June 6, 1933. M. W. GOLDBERG 1,912,837

SAND HANDLING AND CONDITIONING APPARATUS

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Fig. 1.

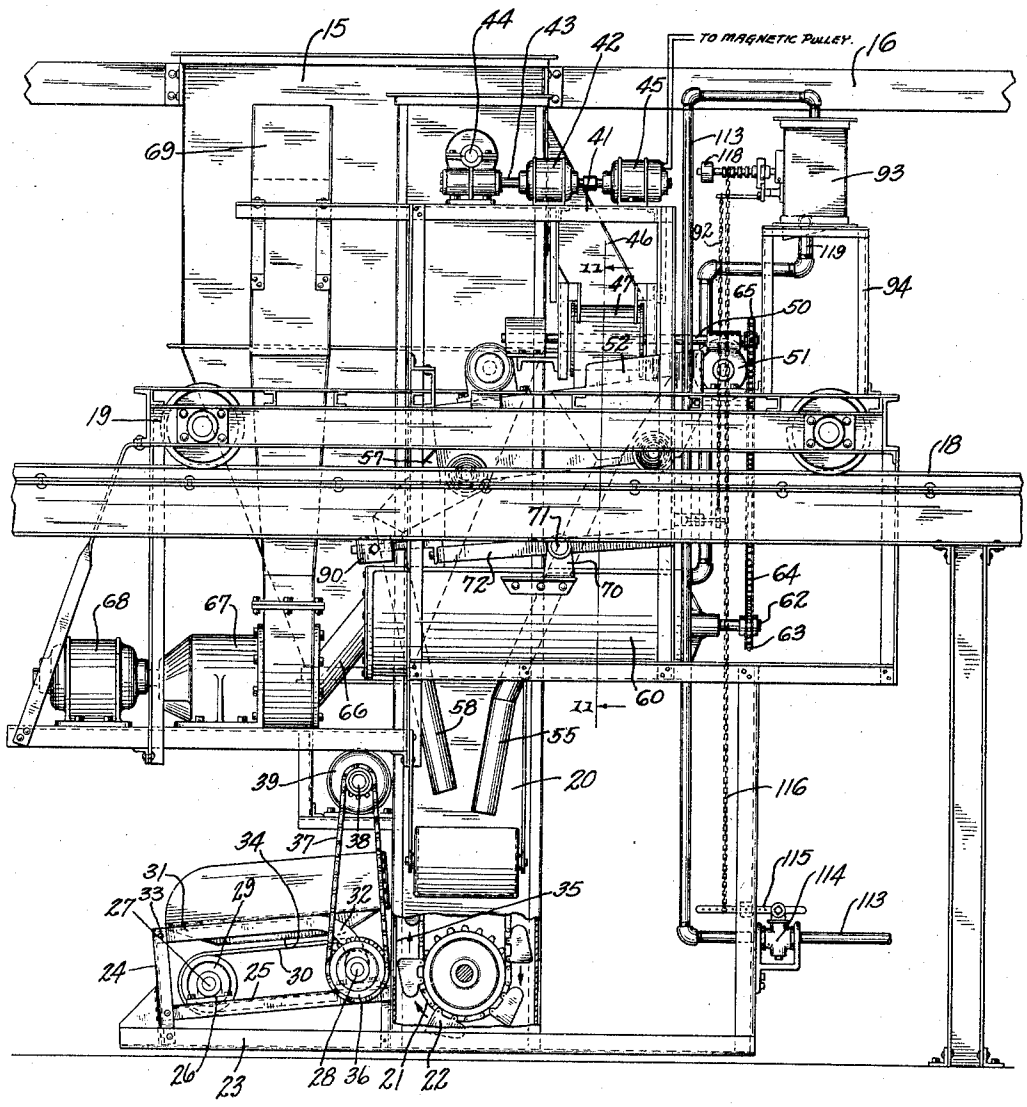
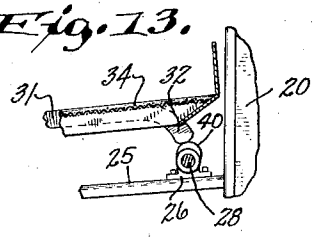


Fig. 13.



