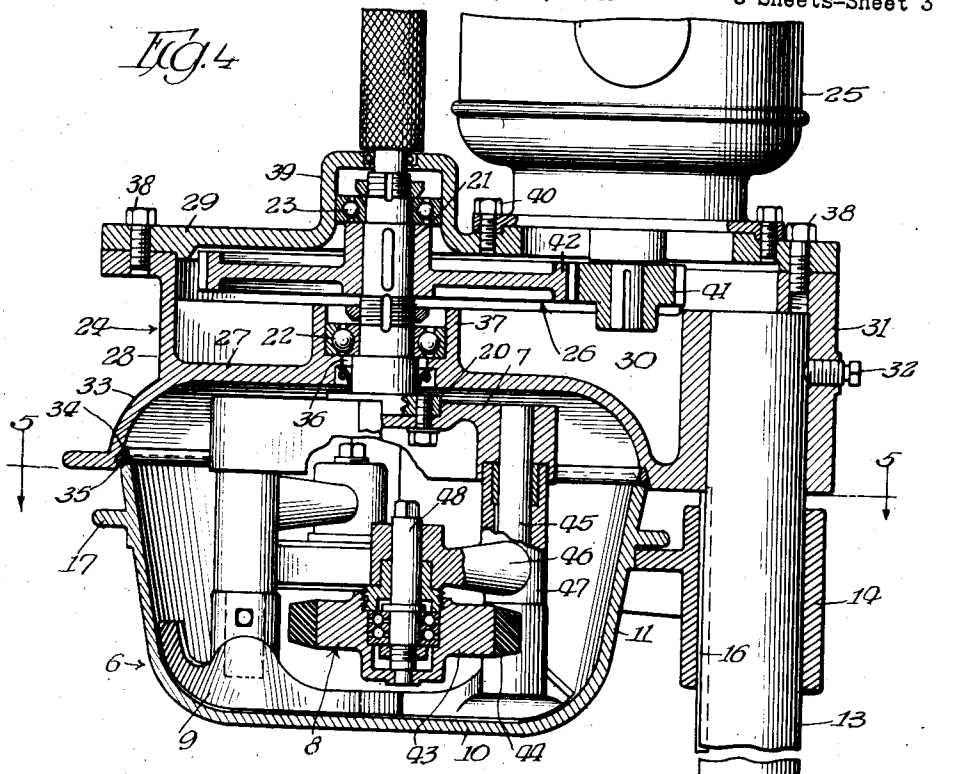
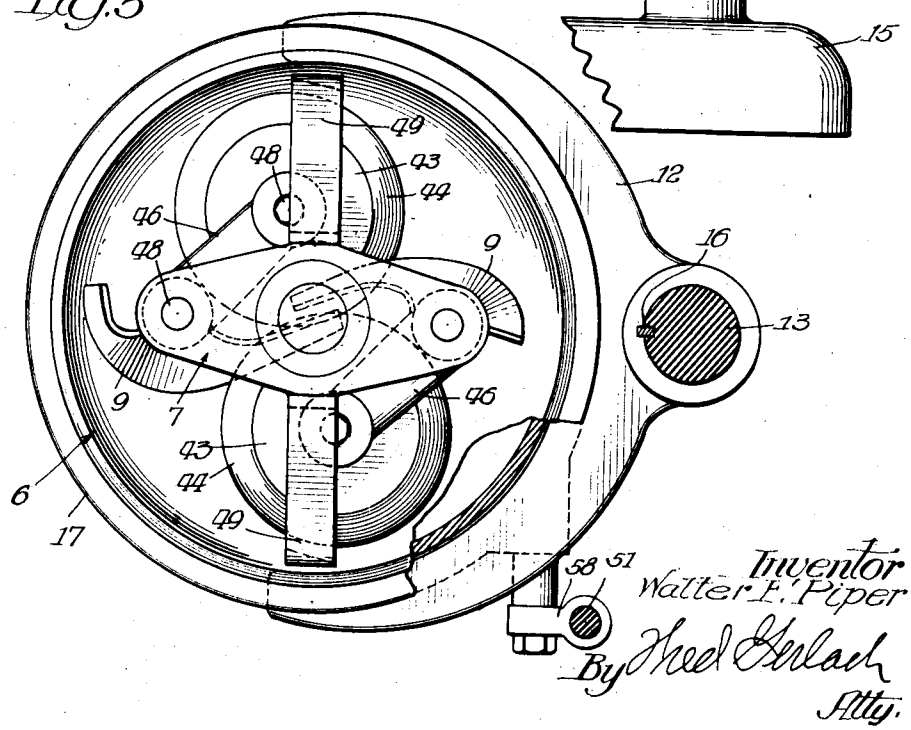


