March 17, 1936. W. F. PIPER 2,034,203

APPARATUS FOR SCREENING AND AERATING MOLDING SAND

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Fig. 1

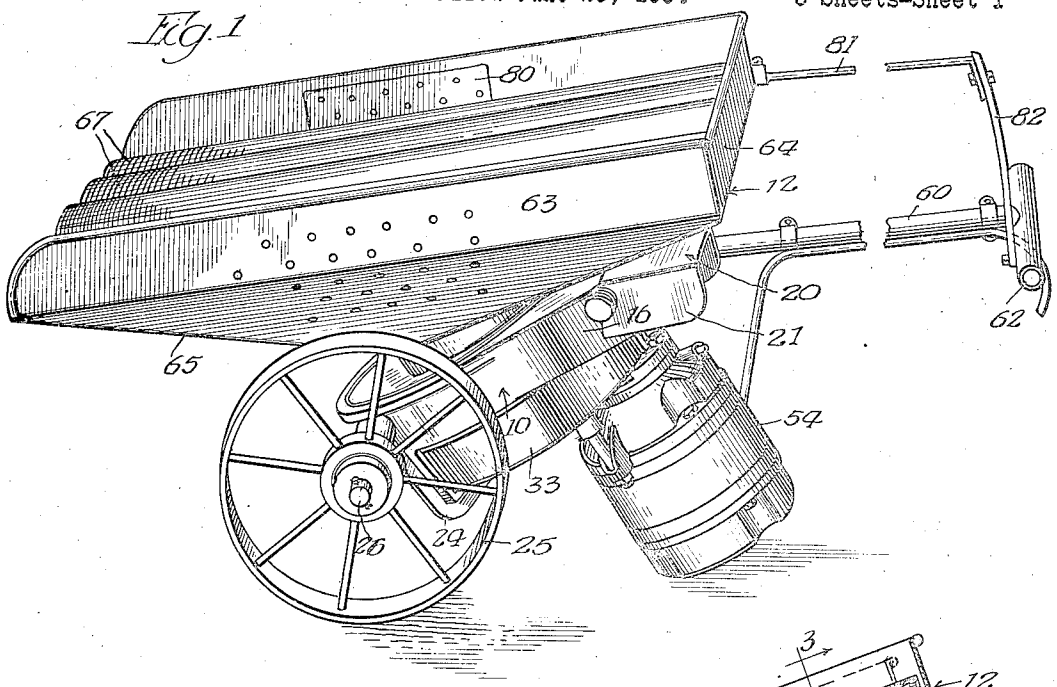


Fig. 2

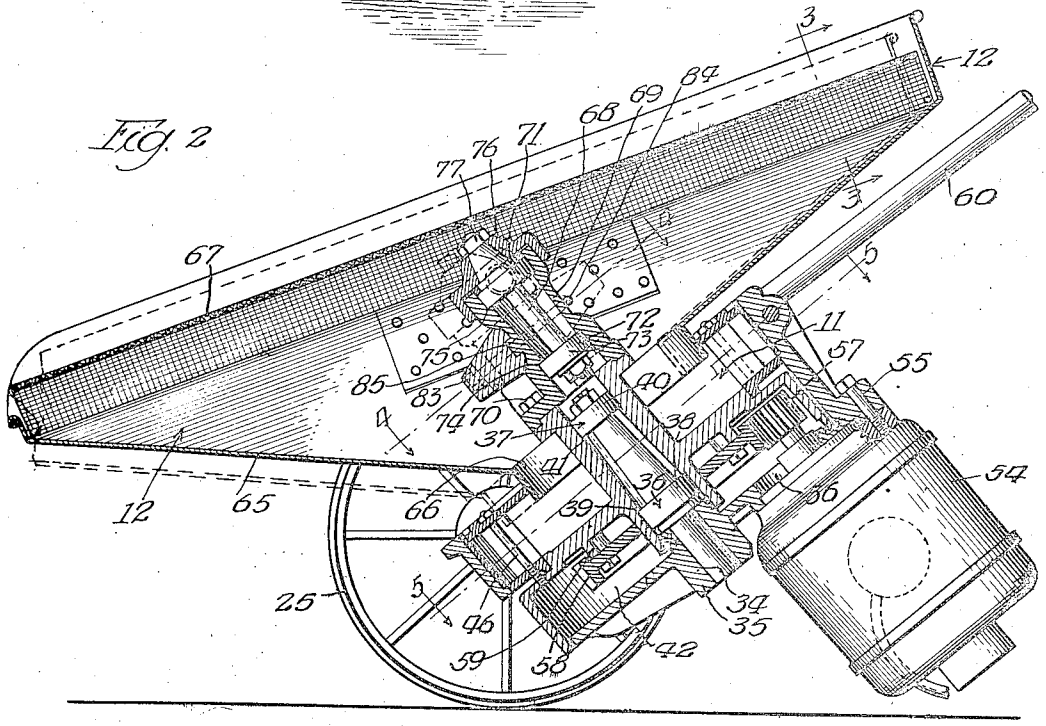
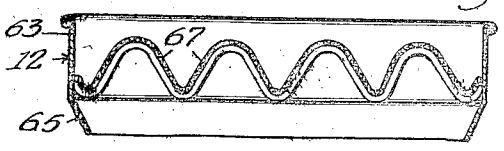