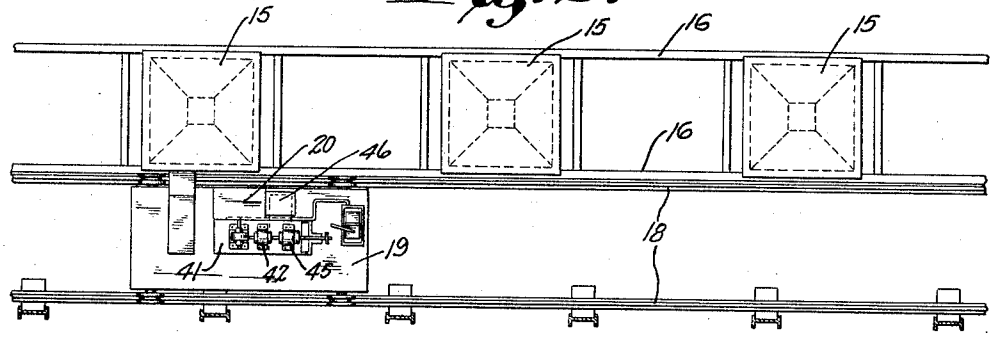
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SAND HANDLING AND CONDITIONING APPARATUS

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Fig. 2.



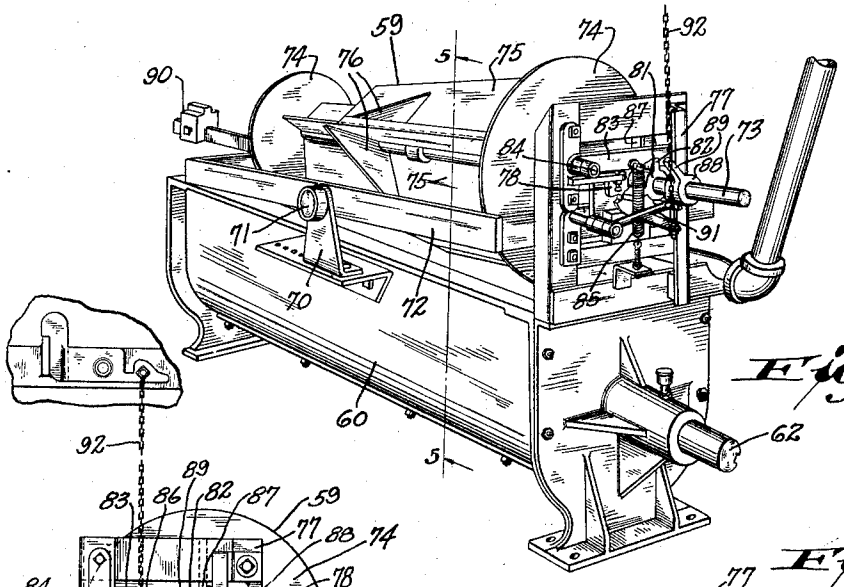


Fig. 3.

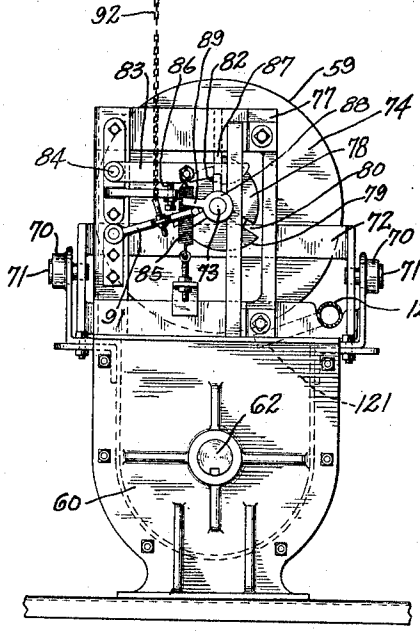


Fig. 4.

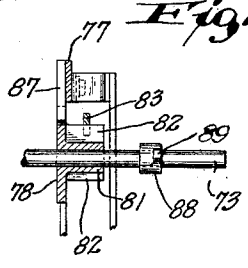


Fig. 14.

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SAND HANDLING AND CONDITIONING APPARATUS

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Fig. 5.

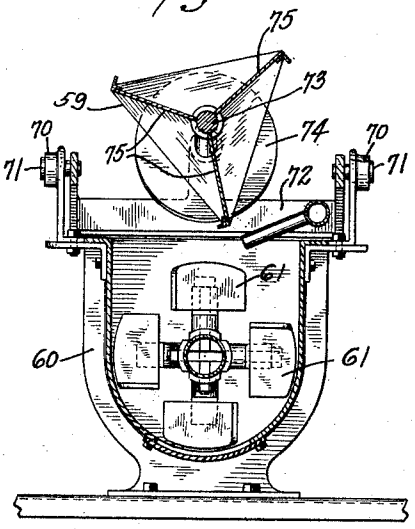


Fig. 12.