Fig. 5



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Patented May 11, 1943

2,318,797

UNITED STATES PATENT OFFICE

2,318,797

MULLING APPARATUS

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Application May 16, 1940, Serial No. 335,491

4 Claims. (Cl. 83—45)

The present invention relates generally to apparatus for mulling granular material. More particularly the invention relates to that type of apparatus which is primarily designed to be used in a foundry or like establishment in connection with the mulling of molding sand for conditioning purposes and as its main parts comprises: (1) an open top bowl-like receptacle which is adapted to receive and retain the sand to be mulled and comprises a circular bottom and an annular side wall around and extending upwardly from the margin of the bottom; (2) a rotary horizontally extending crosshead which is coaxially positioned with respect to the receptacle and is adapted to be driven at a comparatively high speed by way of an electric motor and speed reducing gearing; (3) a plurality of rotary mulling elements which are carried by the crosshead and are adapted, during drive of the latter, to travel in a circular course around the inner face of the receptacle side wall and at the same time to spin or roll and effect mulling of the sand by squeezing it against the side wall; and (4) a plurality or set of plow type deflectors which are carried by the crosshead in front of the mulling elements and operate, during a mulling operation, to deflect the sand in the receptacle upwardly and outwardly against the receptacle side wall and into the path of the mulling elements.

One object of the invention is to provide a mulling apparatus of this type which has certain advantages over, and is an improvement upon, previously designed apparatus of the same general character.

Another object of the invention is to provide a mulling apparatus of the aforementioned type in which the crosshead is supported from above and the receptacle is mounted for vertical movement in order that it may be shifted up and down between an inoperative position wherein it is disposed beneath the crosshead and the mulling elements and plow type deflectors and is capable of being charged or unloaded, and an operative position wherein it is disposed around the mulling elements and deflectors and the latter are adapted, in connection with rotation of the crosshead, to effect mulling of the sand in the receptacle.

Another object of the invention is to provide a mulling apparatus of the last mentioned type and character in which the crosshead is supported from above by way of a housing which serves to house the speed reducing gearing and to support the electric motor and has a cover part for engaging the rim of the receptacle side wall and closing the receptacle when the latter is shifted upwards into its operative position.

A further object of the invention is to provide a mulling apparatus of the type and character hereinbefore set forth which includes novel means for shifting the receptacle into and out of its operative position and in addition includes novel means for automatically closing the circuit for the motor when the receptacle is shifted into its operative position and opening said circuit upon lowering the receptacle into its inoperative position.

A still further object of the invention is to provide a mulling apparatus which is generally of new and improved design, operates effectively and efficiently to fulfill its intended purpose and not only may be manufactured at a comparatively low cost but also is in the form of a compact unit.

Other objects of the invention and the various advantages and characteristics of the present mulling 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 top perspective view of an apparatus embodying the invention, the receptacle being shown in its inoperative position, and parts being broken away for the purpose of illustration;

Figure 2 is a side view of the apparatus showing the receptacle in its operative position;

Figure 3 is a horizontal section taken on the line 3—3 of Figure 2 and showing the design of the speed reducing gearing between the rotary crosshead and the crosshead driving electric motor;

Figure 4 is a vertical section illustrating and disclosing in detail the construction and design of the housing for the speed reducing gearing and the arrangement and mounting of the parts which serve to effect mulling of the sand in the receptacle during drive or rotation of the crosshead; and

Figure 5 is a horizontal section on the line 5—5 of Figure 4.

The invention is exemplified in the apparatus which is shown in the drawings. Such apparatus is primarily designed for use in a foundry or like establishment in connection with the mulling of molding sand for conditioning purposes and comprises an open top bowl-like sand retaining receptacle 6, a rotary crosshead 7, a pair of wheel type mulling elements 8 and a pair of plow type deflectors 9.