Fig. 3



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APPARATUS FOR SCREENING AND AERATING MOLDING SAND

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Fig 4

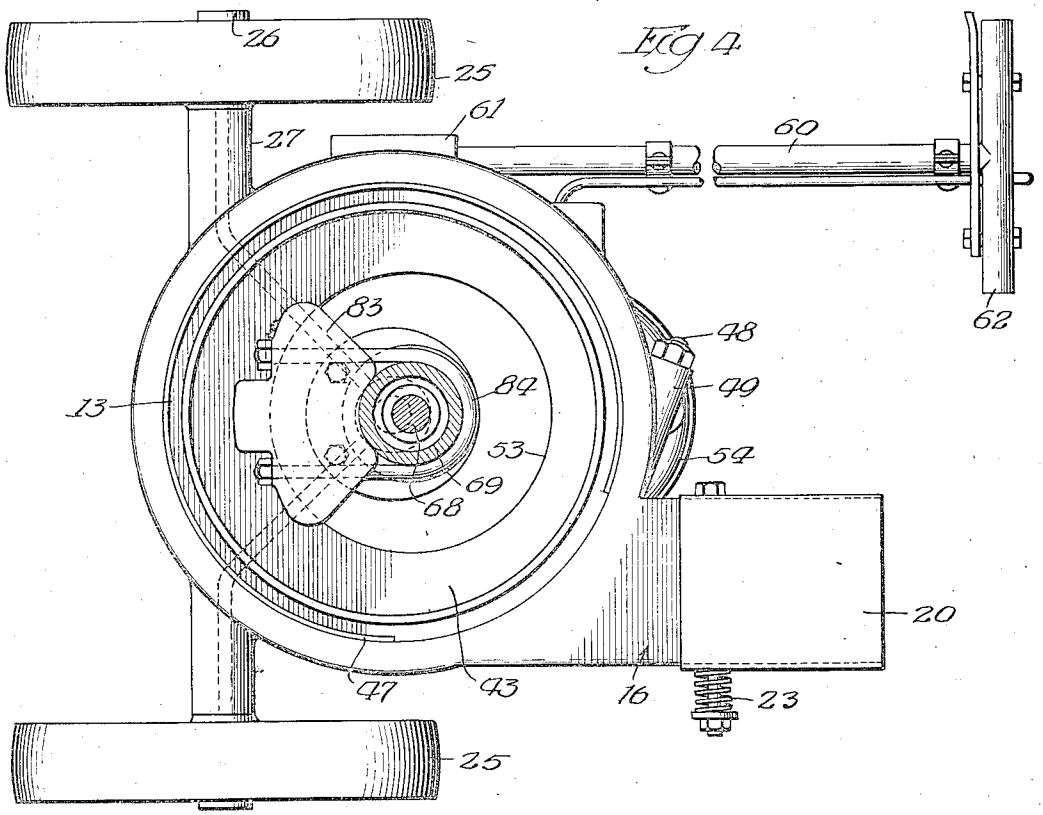
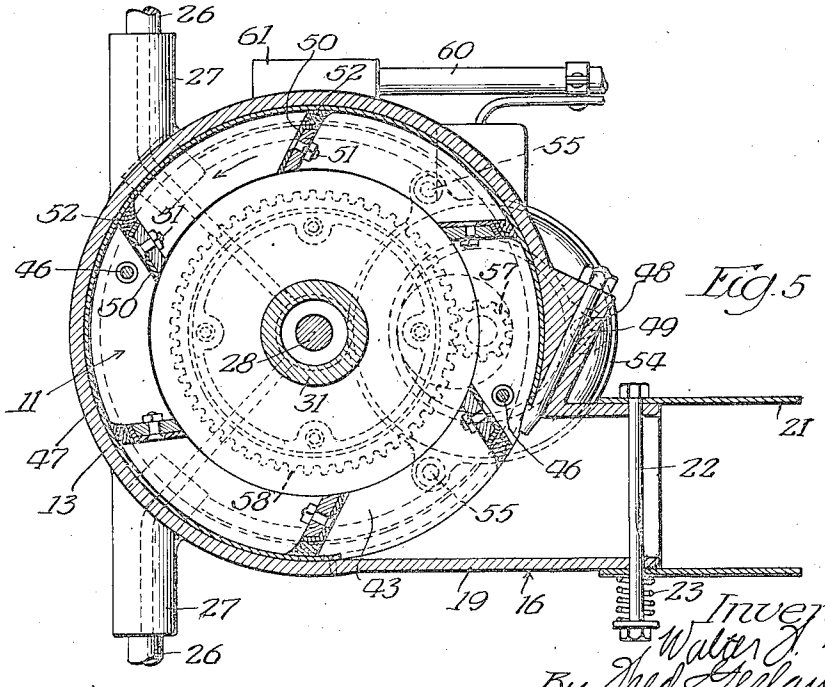