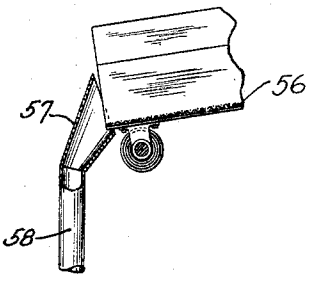
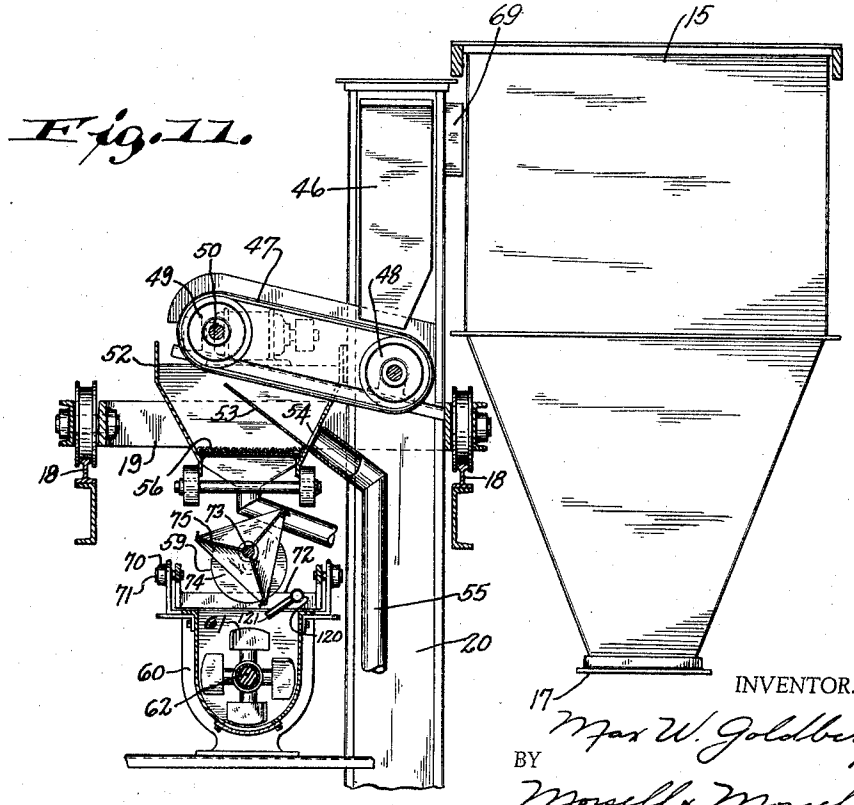


Fig. 11.



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SAND HANDLING AND CONDITIONING APPARATUS

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Fig. 6.

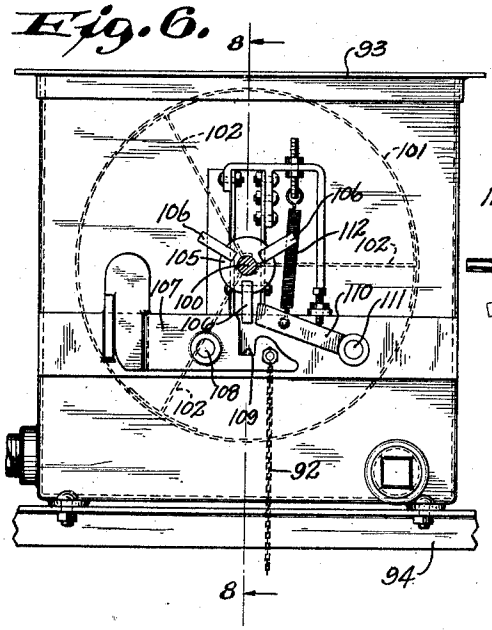


Fig. 8.

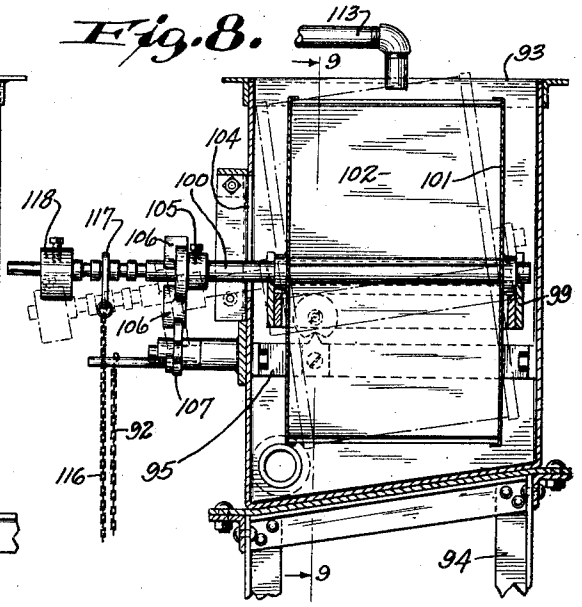


Fig. 7.