The receptacle 6 is adapted to be charged or filled with a batch of sand to be mulled or otherwise conditioned and comprises a flat circular bottom 10 and an annular upstanding side wall 11. It is shown in the drawings as being in the form of a one-piece casting and is removably

or releasably supported on a vertically movable arm 12. This arm, as shown in the drawings, extends horizontally and is semi-circular. It is associated with, and vertically slidable relative to, a standard 13 and embodies at the central portion thereof an integral vertically elongated sleeve-like member 14. The standard is provided at its lower end with a horizontally elongated base 15 and this is adapted to rest on the floor of the foundry in which the apparatus is employed. The sleeve-like member 14 fits around, and is slidably mounted on, the standard with the result that the receptacle and arm are permitted to move or slide vertically with respect to the standard. A rib and groove connection 16 serves to prevent rotation of the arm relatively to the standard. The rib of the connection is formed on the standard and the groove is formed in the interior portion of the sleeve-like member 14. The receptacle 6 embodies in addition to the bottom 10 and the upstanding side wall 11, an annular flange 17. This flange extends outwardly and is located a small distance beneath the rim of the receptacle side wall 11. It is continuous, as shown in Figure 5, and is adapted when the receptacle is mounted or supported on the arm 12, to rest on the arm. When the receptacle is in place the arm 12 straddles the central portion of the side wall 11 and underlies the superencumbent portion of the flange. To remove the receptacle from the arm 12 it is only necessary to shift it bodily away from the standard. This brings the receptacle out of seated relation with the arm and enables the user of the apparatus either to dump or otherwise unload the mulled sand or charge the receptacle with a new batch of sand for mulling purposes. The receptacle when in place on the arm, is adapted to be raised and lowered by means of a lever mechanism 18. The latter, as described hereafter, enables the user of the apparatus to shift the receptacle up and down between an operative position wherein it is disposed around the mulling elements 8 and the deflectors 9, and an inoperative position wherein it is disposed beneath the crosshead and the mulling elements and deflectors. The side wall 11 of the receptacle is conical and extends upwardly and outwardly at an angle of approximately 10°. The rim of the receptacle side wall is externally chamfered or beveled, as shown in Figure 4.

The crosshead 7 carries the mulling elements 8 and the plow type deflectors 9 and is illustrated in the drawings as being in the form of a one-piece casting. It is located in a horizontal position at the upper end of the standard 13 and is so positioned or arranged that it and the receptacle are in axial alignment when the receptacle is in place on the arm 12. The central portion of the crosshead is bolted to an enlarged head 20 on the lower end of a vertically extending shaft 21. This shaft is journaled in a pair of vertically spaced ball bearings 22 and 23 in a housing 24. It is adapted to be driven by an electric motor 25 and speed reducing gearing 26. The housing is fixedly secured to the upper end of the standard 13 and consists of a bottom wall 27, a continuous side wall 28 and a removable top wall 29. These three walls define a compartment 30 for the speed reducing gearing 26. The side wall 28 is formed integrally with the bottom wall 27 and embodies a tubular enlargement 31. The latter fits around the upper end of the standard and is locked in place by means of a set screw 32. The bottom wall 27 of the housing embodies an integral downwardly and outwardly extending skirt 33 and this skirt, as shown in Figure 4, surrounds the crosshead 7 and forms a cover for closing or sealing the receptacle 6 when the latter is in its operative or raised position. The lower margin of the skirt 33 embodies an internal groove 34 in which is seated an annular gasket 35. When the receptacle is in its operative position the chamfered or beveled surface or part of the rim of the side wall engages the gasket and forms therewith an effective seal between the cover and the receptacle. The shaft 21 extends through a hole 36 in the central portion of the bottom wall 27 of the housing and is disposed for the most part in the compartment 30. The bearing 22 surrounds the central portion of the shaft 21 and is mounted in a tubular extension 37 in the central portion of the housing bottom wall 27. The top wall 29 of the housing rests on the upper margin of the side wall 28 and is secured in place by means of bolts 38. Directly above the tubular extension 37 the top wall is provided with an inverted cup shaped part 39. The latter surrounds the upper end of the shaft 21 and carries the bearing 23.

