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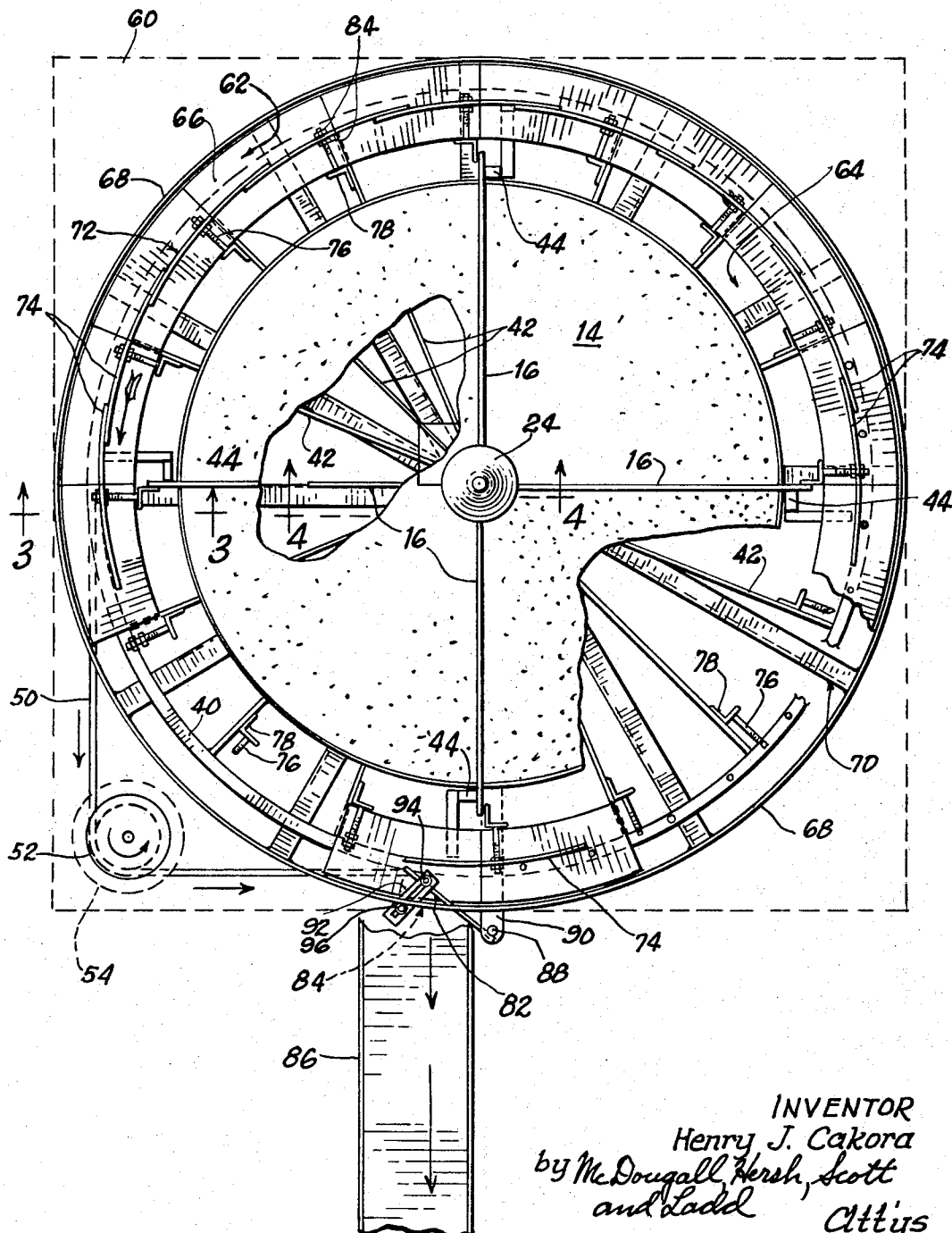
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APPARATUS FOR SEPARATING FOUNDRY SAND