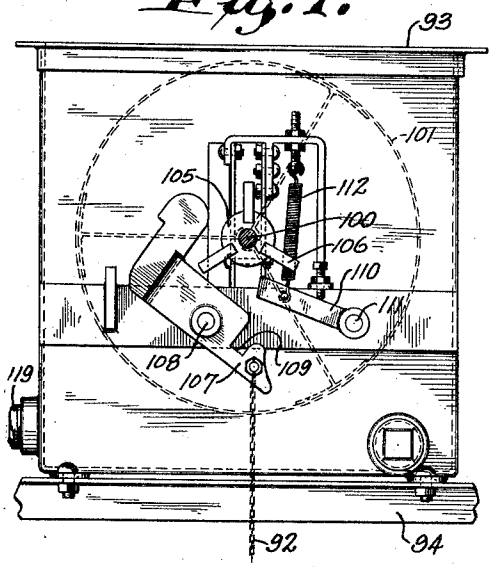


Fig. 9.

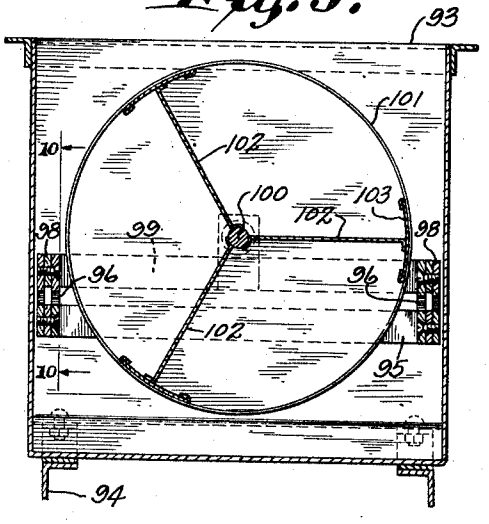
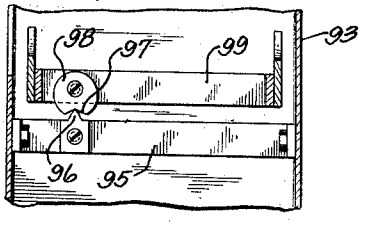


Fig. 10.



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UNITED STATES PATENT OFFICE

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SAND HANDLING AND CONDITIONING APPARATUS

Application filed December 10, 1931. Serial No. 580,063.

This invention relates to improvements in sand handling and conditioning apparatus.

It is common practice in foundries, after the sand is shaken from the castings and molds, to deposit said sand in a heap on the floor and to stir it up either by hand or by machine to free the gases therefrom, and to break up and disintegrate the lumps so that it is in proper condition for re-use. It is also necessary to moisten the sand, and the moistening operation is extremely important inasmuch as the use of an improper amount of water may materially affect the quality of work produced. Heretofore, the addition of moisture has been largely a matter of guess work, due to the fact that no practical method has been devised for accurately proportioning the amount of water to be added to the sand.

In Patent #1,748,124, dated February 25, 1930, there is disclosed apparatus for handling and aerating the sand, the said apparatus being capable of performing this work almost entirely by mechanical means, and including a portable unit which is movable to a selected one of a plurality of overhead hoppers or receptacles. This apparatus, however, did not include certain features which are highly desirable, and particularly did not provide for moistening of the sand.

It is, therefore, one of the objects of the present invention to provide mechanism for accurately supplying a measured amount of water to a given quantity of sand.

A further object of this invention is to provide a portable unit similar to that disclosed in the aforementioned patent, in which the unit is movable to discharge selectively into any one of a plurality of hoppers, and in which the unit not only includes means for elevating and aerating the sand, but also means for automatically adding the exact amount of moisture necessary for a particular type of work.

A further object of the invention is to provide a portable sand handling unit having means for elevating and conditioning sand in connection therewith, in which a vibrating screen is utilized adjacent the receiving opening of the unit.

A further object of the invention is to provide sand handling and conditioning apparatus which includes means for separating foreign matter, such as metal, from the sand.

A further object of the invention is to provide improved sand handling and conditioning apparatus which is capable of greatly expediting the preparation of sand, which is effective in operation, and well adapted for the purpose described.

With the above and other objects in view, the invention consists of the improved sand handling and conditioning apparatus, and all its parts and combinations as set forth in the claims, and all equivalents thereof.

In the accompanying drawings illustrating one complete embodiment of the preferred form of the invention, in which the same reference numerals designate the same parts in all the views:

Fig. 1 is a front elevational view of the improved apparatus;

Fig. 2 is a plan view of the apparatus on a smaller scale, showing its position relative to a plurality of discharge hoppers;

Fig. 3 is a perspective view of the sand measuring and mixing unit;

Fig. 4 is an end view of said unit, showing an operative connection between a portion of the same and a control in connection with the water measuring device, only a fragment of the latter being shown;

Fig. 5 is a sectional view taken on line 5—5 of Fig. 3;

Fig. 6 is a front elevational view of the water measuring device;

Fig. 7 is a similar view showing the position of the parts as a quantity of water is about to be discharged;

Fig. 8 is a sectional view taken on line 8—8 of Fig. 6;

Fig. 9 is a sectional view taken on line 9—9 of Fig. 8;

Fig. 10 is a fragmentary sectional view taken on line 10—10 of Fig. 9;

Fig. 11 is a sectional view taken on line 11—11 of Fig. 1;

Fig. 12 is a detail view showing means for

directing waste sand to a refuse bucket, parts being broken away, and parts being shown in section;

Fig. 13 is a fragmentary detail view showing the mechanism for operating the shaker screen; and

Fig. 14 is a fragmentary detail view showing the control mechanism for the sand measuring device, part being shown in longitudinal vertical section.