Fig 5



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APPARATUS FOR SCREENING AND AERATING MOLDING SAND

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Fig. 6

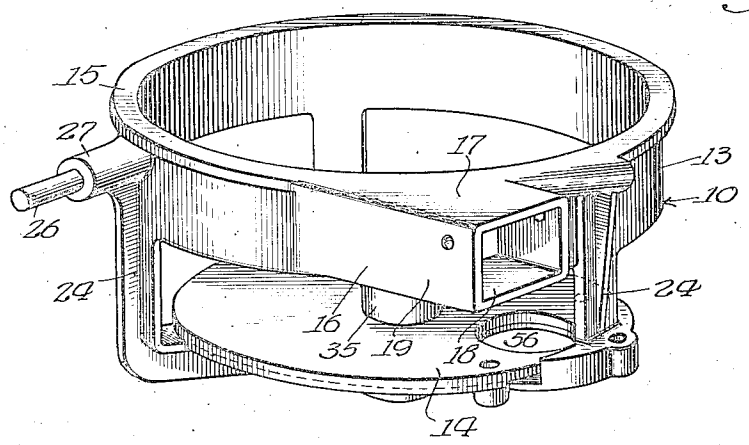


Fig. 7

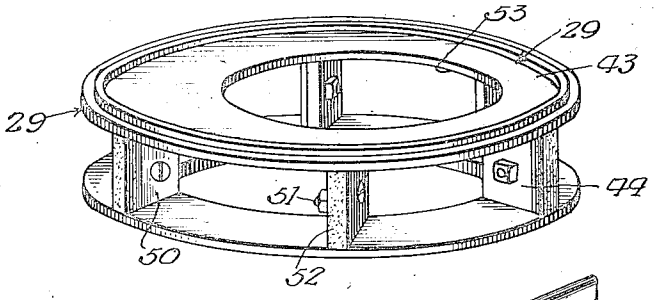


Fig. 8

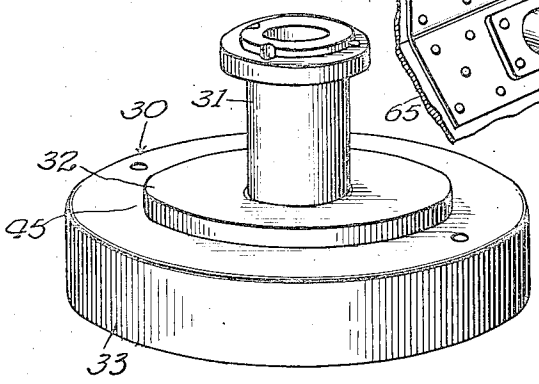
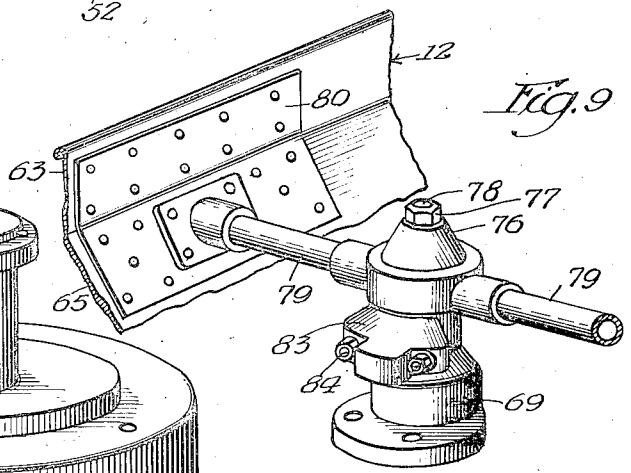


Fig. 9



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Patented Mar. 17, 1936 2,034,203

UNITED STATES PATENT OFFICE

2,034,203

APPARATUS FOR SCREENING AND AERATING MOLDING SAND

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Application June 23, 1934, Serial No. 732,005

17 Claims. (Cl. 259—7)

The invention relates generally to apparatus for screening and aerating molding sand. More particularly, the invention relates to that type of sand screening and aerating apparatus which is readily movable from place to place on the floor of the foundry wherein it is used, and comprises (1) a housing structure which embodies a discharge opening at one side thereof and is provided with a pair of ground wheels for purposes of portability, (2) a bodily movable, screen-equipped hopper which is associated with the housing and serves during operation of the apparatus to screen the sand that is shoveled or delivered into it and to feed the screened sand into the housing structure, and (3) a blade-equipped rotor which is disposed in the housing structure and is driven by an electric motor through the medium of speed-reducing gearing so that it operates to fling or throw the sand outwardly through the discharge opening for aerating purposes.

One object of the invention is to provide an apparatus of this type which is generally an improvement upon, and is more efficient in operation than, previously designed apparatus for the same purpose and in which the various parts thereof are arranged compactly and are so constructed and positioned one with respect to the other that the apparatus as a whole is capable of withstanding hard usage and is not subject to damaging strains or stresses during operation.

Another object of the invention is to provide a sand screening and aerating apparatus of the type and character under consideration in which the rotor consists of a pair of superposed units, the upper of which embodies the blades for flinging or throwing the sand from the housing structure through the discharge opening and rotates in a cylindrical portion of the housing structure, and the lower of which embodies a depending skirt which houses the speed-reducing gearing through which the rotor is driven from the electric motor.

Another object of the invention is to provide an apparatus of the last mentioned character and for the purpose hereinbefore set forth in which the electric motor for driving the rotor is connected to the lower part of the housing structure in such a manner that it is disposed intermediate the ground wheels and forms with the latter a tripod arrangement whereby the apparatus is supported against movement or creeping during operation thereof.

Another object of the invention is to provide an apparatus for screening and aerating molding sand in which the blades of the rotor are constructed in a novel manner and have simple means for preventing breakage thereof by scrap and other metal pieces which work their way through the screen of the hopper and into the housing structure.

Another object of the invention is to provide a sand screening and aerating apparatus of the rotor type in which the screen-equipped hopper is mounted above the housing structure and is gyrated for sand screening and feeding purposes by means of a shaft which is rotatably mounted in an eccentric sleeve on the upper end of the hub of the rotor.