The electric motor 25 is disposed in a vertical position on top of the removable top wall 29 of the housing 24. It is fixedly secured in place by means of bolts 40 and has the lower end of its armature shaft disposed in the compartment 30. The speed reducing gearing extends between the motor and the crosshead and serves to drive the crosshead from the motor when current is applied to the latter. It comprises a pinion 41 and a gear 42 and these are of such size that the crosshead 7 is driven at a speed of between 60 to 90 revolutions per minute when the motor 25 is in operation. The pinion 40 is fixedly secured to the lower end of the armature shaft of the motor and meshes with, and serves to drive, the gear 42. Such gear is disposed in the compartment 30 between the tubular extension 37 and the inverted cup shaped part 39 and is keyed to the central portion of the shaft 21.

The mulling elements 8 are in the form of wheels and consist of cast metal bodies 43 and solid rubber tires 44. They are disposed beneath a crosshead 7 and are adapted in connection with a mulling operation, i. e., when the receptacle 11 is charged with a batch of sand and is in its operative position and the motor 25 is in operation, to travel in a circular course around the central portion of the receptacle side wall 11 and to effect mulling of the sand by squeezing it against the side wall. A pair of vertically extending shafts 45 and a pair of horizontally extending arms 46 serve to support the mulling elements from the crosshead. The shafts 45 are fixedly secured to, and depend from, the ends of the crosshead and are arranged in parallel relation. The arms 46 embody integral hubs 47 and these fit loosely around the central portions of the shafts 45 and permit the arms to swing horizontally. The distal ends of the arms 46 carry depending stub axles 48, as shown in Figure 4. The bodies 43 of the mulling elements 8 are rotatably mounted on the lower ends of the stub axles in order that the elements are free to spin or roll during travel around the side wall of the receptacle. Preferably the two mulling elements are vertically offset. When the receptacle is in its operative position and the motor 25 is operated the crosshead 7 is driven by the speed

reducing gear 26 at the speed heretofore mentioned and in turn operates to swing the mulling elements around the receptacle side wall. During drive of the crosshead the mulling elements, due to the action of centrifugal force, move outwards toward the receptacle side wall and effect mulling by the resultant squeezing action.

The two plow type deflectors 9 are mounted for conjoint circular travel with the mulling elements 8 and are fixedly secured to the lower ends of the vertically extending shafts 45. They are positioned in front of the mulling elements 8 and are shaped conformably to the lower portion of the receptacle. During a mulling operation the deflectors operate to deflect the sand on the receptacle bottom upwards and outwards against the central portion of the receptacle side wall and into the path of the mulling elements. In order to scrape the mulled sand from the receptacle side wall during a mulling operation the apparatus is provided with a pair of scrapers 49. These scrapers are connected to, and depend from, the crosshead 7 and are disposed directly behind the mulling elements 8. When the crosshead is in operation in connection with a mulling operation the scrapers scrape the mulled sand from the receptacle side wall and direct it inwards into the path of the plow type deflectors 9. The latter, as hereinbefore described, operate to deflect the sand outwards into the path of the mulling elements 8.