Referring to the drawings, particularly Fig. 2, it will be seen that a plurality of hoppers 15 are supported in any suitable manner, such as by beams 16, at an elevation from the floor, the said hoppers having the usual lower discharge openings 17, and having a side receiving opening. Extending parallel to the row of hoppers is a track 18 on which a wheeled truck 19 is movable.

An elevator unit 20 is secured to the side of the truck, and said elevator extends downwardly to a position adjacent the floor, and also extends upwardly above the truck. The said elevator unit is of standard construction and may be provided with an endless elevating device 21 carrying a plurality of elevating buckets 22, as shown in Fig. 1.

Suitable supports 23 project from the bottom of the elevator unit, and have secured thereto near their outer ends upright frame members 24. Other frame members 25 extend inwardly at right angles from the frame members 24, and have mounted thereon bearings 26 within which shafts 27 and 28 for rollers 29, are journaled. An endless belt 30 is movable around said rollers. An upper frame portion 31 having downwardly curved inner end portions 32, is pivoted as at 33, to the uprights 24. Said frame portions 31 support a suitable screen 34, and said screen is adapted to discharge sand placed thereon onto the belt 30, and the latter is adapted to convey the sand into an opening 35 of the elevator unit where it is intercepted by the buckets 22. A sprocket wheel 36 mounted rigidly on the roller shaft 29, is connected by an endless chain 37 with a sprocket 38 in connection with an electric motor 39, the latter being thus adapted to impart motion to the endless belt. The roller shaft 28 is also provided with suitable cam portions 40 which are engageable with the downwardly curved inner ends 32 of the pivoted screen frame 31 to cause vibration of said screen and sifting of the sand.

A suitable framework 41 mounted on the truck 19 supports an electric motor 42. A drive shaft 43 extends in both directions from said motor, and one end of said drive shaft makes a suitable connection with a shaft 44 extending into the upper portion of the elevator and carrying an upper sprocket (not shown) around which the endless elevating unit 21 is movable. The other end of the drive shaft 43 of the motor 42 is connected with a generator 45.

The elevating unit has a discharge spout 46 extending at an angle from one side thereof, as shown in Figs. 1 and 11, and said spout is arranged to discharge the elevated sand onto an endless belt 47 movable over a pulley 48 and a magnetic pulley 49. The magnetic pulley 49 is rigidly mounted on a shaft 50, and one end of said shaft is driven through a worm and worm wheel connection 51 with another electric motor, not shown (see Fig. 1). The magnetic pulley 49 is electrically connected with the generator 45. Sand deposited on the belt 47 is deposited into a receptacle 52. Any metal, however, mixed with the sand will be held on the belt, due to the magnetic action of the pulley 49, and will not be released until the portion of the belt carrying the metal has passed the magnetic pulley. The metal will then be intercepted by the angularly extending partition 53 within the receptacle 52, and directed through an opening 54 into a conduit 55. The latter is arranged to convey this metal to a point of discharge.

The receptacle 52 is provided with a lower opening having a screen 56 therein, and said receptacle and screen may be of any standard construction, and are arranged to vibrate to cause discharge of the sand through the screen. In view of the fact that the receptacle and screen are arranged on an incline, any particles which do not pass through the screen, will be shaken toward a funnel shaped upper end 57 of a discharge conduit 58, as shown in Fig. 12.

The majority of the sand, however, will pass through the screen into a sand measuring device 59 which is illustrated in Figs. 3, 5 and 11, and which will be hereafter described in detail. A measured quantity of sand will be discharged by the latter device into a pug mill 60 of standard construction and including mixing paddles 61 mounted on a shaft 62. The said shaft has a sprocket 63 mounted on its outer end which is connected by an endless chain 64 with a sprocket wheel 65 mounted rigidly on the shaft 50 of the magnetic pulley. As the mixing paddles of the pug mill are rotated, water is discharged into the pug mill, by means to be later described in detail, and the sand is thoroughly mixed with the water and directed to the discharge end of the pug mill where it passes through a conduit 66 into a sand conditioning and aerating device 67 driven by an electric motor 68. Said device is of standard construction, and is adapted to thoroughly aerate and break up the sand and to then discharge it from a spout portion 69 which is adapted to register with receiving openings of the hoppers 15.