A further object of the invention is to provide an apparatus of the last mentioned character in which the hopper embodies a substantially central discharge member for directing the screened sand into the central portion of the upper unit of the rotor and said upper unit of the rotor embodies a top ring above the blades having an eccentric hole for receiving the discharge member and accommodating the latter during gyration of the hopper and rotation of the rotor during operation of the apparatus.

A still further object of the invention is to provide a sand screening and aerating apparatus which may be manufactured at a low and reasonable cost and has an exceptionally large capacity for its size and in which the hopper is so balanced and positioned with respect to the rotatable shaft in the eccentric sleeve on the hub of the rotor and said sleeve is so counterbalanced that during operation of the apparatus the hopper gyrates without imparting vibration to the other parts of the apparatus.

Other objects of the invention and the various advantages and characteristics of the present sand screening and aerating 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 perspective of a sand screening and aerating apparatus embodying the invention;

Figure 2 is a vertical, longitudinal section illustrating in detail the arrangement and construction of the various parts of the apparatus;

Figure 3 is a transverse section taken on the line 3—3 of Figure 2 and exhibiting in detail the cross sectional construction of the screen in the hopper;

Figure 4 is a section taken on the line 4—4 of Figure 2;

Figure 5 is a section taken on the line 5—5 of Figure 2 and illustrating the construction of the upper unit of the rotor and the arrangement of the blades for flinging or throwing the sand out

of the housing structure via the discharge opening;

Figure 6 is a perspective of the housing structure;

Figure 7 is a perspective of the upper unit of the rotor;

Figure 8 is a perspective of the lower unit of the rotor; and

Figure 9 is a fragmentary perspective showing the manner in which the hopper is connected to the eccentric shaft on the rotor so that it is gyrated in response to drive of the rotor by the electric motor.

The apparatus which forms the subject matter of the invention is designed primarily for use in foundries and like establishments for screening and aerating molding sand. It is of the portable variety and comprises as the main parts thereof a housing structure **10**, a rotor **11** and a hopper **12**. The hopper, as shown in Figures 1 and 2 of the drawings, is located above the housing structure and operates, as hereinafter described, to feed the sand after screening thereof into the housing structure. The rotor **11** is disposed in the housing structure and is adapted during drive to receive the material from the hopper and to fling or throw it outwardly with such force as to loosen or separate the grains of sand.

The housing structure is preferably formed of cast metal. It consists of a cylindrical side wall **13** and a circular bottom **14** and when the apparatus is in its operative position on the floor of the foundry wherein it is used, assumes a position of approximately 45° with respect to the horizontal. The side wall **13** is open at the top and bottom and embodies an integral, outwardly extending, annular flange **15** at its upper margin. It also embodies a rearwardly and tangentially extending discharge member **16**. The latter is rectangular in cross section and forms an opening for the discharge of sand from the housing structure. Because of the angularity of the housing structure when the apparatus is in its normal or operating position, the member **16** extends upwardly and rearwardly. The member consists of a top wall **17**, a bottom wall **18** and a pair of sides **19**. The top wall **17** is flush with the outwardly extending, annular flange **15** at the top of the side wall **13** of the housing structure. The bottom wall **18** is substantially flush with the bottom margin of the side wall and the sides **19** are spaced apart laterally and project from the side wall **13** of the housing structure as shown in Figure 5. Associated with the member **16** is a deflector **20**. This deflector is formed from plate metal or like material and embodies a pair of downwardly extending sides **21** which lap the sides **19** of the member **16** and are pivotally connected to the latter by means of a bolt **22** which extends through aligned holes in the sides **21** and **19** and permits the deflector to be swung upwards and downwards in order to control the direction of the stream emanating from the housing structure during operation of the apparatus. A spring **23** is applied to one end of the bolt **22** and abuts against one of the sides **21** of the deflector so that the deflector is held in its assigned positions. The bottom **14** is supported a comparatively small distance beneath the side wall **13** by means of three bracket-like members **24**. These members are formed integrally with the side wall and bottom and are spaced substantially equidistantly. The housing structure **10** is supported by means of a pair of ground wheels **25** which are located at opposite sides of the housing structure. These wheels are journalled on stub axles **26** and permit the apparatus to be wheeled from place to place over the foundry floor. The stub axles **26** are located at the front of the housing structure and fit in sockets **27** which are formed integrally with, and project outwardly from, the side wall **13** of the housing structure.

The rotor **11** is rotatably mounted on a shaft **28** and consists of an upper unit **29** and a lower unit **30**.

The lower unit is formed of cast metal and consists of an elongated hub **31**, a circular wall **32** and a depending skirt **33**. The shaft **28** extends upwardly and forwardly from the bottom **14** of the housing structure and has the lower end thereof fixed in a socket **34** in a boss **35** on the central portion of the bottom **14**. The upper end of the shaft extends through the hub **31** of the lower unit of the rotor and is provided with a lower roller bearing **36** and an upper roller bearing **37** between it and the interior or inner periphery of the hub **31**, so that it is free to revolve therearound. The lower bearing **36** embodies an outer race **38** which abuts against a downwardly facing shoulder **39** in the hub, and the upper bearing **37** embodies an outer race **40** which bears against an upwardly facing shoulder **41** in the hub. The two bearings are so constructed and coact with the aforementioned shoulders in such manner that the hub **31** of the lower unit of the rotor is held against axial displacement relatively to the shaft **28**. The circular wall **32** is flush with the bottom margin of the side wall **13** of the housing structure and is the same in diameter as said side wall. The skirt **33** is formed integrally with the wall **32** which surrounds the bottom **14** of the housing structure and together with the bottom **14** and the circular wall **32**, forms a substantially closed compartment **42**.