The mechanism 18 for raising and lowering the receptacle, i. e., shifting the receptacle back and forth between its operative and inoperative positions, comprises as the parts thereof a lever 50 and a link 51. The lever embodies a long arm 52 at one end thereof and a short arm 53 at its other end and has a hub 54 between the inner ends of the two arms. It is located at one side of the housing 24 and is adapted to be manually manipulated. The hub 24 is rotatably mounted on a pivot stud 55 which is connected to, and projects outwardly from, the side wall 28 of the housing 24. The outer or distal end of the long arm 52 of the lever 50 embodies a laterally extending handle 56 in order that the lever may be rotated or swung with respect to the pivot stud 55. The link 51 of the mechanism 18 extends vertically and is positioned at one side of the standard 13. It is disposed at one side of the arm 12 and has a laterally extending lug 57 at its lower end and a laterally extending lug 58 at its upper end. The lug 57 is pivotally connected to a laterally extending pivot stud 59 on the adjacent end of the arm 13 and the lug 58, as shown in Figure 1, is pivotally connected to the outer or distal end of the short arm 53 of the lever 50. When the receptacle 6 is in its inoperative position the lever 50 is disposed or positioned as shown in Figure 1 i. e., with the arm 53 extending downwards and the arm 52 extending upwards. When it is desired to raise or elevate the reecptacle 6 into its operative position the lever 50 is turned or rotated in a counterclockwise manner as viewed in Figure 1. This causes the short arm 53 to swing upwards and raise or elevate the arm 12 and the receptacle. The short arm 53 is so arranged that when the receptacle is in its operative position with the chamfered or beveled surface of the rim of the receptacle side wall in contact with the gasket 35, it extends upwardly from the pivot stud 55 and is in substantially a vertical position, as shown in Figure 2. When the short arm 53 is in such position the resultant dead-center relationship between the pivot stud 55 and the pivotal connection between the lug 58 and the distal end of the arm 53 serves to maintain or hold the receptacle in its operative position. When it is desired to lower the receptacle into its inoperative position beneath the mulling elements 8, the lever 50 of the lever mechanism 18 is turned or rotated in a clockwise direction as viewed in Figure 1. This results in downward swing of the short arm 53 and corresponding lowering of the arm 12 and the receptacle 6. By swinging the lever 50 in one direction the receptacle is shifted into its operative position and by swinging the lever 50 in the reverse direction the receptacle is lowered or shifted into its inoperative position.

The sleeve-like member 14 on the central portion of the arm 12 coacts with the standard 13 to restrict the receptacle to vertical rectilinear movement only in connection with shift thereof into and out of its operative and inoperative positions. When the receptacle is in its operative position the open top thereof is completely closed or sealed by the gasket equipped cover and hence no sand or dust can emerge from the receptacle during a mulling operation.

The electric motor 25 is provided with a pair of conductors 60 and 61 for supplying it with current from a suitable source of electrical supply. One of these conductors has associated therewith a push button switch 62 for motor controlling purposes. The switch, as shown in Figures 1 and 2, is fixed to the top wall 29 of the housing 25 by a bracket 63. It is located adjacent the pivot stud 55 and embodies a horizontally slidable push button 64. This button is adapted when slid inwards to close the switch 62 and is retracted or urged outwards by means of a spring (not shown). As shown in Figure 2, the switch 62 is so arranged that the push button 64 is shifted inwards by the distal end of the short arm 53 of the lever 50 when such arm is swung upwards into its vertical or dead-center position in connection with shift of the receptacle into its operative position. As a result of this the motor 25 is automatically set into operation when the receptacle reaches its operative position in connection with raising thereof. When the arm 53 is swung downward in connection with lowering the receptacle into its inoperative position it swings away from the push button 64 with the result that the aforementioned spring for the button operates automatically to open the switch 62. The switch 62 constitutes simple control means whereby the motor is supplied with current when the receptacle is in its operative position and is stopped when the receptacle is lowered into its inoperative position.

When it is desired to use or employ the apparatus for mulling purposes the receptacle 6 is first charged. This may be done either by dumping the sand to be mulled into the receptacle while the latter is in its inoperative position on the arm 12 or by removing the receptacle from the arm and then after charging it with the sand to be mulled placing it back on the arm 12. After charging of the receptacle the lever 50 of the lever mechanism 18 is turned or rotated in a counterclockwise direction, as shown in Figure 1, in order to raise the receptacle into its operative position with respect to the mulling elements 8. When the receptacle reaches its operative position the distal end of the short arm 53 of the lever 50 urges inwards the push button 64 and this, as hereinbefore de-

scribed, results in drive of the motor 25. As soon as the motor is set in operation the crosshead 7 is rotated and operates to move or swing the mulling elements 8, the plow type deflectors 9 and the scrapers 49 in a circular course around the side wall 11 of the receptacle. During drive of the crosshead the deflectors, as hereinbefore pointed out, serve to deflect the sand upwards into the path of the wheel type mulling elements and the scrapers operate to scrape the sand from the side wall and direct it inwards for further action by the deflectors. At the conclusion of the mulling operation the receptacle is lowered by swinging the lever 50 in a clockwise direction as viewed in Figure 1. As soon as the receptacle leaves its operative position in connection with downward movement thereof the switch 62 automatically opens with resultant stopping of the electric motor and the parts which are driven thereby.