The pug mill 60 is provided with upward-

ly extending bearing portions 70 on opposite sides thereof, and said bearings are arranged to receive trunnions 71 of a frame 72 (see Fig. 3), said frame being pivotal on the trunnions. Opposite ends of the frame are provided with upwardly extending bearing members within which a longitudinal shaft 73 is journaled. Said shaft has rigidly mounted thereon end discs 74 which are connected by longitudinally extending partitions 75 to form three compartments. Other partitions 76 are arranged between the longitudinal partitions 75, and may be positioned so that each section of the measuring unit will hold a definite quantity of sand. The forward end of the shaft 73 projects through a frame portion 77, and said end has rigidly mounted thereon a plate 78 formed with three cam portions 79, each cam portion being separated from the adjacent one by a radially extending slot 80. Also rigidly mounted on the shaft 73 adjacent the plate 78 is a collar 81 having three radially projecting lugs 82, the lugs being in alinement with the slots 80 of the plate 78. A dog 83 is pivoted to the frame 77, as at 84, and the outer end of said dog is engageable with one of the lugs 82, as shown in Fig. 4. A spring 85 in connection with the dog 83 normally holds said dog yieldingly in a lowered position against a stop 86. A lug 87, projecting from the rear portion of the frame 77, is engageable with one of the slots 80 of the plate 78. Also rigidly mounted on the shaft 73, outwardly of the collar 81, is another collar 88 having a single lug 89 projecting therefrom.

The sand measuring device is normally held by a counter-weight 90, in a rearwardly tilted position, as shown in Fig. 3, being locked against rotation in one direction by the engagement of one of the lugs 82, with the dog 83, and against movement in the other direction by engagement of the lug 87 with one of the slots 80 of the plate 78. Sand is discharged from the screen 56 into the uppermost section of the sand measuring device, and when said section has received a predetermined quantity of sand, it will over-balance the counter-weight 90, and cause pivoting of the frame on the trunnions 71, to a forward position, thereby disengaging the lug 87 from the slot 80 and the lug 82 from the dog 83. Inasmuch as the sand measuring device is in the position shown in Fig. 5, the weight of the sand on the left hand partition shown in said figure, will cause rotation and discharging of the sand in what was formerly the upper section into the pug mill below. As soon as the sand is discharged, the counter-weight 90 will return the device to a rearwardly tilted position, and the lug 87 will ride over one of the cam portions 79 of the plate 78, and will engage the next slot 80, the next lug 82 also engaging the dog 83 to hold the measuring device with another compartment facing upwardly ready to receive another supply of sand. Each time one of the compartments is filled, the device will rotate another third revolution, and when all three sections have been loaded and have discharged their loads into the pug mill, the lug 89 carried by the collar 88 will come to the position shown in Fig. 4, and will trip a pivoted lever 91, thereby exerting a downward pull upon a chain 92 connected with the water measuring device to be next described.

A container for water 93 is mounted on a stand 94 carried by the truck 19. Said container is formed therein with a frame 95 having opposite sides formed with pointed projections 96 (see Fig. 10), engageable with recesses 97 in projecting discs carried by opposite sides of another frame 99, thus providing for rocking movement of the frame 99 within the container. A shaft 100 which is journaled through the frame 99 as shown in Fig. 8, has rigidly mounted thereon a drum 101, said drum being provided with three partitions 102 arranged to form compartments within the drum. The periphery of the drum is open, except for short wall portions 103 which project from both sides of the outer edges of the partitions. The shaft has one end extending through a slot 104 in the front of the container 93, and the said shaft has rigidly mounted thereon a collar 105 carrying three radially extending lugs 106 (see Fig. 6). A lever 107 is pivoted to the outer side of the container as at 108, and has a recess 109 formed near its inner end. The said inner end also has secured thereto the upper end of the chain 92, extending from the lever 91 in connection with the sand measuring device (see Fig. 4). A stop member 110 is pivoted to the container as at 111, and said member is normally held by a spring 112 in the position shown in Fig. 6. Water from an outside source is let into the container through a pipe 113 (see Fig. 1), and the entrance of said water into the container is controlled by a valve 114 which is normally held in open position by a counter-weighted lever 115. Said lever is connected through a chain or other flexible member 116 with a link 117 which is adjustably positionable on the outer end of the shaft 100 of the water measuring device. As water starts to enter the uppermost compartment of the drum 101, the drum is held in the dotted line position shown in Fig. 8 by a counter-weight 118 on its outer end. When a desired quantity of water has been admitted to the compartment, however, the water will over-balance the weight, and will cause the drum to tilt back to the full line position of Fig. 8, causing a pull upon the chain 116 and a closing of the valve 114. Then the parts will be in the position