The upper unit **29** of the rotor is confined within the side wall **13** of the housing structure and consists of a pair of superposed rings **43** and a plurality of blades **44**. The latter extend between and space apart the two rings and are preferably formed integrally with the latter. The upper ring is substantially flush with the flange **15** and the lower ring is mounted in an annular groove **45** on the marginal portion of the top face of the circular wall **32** of the lower unit of the rotor. The two units are secured together for conjoint rotation by means of bolts **46** which extend through the two rings **43** and the circular wall **32**, as shown in Figure 2. The blades **44** are angularly positioned and operate during operation of the apparatus to fling the sand that is introduced into the housing structure against an arcuate liner **47** and out the discharge opening in the member **16**. The liner fits against the inner periphery of the side wall **13** of the housing structure and is anchored at one end. The other end is secured in place by means of a bolt **48** which extends through a lug **49** on the outside of the side wall **13** and adjacent one of the sides **19** of the member **16**. The blades **44** have hard metal plates **50** secured to the front faces thereof by means of studs **51** and embody solid rubber parts **52** which are secured in any suitable manner to the plates **50** and engage the liner **47**. By employing the rubber parts **52**, breakage of the blades is reduced to a minimum inasmuch as there is little, if any, likelihood of scrap or any other foreign articles in the sand becoming jammed between the blades and the inner periph-

ery of the arcuate liner 47. The upper ring 43 embodies a hole 53 through which the screened sand is introduced from the hopper 12 into contact with the blades of the rotor. During operation of the apparatus, the screened sand is delivered through the opening 53 in the top ring 43 and after striking the central portion of the circular wall 32 of the lower unit of the rotor is thrown outwardly into contact with the blades. The blades coact with the liner so that the sand is flung or thrown outwardly through the discharge opening in the member 16.

The rotor 11 is driven for sand flinging or throwing purposes by means of an electric motor 54. The latter is located beneath the member 16 and is secured to the rear portion of the housing structure by means of bolts 55. One end of the armature shaft of the motor extends through a hole 56 in the bottom 14 of the housing structure and is provided with a pinion 57 in the compartment 42. This pinion meshes with a gear 58 which is secured to lugs 59 on the bottom face of the circular wall 32 of the lower unit of the rotor. When current is supplied to the motor 54, the pinion 57 operates to drive the gear 58 which, in turn, effects rotation of the rotor in the housing structure. By disposing the pinion 57 and the gear 58 in the compartment 42, no sand or other foreign matter is likely to come in contact with them. The motor 54 is adapted to rest upon the floor of the foundry wherein the apparatus is employed and serves to hold the housing structure in its proper angular position. It forms with the ground wheels 25 a tripod support for the apparatus and prevents the latter from moving or creeping during drive of the rotor.

To permit of ready wheeling of the apparatus from one place to another, a handle 60 is provided. This handle is in the form of a pipe which projects rearwardly from the housing structure 10. The front end of the handle is secured in a socketed boss 61 on one side of the side wall 13 of the housing structure, and the rear end of the handle embodies a transversely extending grip 62. When it is desired to move the apparatus, the handle 60 is raised so as to swing the electric motor 54 out of contact with the foundry floor. The apparatus is then either pushed or pulled to the desired location.

The hopper 12 is formed of sheet metal or any other suitable material and consists of a pair of sides 63, a back 64 and a bottom 65. The bottom is trough-shaped and embodies in the central portion thereof a circular discharge member 66. This member fits in, and extends through, the hole 53 in the top ring 43 of the upper unit of the rotor. A screen 67 is positioned between the sides 63 of the hopper and the back and extends over the hopper bottom 65. It is preferably zigzag in cross section, as shown in Figure 3 of the drawings, and rests upon the marginal portion of the hopper bottom 65. The hopper is adapted to have the sand to be screened and aerated shoveled or otherwise deposited onto the screen 67 and is inclined at the angle shown in Figure 2 so that any scrap or other foreign articles work their way downwardly and forwardly on the screen and are discharged automatically through the open front end of the hopper. In order to effect rapid screening of the sand, the hopper is gyrated by means of a shaft 68 which is eccentrically positioned with respect to the shaft 28 for the rotor and is rotatably mounted in a sleeve-like member 69 on the upper end of the hub 31 of the lower rotor unit. This sleeve-like member is secured to the upper end of the hub 31 by bolts 70 and is eccentrically positioned with respect to the shaft 28 and the hub. The shaft 68 extends longitudinally through the member 69 and is journalled in an upper bearing 71 and a lower bearing 72. These bearings are of the roller type and support the shaft so that it is free to rotate relatively to the sleeve-like member 69. The lower bearing 72 embodies an outer race 73 which abuts against a downwardly facing shoulder 74 in the lower end of the member 69. The outer race of the upper bearing 71 abuts against an upwardly facing shoulder 75 in the upper end of the member 69. The two bearings are so formed and coact with the shoulders 74 and 75 in such manner that the shaft 68 is held against axial displacement relatively to the sleeve-like member. The upper end of the shaft 68 projects above the member 69. It is tapered, as shown in Figure 2, and supports a cap 76. The latter is held in clamped relation with respect to the tapered upper end of the shaft by means of a nut 77 which is mounted on a threaded stem 78 in the extreme upper end of the shaft 68. The hopper is connected to the cap by means of a pair of rods 79 which are secured to, and project inwardly from, a pair of oppositely facing plates 80 which are riveted or otherwise secured to the upper side portions of the hopper bottom 65. The inner ends of the rods are welded or otherwise secured to the cap. During rotation of the rotor 11, the hopper is gyrated through the medium of the shaft 68 which, because of its eccentric position with respect to the shaft 28, moves bodily in a circular path around the shaft 28. Rotation of the hopper is prevented by means of a rod 81 which is secured to the back 64 of the hopper and is attached to an arm 82 on the grip 62 at the rear end of the handle 60. The arm 82 projects upwardly from the grip and is formed of spring metal so that it is free to swing lengthwise of the apparatus in response to gyration of the hopper. The hole 53 in the top ring 43 of the upper rotor unit is eccentrically positioned with respect to the hub 31 of the lower rotor unit and is so disposed or located that during rotation of the rotor it follows the gyratory action of the discharge member 66 at the central portion of the hopper bottom 65. By virtue of the fact that the member 66 fits in the eccentric hole 53, there is no likelihood of sand being thrown from the interior of the housing structure upwardly through the hole. In order to counterbalance the shaft 68 and the hopper, a counterweight 83 is provided. This weight is secured to the central portion of the sleeve-like member 69 by means of a U-bolt 84 and is locked against rotation relatively to the member by means of a lug and socket connection 85. During operation of the apparatus, the weight 83, because it is located in the hopper, helps to break up the sand as it passes from the screen to the discharge member 66. Because the hopper is located on top of the housing structure and the various parts are constructed and arranged as hereinbefore described, the housing structure, as well as the rotor, is not subjected to undue vibration, stress or strain during operation of the apparatus and hence the apparatus does not creep or move. It is to be particularly noted from the drawings that the shaft 68 for gyrating the hopper during operation of the apparatus is located at substantially the intersection of the longitudinal and transverse centers of the hopper and that there