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FIG. 1



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FIG. 2

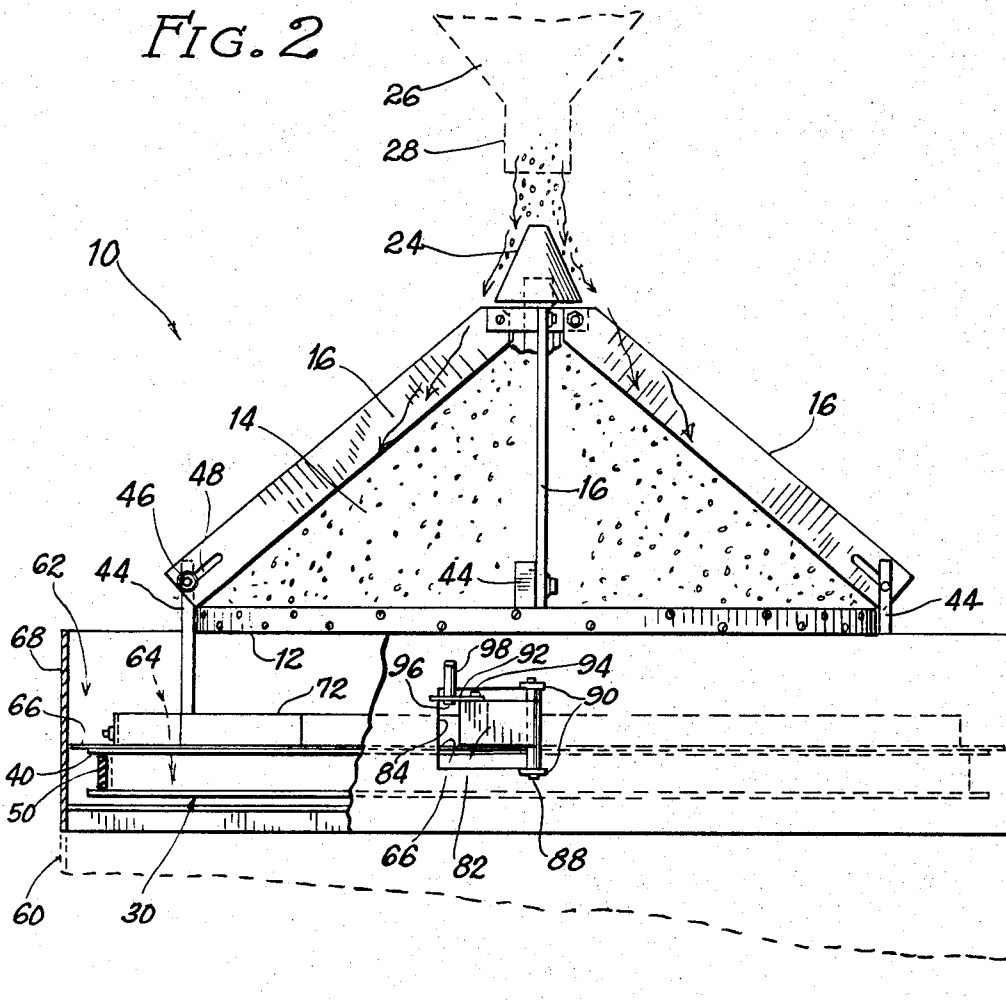
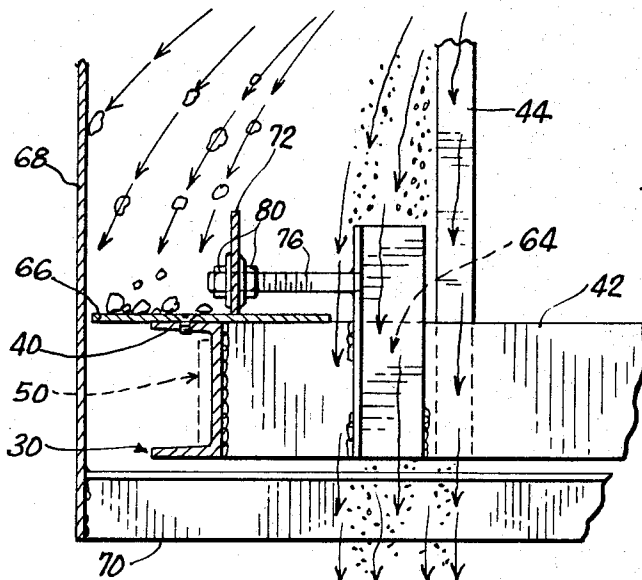