shown in Fig. 6. After the sand measuring device has made a complete revolution as heretofore described, the lug 89 in connection therewith will trip the lever 91, and will cause a downward pull upon the chain 92 connected with the lever 107 of the water measuring device, and a pivoting of said lever from the position shown in Fig. 6 to the position shown in Fig. 7. This will momentarily free the lug 106 from the slot 109, and the weight of the water upon the horizontally disposed partition of the drum will cause the drum to rotate to deposit the water carried thereby into the bottom of the container, the said water then flowing out through a discharge pipe 119. As the drum rotates, the next lug 106 will slide over the outer end of the lever 110 against the tension of the spring 112, and into place within the recess 109 to lock the drum ready for another compartment thereof to be filled. At the same time, the discharge of the water from the drum will permit the counterweight 118 to return the drum to the tilted position shown by dotted lines in Fig. 8, and this will cause slack in the chain 116, permitting the counter-weighted lever 115 in connection with the valve 114 to drop and turn on the water to fill the next compartment of the drum.

The discharge pipe 119 leading from the water container 93 extends downwardly to a discharge portion 120 running longitudinally of the pug mill. The said discharge portion has branch pipes 121 extending at an angle into the pug mill to discharge water therein for mixture with the sand.

It will be apparent from the above that each time all three of the compartments of the sand measuring device have discharged their contents into the pug mill, that the measured supply of water carried by one of the compartments of the water measuring device will be admitted to the pug mill. Thus, the amount of water for a given quantity of sand may be readily measured. For certain types of work, it is preferred to construct the apparatus so that each compartment of the sand measuring device will hold approximately 33⅓ pounds of sand. Thus, the three compartments will hold 100 pounds. It has been found that a desirable quantity of water for a number of types of work is 3 pounds for each 100 pounds of sand, and therefore each compartment of the water measuring device may be constructed to hold 3 pounds of water. By varying the capacity of compartments in either or both of the units, the percentage of water may be increased or decreased, as desired. Also, the amount of sand which one compartment of the sand measuring device will receive before it discharges its contents, can be varied by changing the position of the counterweight 90, and a similar adjustment may be made on the water measuring device by moving the counterweight 118 on the shaft 100.

For some types of work it may be desirable to have a quantity of water supplied to the pug mill after each compartment of the sand measuring device has discharged. This can be taken care of by utilizing three lugs 89 instead of one as shown in Fig. 4.

While the operation of the various individual units of the apparatus has already been described, for purposes of clarity, a summary of the operation of the entire device will be made at this point. Sand deposited on the shaker screen 34 will be discharged by the latter onto the movable endless belt 30, and carried by said belt into the buckets of the movable endless elevator 21. Said buckets will carry the sand upwardly, and will deposit it into the discharge spout 46 carried by the upper portion of the elevator. The discharge spout will in turn direct the sand onto the endless belt 47 which is movable over the magnetic pulley 49. Said sand will then be deposited on top of the vibrating screen 56, and any metallic particles mixed with the sand will be separated therefrom and directed by the partition 53 into the discharge conduit 55, as previously pointed out, due to the action of the magnetic pulley on said metallic particles. The sand on the vibrating screen 56 will then be discharged into the upper compartment of the sand measuring unit. When said compartment has received a predetermined amount, said unit will tilt forward, and permit a 120° rotation of the unit to dump the sand into the pug mill below. When all three of the compartments of the sand measuring unit have received and deposited their loads into the pug mill, the lug 89 will trip the lever 91 to cause a discharge of water from one of the compartments of the water measuring device into the water container, the said water being conveyed through the pipes 119 and 120 into the pug mill. The pug mill will then thoroughly mix the water and sand together, and will convey the properly moistened sand through the discharge conduit 66 into the aerating device 67. The latter will thoroughly condition the sand and will blow it into one of the hoppers 15, and said hopper may then be used to discharge sand from its lower end into a mold positioned below. When a desired amount of sand has been deposited in one of the hoppers, the sand handling unit may be readily moved over the tracks 18 to a position adjacent another hopper. Thus, workmen stationed at molds below each of the hoppers may be readily furnished with properly prepared sand by means of a single portable sand conditioning outfit.

From the above, it may be seen that the

improved apparatus will not only greatly expedite the process of preparing sand, but will also condition the sand perfectly by adding just the right amount of moisture thereto by mechanical means which is absolutely accurate. Thus, there has been provided in a single portable unit all of the requisite mechanism for automatically preparing sand for use.

Although only one form of the invention has been shown and described, it is obvious that various changes and modifications may be made, and it is to be understood that all such changes are contemplated as may come within the scope of the claims.