is substantially the same amount of weight on one side of the shaft as on the other. It is also to be noted that the counterweight **83** is positioned on the sleeve-like member **69** at approximately the center of balance or mass of the hopper. Because of this the hopper gyrates without any vibration being transmitted to the other parts of the apparatus.

The operation of the apparatus is as follows:

When current is supplied to the electric motor **54**, the rotor **11** is driven through the medium of the pinion **57** and the gear **58** in the compartment **42**. Drive of the rotor operates to gyrate the hopper **12**. When sand is shoveled into the hopper, it is screened by the screen **67** and is delivered via the discharge member **66** into the housing structure **10**. As soon as the sand enters the housing structure, it is thrown outwardly against the liner **47** by the blades **44** and upon reaching the member **16** is flung outwardly in stream form through the discharge opening in the member. The sand as it leaves the discharge opening in the housing structure becomes aerated. The direction of travel of the sand leaving the housing structure is controlled by means of the deflector **20**.

The herein described sand screening and aerating apparatus consists of but a small number of parts and therefore may be manufactured at a low and reasonable cost. It is of comparatively large capacity for its size and is not likely to get out of order for the reason that the driving parts are protected against contact with the sand, and the hopper, as far as gyration is concerned, is balanced.

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. In an apparatus of the character described, the combination of a housing having an open top and including a continuous side wall with a lateral discharge opening therein, a hopper for granular material positioned above the housing and provided with a discharge member in the bottom thereof for delivering the material into the housing through the open top, a rotor disposed in the housing and having a cross-wall for receiving the material delivered into the housing by the hopper and means on the cross-wall for throwing the material outwardly through the discharge opening during drive of the rotor, a motor associated with the housing and connected to drive the rotor, and means for gyrating the hopper during drive of the rotor by said motor comprising a rotatable member disposed above, and carried eccentrically by, the rotor.

2. In an apparatus of the character described, the combination of a housing having an open top and comprising a bottom and a continuous side wall connected to the bottom and having a lateral discharge opening therein, a hopper for granular material positioned above the housing and provided with a discharge member in the bottom thereof for delivering the material into the housing through the open top, a shaft connected to and extending upwardly from the bottom of the housing, a rotor in the housing mounted on the shaft and having a cross-wall for receiving the material delivered into the housing and a plurality of upstanding blades at the margin of the cross-wall for throwing the material outwardly through the discharge opening during drive of the rotor, a motor associated with the housing and connected to drive the rotor, and means for gyrating the hopper during drive of the rotor by the motor comprising a rotatable member disposed in the hopper and carried eccentrically by the rotor.

3. In an apparatus of the character described, the combination of a housing having an open top and comprising a bottom and a continuous side wall connected to the bottom and having a lateral discharge opening therein, a hopper for granular material positioned above the housing and provided with a discharge member in the bottom thereof for delivering the material into the housing through the open top, a shaft connected to and extending upwardly from the central portion of the housing bottom, a rotor disposed in the housing and comprising a hub around the shaft, a cross-wall around the hub for receiving the material delivered into the housing by the hopper and a plurality of upstanding blades at the margin of the cross-wall for throwing the material outwardly through the discharge opening during drive of the rotor, a motor attached to the housing bottom and connected to drive the rotor, and means for gyrating the hopper during drive of the rotor by said motor including a rotatable shaft disposed in the hopper and supported above, and carried eccentrically by, the hub of said rotor.