The herein described mulling apparatus effectively and efficiently fulfills its intended purpose and may be produced at a comparatively low cost. It occupies but a comparatively small space and is characterized by the fact that the receptacle is completely closed during a mulling operation. The construction and design are such that the apparatus may be built either on a large or small scale. When the apparatus is built on a large scale it is capable of mulling large batches of sand preparatory to use in forming molds and when the apparatus is built on a small scale it may be used in a foundry laboratory as a test apparatus to determine how long any particular form or type of molding sand should be mulled or conditioned before use in a mold.

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.

Having thus described the invention what I claim as new and desire to secure by letters patent is:

1. An apparatus for mulling molding sand or like granular material, comprising an open top receptacle member for retaining a batch of sand to be mulled, a rotary member of the crosshead type positioned directly above the receptacle member, mechanical means for shifting one of the members vertically to and from the other member into and out of operative relation therewith, a freely rotatable mulling element and a plow type deflector carried by, and depending from, the rotary member and arranged so that when the two members are in operative relation and the rotary member is driven they travel in a circular horizontal course within the receptacle and operate respectively to squeeze the sand against the side wall of the receptacle and to deflect the sand outwards and upwards against said side wall and into the path of the element, and means controlled by said shifting means for automatically rendering the driving means operative when the two members are in operative relation and inoperative when said members are out of operative relation.

2. An apparatus for mulling molding sand or like granular material, comprising a standard, a housing fixed to the upper end of the standard and projecting laterally therefrom, a rotary member suspended beneath the housing and provided with an eccentrically disposed freely rotatable horizontal wheel-type mulling element adapted during drive of the member to travel in a horizontal circular course, an open top receptacle adapted to retain the sand to be mulled and positioned beneath the member, a horizontally extending receptacle supporting arm mounted on the standard to slide vertically and adapted when shifted upwards to move the receptacle into an operative position wherein it surrounds the element and the latter is adapted during drive of the member to mull the material by squeezing it against the inner face of the receptacle side wall, lever mechanism between the housing and the arm for sliding the arm up and down relatively to the standard, means for driving the rotary member consisting of an electric motor on the housing and speed reducing gearing in said housing, and a switch for controlling the motor controlled automatically by said lever mechanism and arranged so that it is maintained in its closed position when the receptacle is in its operative position.

3. An apparatus for mulling molding sand or like granular material, comprising an open top receptacle for the sand to be mulled, a rotary member over the receptacle supported from above and having an eccentrically disposed horizontal wheel-type mulling element depending therefrom and adapted during drive of the member to travel in a horizontal circular course, means adjacent said rotary member also supported from above and shaped to define a downwardly facing cover around the member, means for supporting the receptacle so that it is vertically slidable back and forth between an operative position wherein it surrounds the element, the rim thereof is in sealed relation with the cover and said element is adapted during drive of the member to mull the material by squeezing it against the side wall of the receptacle, and an inoperative position wherein it is disposed a substantial distance beneath the rotary member, and means for driving the rotary member when the receptacle is in its operative position.

4. An apparatus for mulling molding sand or like granular material, comprising an open top receptacle for the sand to be mulled, a housing supported from above and over the receptacle and having a downwardly facing cover, a rotary member beneath the cover, supported from the housing and provided with an eccentrically disposed freely rotatable horizontal wheel-type element adapted during drive of the member to travel in a horizontal circular course, means for supporting the receptacle so that it is slidable vertically back and forth between an operative position wherein it surrounds the element, the rim of the side wall thereof is in sealed relation with the rim of the cover and the element is adapted during drive of the member to mull the sand by squeezing it against the inner face of the receptacle side wall, and an inoperative position wherein it is disposed a substantial distance beneath the cover and rotary member, means for driving the rotary member including an electric motor on the housing and speed reducing gearing in the housing, and a switch for controlling the motor arranged so that it is automatically closed when the receptacle is shifted into its operative position and is automatically opened upon shift of the receptacle out of its said operative position.

WALTER F. PIPER.