What I claim is:

1. Sand handling apparatus comprising a plurality of overhead receptacles, an elevator and sand moistening unit movably mounted adjacent said receptacles, and means carried by said unit for discharging the elevated and moistened sand, the unit being positionable adjacent a predetermined receptacle for said discharge.

2. Sand handling apparatus comprising a plurality of overhead receptacles, an overhead support adjacent said receptacles, an elevator and sand moistening unit movable along said overhead support, and means carried by said unit for discharging the elevated and moistened sand, the unit being positionable adjacent a predetermined receptacle for said discharge.

3. Sand handling apparatus comprising a plurality of overhead receptacles, an overhead track adjacent said receptacles, an elevator and sand moistening unit movable along said track, and means carried by said unit for discharging the elevated and moistened sand, the unit being positionable adjacent a predetermined receptacle for said discharge.

4. Sand handling apparatus comprising a plurality of overhead receptacles, an overhead track adjacent said receptacles, a truck movable on said track, an elevator carried by said truck, a sand moistening device mounted on the truck for receiving sand lifted by the elevator, and means carried by the moistening device for discharging said sand, the truck being positionable adjacent a predetermined receptacle for said discharge.

5. A material handling apparatus comprising a plurality of overhead receptacles, an elevator unit having a material receiving opening, said elevator unit being movable adjacent said receptacles for lifting material fed into said receiving opening and for discharging the same into a predetermined receptacle, and a vibrating screen positioned adjacent the receiving opening of the elevator unit and movable with said unit.

6. Sand handling apparatus comprising a movable frame, elevating mechanism within said frame for lifting sand fed thereinto, means carried by the frame for segregating a measured amount of sand, means for supplying a measured amount of water to said measured amount of sand, and means for discharging the elevated and moistened sand, said frame being movable to a predetermined point for said discharge.

7. Sand handling apparatus comprising a movable frame, elevating mechanism within said frame for elevating sand fed thereinto, means carried by the frame for periodically adding a predetermined amount of moisture to the sand, and means for discharging the elevated and moistened sand, the frame being movable to a predetermined point for said discharge.

8. In a sand handling apparatus, sand measuring mechanism, water measuring mechanism, means for directing sand into said sand measuring mechanism, and means for automatically adding a measured amount of water from said water measuring mechanism to a measured amount of sand.

9. In a sand handling apparatus, a rotatable drum having a plurality of compartments, a receptacle below said drum, means for causing rotation of said drum to discharge sand from a compartment thereof into the receptacle when said compartment has been filled with a predetermined amount of sand, water measuring mechanism, and means for automatically adding a measured amount of water from said water measuring mechanism to a measured amount of sand in the receptacle.

10. In a sand handling apparatus, a rotatable drum having a plurality of compartments, means for directing sand into a compartment of said drum, a receptacle below said drum, means responsive to the weight of the sand discharged into said compartment for causing rotation of said drum to discharge sand from said compartment into the receptacle when the compartment has been filled with a predetermined amount, water measuring mechanism, and means for automatically adding a measured amount of water from said water measuring mechanism to a measured amount of sand in the receptacle.

11. In a sand handling apparatus, a rotatable drum having a plurality of compartments, means for directing water into said drum, a receptacle below the drum, a sand receptacle, and means for causing rotation of said drum to discharge water from a compartment thereof into the water receptacle below when said compartment has been filled with a predetermined amount of water, and means for directing said water from the water receptacle to the sand receptacle.

12. In a sand handling apparatus, a rotatable drum having a plurality of compart-

ments, a sand receptacle below said drum, means for directing sand into a compartment of said drum, means responsive to the weight of the sand discharged into said compartment for causing rotation of said drum to discharge sand from said compartment into the receptacle when said compartment has been filled with a predetermined amount, a second rotatable drum having a plurality of compartments therein, means for directing water into said drum, a water receptacle below said second drum, means responsive to rotation of the sand receiving drum for causing discharge of water from a compartment of the water drum into the water receptacle, and means for leading said discharged water from the water receptacle into the sand receptacle.

13. A sand handling device comprising a movable frame, elevating mechanism within said frame, means carried by said frame for automatically adding water to said elevated sand, means for mixing said water and sand, a sand conditioning device carried by the frame, means for discharging the moistened sand into said conditioning device, and means carried by the frame for discharging the elevated, moistened and conditioned sand, said frame being movable to a predetermined point for said discharge.

14. A sand handling device comprising a movable frame, elevating mechanism within said frame, means carried by said frame for automatically adding a predetermined amount of water to said elevated sand, means for mixing said water and sand, a sand conditioning device in connection with the frame, means for discharging the moistened sand into said conditioning device, and means carried by the frame for discharging the elevated, moistened and conditioned sand, said frame being movable to a predetermined point for said discharge.

In testimony whereof, I affix my signature.

MAX W. GOLDBERG.