4. In an apparatus of the character described, the combination of a housing comprising a continuous, substantially cylindrical side wall with a lateral discharge opening therein and a circular bottom connected to and spaced beneath said side wall; a hopper for granular material associated with the housing and provided with a discharge member for delivering the material into the housing; a rotor disposed in the housing and comprising a flat, disk-like cross-wall substantially flush with the bottom edge of the side wall and adapted to receive the material delivered into the housing from the hopper, a cylindrical skirt depending from and integral with the margin of the cross-wall and extending between the bottom edge of the side wall and the margin of the housing bottom so that it forms with the cross-wall and said housing bottom a closed compartment and a plurality of blades extending upwardly from the margin of the cross-wall and operative during drive of the rotor to fling the material outwardly through the discharge opening; and means for driving the rotor consisting of an electric motor disposed beneath the housing and having the casing thereof attached to the housing bottom and one end of its armature shaft extending through a hole in said bottom and projecting into the compartment and speed reducing gearing between said projecting end of the armature shaft of the motor and the rotor and disposed and housed in said compartment.

5. In a portable apparatus of the character described, the combination of a housing provided at opposite sides thereof with a pair of ground wheels whereby the apparatus may be moved from place to place and comprising a continuous side wall with a lateral discharge opening therein and a bottom connected to but spaced beneath the side wall; means for delivering granular material into the housing; a rotor disposed in the housing and comprising a cross-wall substantially flush with the bottom margin of the side wall of the housing and adapted to receive the ma-

terial delivered into the housing by said means, a plurality of upstanding blades at the margin of the cross-wall for throwing the material outwardly through the discharge opening during drive of the rotor and a skirt depending from the margin of the cross-wall and extending between said bottom margin of the side wall of the housing and the margin of the housing bottom so that it forms with said cross-wall and the housing bottom a closed compartment; and means for driving the rotor comprising an electric motor having the casing thereof attached to the housing bottom so that it forms with the ground wheels a tripod support for the apparatus and also having one end of its armature shaft extending through a hole in said housing bottom and projecting into said compartment, and also comprising speed reducing and gearing between said projecting end of the armature shaft and the rotor and disposed in the compartment.

6. In an apparatus of the character described, the combination of a housing having an open top and comprising a continuous side wall with a lateral discharge opening therein, and a bottom connected to but spaced from the lower margin of the side wall and having a hole through its marginal portion; a hopper for granular material supported above the housing and provided with a discharge member in the bottom thereof for delivering the material into the housing through the open top; a shaft connected to and extending upwardly from the central portion of the bottom of the housing; a rotor in the housing mounted on the shaft and having a cross-wall substantially flush with the lower margin of the side wall of the housing and adapted to receive the material discharged into the housing through said open top, a plurality of blades extending upwardly from the margin of the cross-wall and operative during rotation of the rotor to throw or fling the material outwardly through the discharge opening, and a skirt depending from the margin of the cross-wall and forming with said cross-wall and the bottom of the housing a substantially closed compartment; an electric motor connected to the bottom of the housing and arranged so that one end of the armature shaft thereof extends through the hole in the housing bottom; and projects into the compartment; speed reducing gearing between the motor and the rotor, disposed in the aforesaid compartment and comprising a pinion on said projecting end of the armature shaft and a gear on the under side of the cross-wall of the rotor and extending around the shaft on which the rotor is mounted and meshing with the pinion and means for gyrating the hopper during drive of the rotor by the motor comprising a rotatable member disposed in the hopper and carried eccentrically by the rotor.

7. In a portable apparatus of the character described, the combination of a housing having an inlet opening in one portion thereof and a discharge opening in another portion and provided at opposite sides thereof with a pair of ground wheels whereby the apparatus may be moved from place to place, means associated with the housing for delivering granular material into the housing via the aforesaid inlet opening, a rotor disposed in the housing and having blade means for throwing the material outwardly through the discharge opening during drive of the rotor, and an electric motor connected to drive the rotor and having the casing thereof attached to the bottom portion of the housing at a point substantially midway between and to one side of the ground wheels, so that it forms with said wheels a tripod support for the apparatus.

8. In an apparatus of the character described, the combination of a housing having an open top and comprising a bottom and a continuous side wall connected to the bottom and provided with a lateral discharge opening, a pair of wheels at the sides of the front portion of the housing whereby the apparatus may be moved from place to place, a hopper for granular material supported above the housing and provided with a discharge member at the bottom thereof for delivering the material into the housing through the open top, a rotor disposed in the housing and having blade means for throwing the material outwardly through the discharge opening during drive of the rotor, and an electric motor having the casing thereof attached directly to the rear portion of the housing at a point intermediate the wheels so that it forms with the latter a tripod support for the apparatus, and having one end of the armature shaft thereof extending through a hole or opening in the housing bottom and connected to drive the rotor.

9. In an apparatus of the character described, the combination of a housing having an open top and including a continuous side wall with a lateral discharge opening therein, a hopper for granular material disposed above the housing and provided with a discharge member in the bottom thereof for delivering the material into the housing through the open top, a rotor in the housing provided with blades for throwing the material outwardly through the discharge opening during drive of the rotor, a motor associated with the housing and connected to drive the rotor, and means for gyrating the hopper disposed in the hopper and supported by and mounted eccentrically with respect to the rotor.

10. In an apparatus of the character described, the combination of a housing having an open top and including a continuous side wall with a lateral discharge opening therein, a screen equipped hopper for granular material disposed above the housing and provided with a discharge member in the bottom thereof for delivering the material into the housing through the open top, a rotor in the housing provided with blades for throwing the material outwardly through the discharge opening during drive of the rotor, a motor associated with the housing and connected to drive the rotor, and means for supporting and gyrating the hopper comprising a sleeve-like member disposed in the hopper and connected eccentrically to the rotor for rotation therewith, a shaft rotatably mounted in the sleeve-like member and supporting elements between the shaft and the sides of the hopper.

11. In an apparatus of the character described, the combination of a housing having an open top including a continuous side wall with a lateral discharge opening therein, a hopper for granular material disposed above the housing and provided with a discharge member in the bottom thereof for delivering the material into the housing through the open top, a rotor disposed in the housing and comprising a hub and a plurality of blades for throwing the material outwardly through the discharge opening during drive of the rotor, a motor associated with the housing and connected to drive the rotor, and means for supporting and gyrating the hopper comprising a sleeve-like member disposed in the hopper and connected eccentrically to the upper end of the hub, a shaft rotatably mounted in

the sleeve-like member and supporting elements between the shaft and the sides of the hopper.

12. In an apparatus of the character described, the combination of a housing comprising a bottom and a continuous side wall connected to the bottom and having a lateral discharge opening therein; a hopper for granular material associated with the housing and provided with a discharge member for delivering the material into the housing; a rotor disposed in the housing and comprising a cross-wall spaced above the bottom of the housing and adapted to receive the material delivered into the housing by the hopper, and also comprising means for throwing the material outwardly through the discharge opening during drive of the rotor; an electric motor disposed beneath the housing and having the casing thereof secured to the housing and one end of its armature shaft extending through a hole or opening in the housing bottom into the space between said bottom and the cross-wall of the rotor; and speed reducing gearing in the aforesaid space and between said one end of the armature shaft and the rotor for driving said rotor from the motor.

13. In an apparatus of the character described, the combination of a housing comprising a bottom and a continuous side wall connected to the bottom and having a lateral discharge opening therein; a hopper for granular material associated with the housing and provided with a discharge member for delivering the material into the housing; a shaft connected to and extending upwardly from the central portion of the housing bottom; a rotor in the housing mounted on the shaft and comprising a cross-wall spaced above the bottom of the housing and adapted to receive the material delivered into the housing by the hopper, and also comprising a plurality of upstanding blades at the margin of the cross-wall for throwing the material outwardly through the discharge opening during drive of the rotor; an electric motor disposed beneath the housing and having the casing thereof secured to the housing bottom and one end of the armature shaft extending through a hole in said bottom into the space between the bottom and the cross-wall of the rotor; and speed reducing gearing for driving the rotor from the motor disposed in the aforesaid space and consisting of a pinion on said one end of the armature shaft and a gear fixed to the underside of the cross-wall of the rotor and extending around the shaft and meshing with the pinion.

14. In an apparatus of the character described, the combination of a housing comprising a bottom and a continuous side wall connected to the bottom, and provided with a lateral discharge opening; a pair of ground wheels at the sides of the front portion of the housing whereby the apparatus may be moved from place to place; means for delivering granular material into the housing, a rotor disposed in the housing and comprising a cross-wall spaced above the bottom of the housing and adapted to receive the material delivered into the housing by said means, and also comprising means for throwing the material outwardly through the discharge opening during drive of the rotor; an electric motor having the casing thereof attached to the rear portion of the housing bottom so that it forms with the wheels a tripod support for the apparatus, and also having one end of its armature shaft extending through a hole in the bottom of the housing into the space between the cross-wall of the rotor and said bottom; and speed reducing gearing in the aforesaid space between said one end of the armature shaft and the rotor for driving the rotor from the motor.

15. In an apparatus of the character described, the combination of a housing having an open top and including a side wall with a lateral discharge opening therein; a hopper for granular material disposed above the housing and provided with a discharge member in the bottom thereof for delivering the material into the housing through the open top; a rotor in the housing provided with means for throwing the material outwardly through the discharge opening during drive of the rotor; a motor associated with the housing and connected to drive the rotor; means for supporting and gyrating the hopper comprising a sleeve-like member disposed in the hopper and connected eccentrically to the rotor for rotation therewith, a shaft rotatably mounted in the sleeve-like member and supporting elements between the shaft and the sides of the hopper; and a counterweight mounted on said sleeve-like member.

16. In an apparatus of the character described, the combination of a housing having an open top and including a continuous side wall and a lateral discharge opening therein; a hopper for granular material disposed above the housing and provided with a circular discharge member in the bottom thereof for delivering the material into the housing through the open top; a rotor in the housing provided with blades for throwing the material outwardly through the discharge opening during drive of the rotor; a motor associated with the housing and connected to drive the rotor; means for gyrating the hopper disposed in the hopper and supported by and mounted eccentrically with respect to the rotor; and a ring shaped plate forming a part of and disposed on the upper portion of the rotor above said blades and having the hole therein eccentrically positioned and adapted to receive the circular discharge member of the hopper and to follow the same around during gyration of the hopper.

17. In an apparatus of the character described, the combination of a housing having an inlet and including a cylindrical side wall with a lateral discharge opening therein, means for delivering granular material into the housing through the inlet, a rotor disposed in the housing and comprising a circular cross-wall concentrically positioned within the side wall and adapted to receive the material from the delivery means and also comprising a plurality of outwardly extending, upstanding blades secured fixedly to the margin of the cross-wall and having straight outer edges disposed adjacent to and extending parallel with the inner periphery of the side wall of the housing so that they operate to throw the material outwardly through the discharge opening during drive of the rotor, members of elastic material fixedly secured to, and coextensive with, the outer edges of the blades and adapted to prevent breakage of the blades when the latter encounter scrap in the material, and a motor associated with the housing and connected to drive the rotor.

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