FIG. 3



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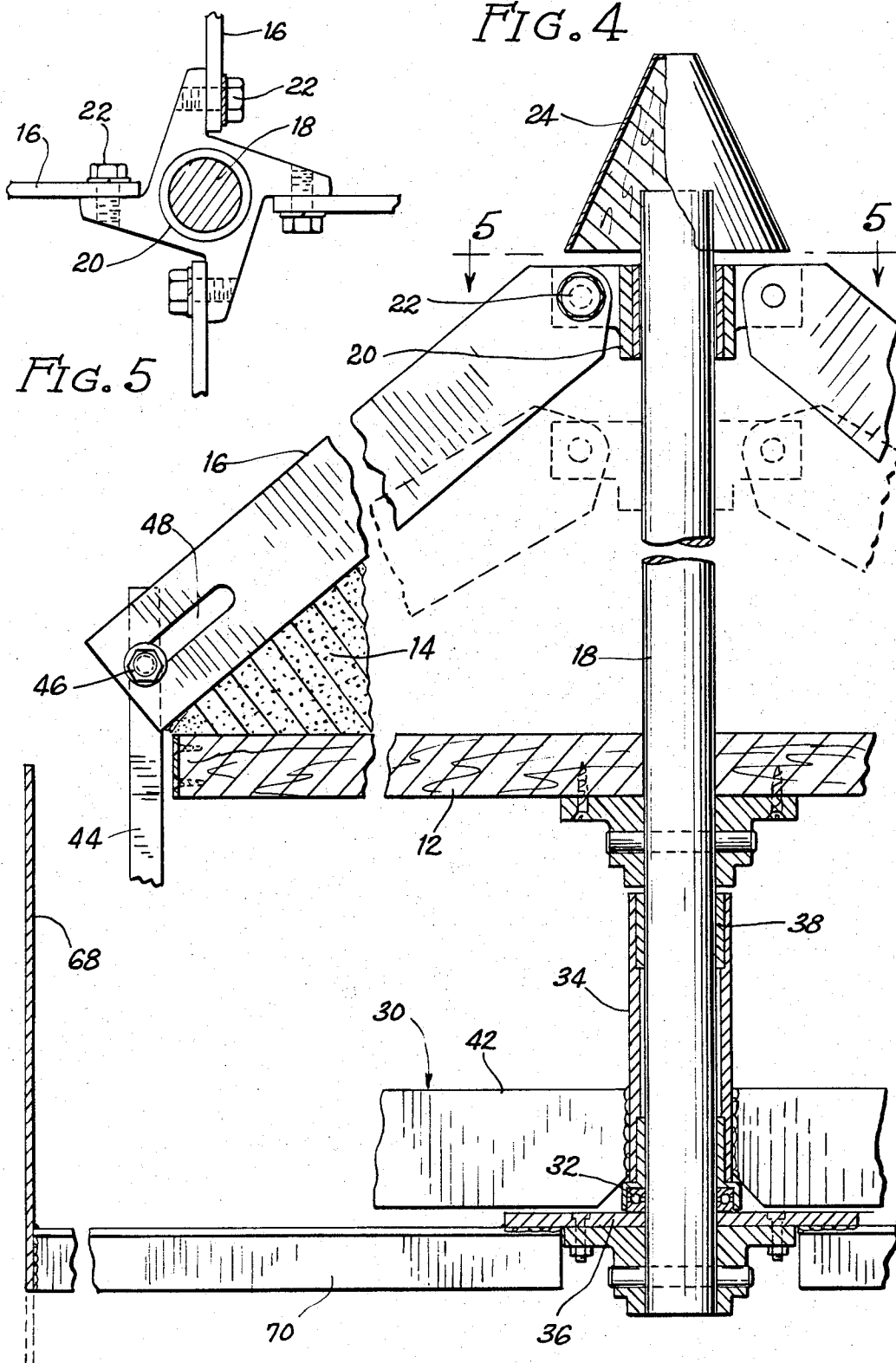
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APPARATUS FOR SEPARATING FOUNDRY SAND

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ABSTRACT OF THE DISCLOSURE

A machine for removing tramp metal, core butts, and other foreign material from foundry sand or the like, comprising a circular platform for holding a pile of the sand, a rotatable support beneath said platform, one or more plows mounted on said rotary support and extending upwardly at an inclined angle from the periphery of said platform toward the axis thereof for striking off the sand into a conical pile, means for directing contaminated sand upon the top of the pile, the sand itself being adapted to stick to the pile while the foreign bodies roll and slide down the pile and fly off the lower edge of the pile, an annular trough disposed outwardly and downwardly from the platform for catching the foreign bodies, the trough comprising a bottom wall rotatable with said support, a stationary cylindrical outer wall, and inner wall members adjustably mounted on said rotary support, the sand being adapted to fall downwardly from the edge of the pile through an opening between said platform and said trough, and a device for removing the foreign bodies from said trough.

This invention relates to a new and improved machine for separating tramp metal, core butts, and other foreign bodies from foundry sand or the like.

In foundries, it is standard practice to make castings by pouring molten metal into molds made of foundry sand. After the metal has solidified, the foundry sand is broken away from the metal so that the metal casting can be removed.

Most of the foundry sand can be reused. However, it is necessary to clean the used sand, in order to avoid any impairment of the quality of subsequent castings. The used sand contains various foreign bodies, such as pieces of tramp metal, core butts comprising sand which has been used in making cores and has fused together due to the heat of the molten metal, and various other foreign bodies.

In conventional foundry practice, the used or contaminated sand is cleaned by allowing it to pass through a vibratory screening machine. Such a machine has a screen which passes the fine sand, while retaining the larger foreign bodies such as pieces of metal and core butts. The screen is vibrated mechanically so as to accelerate the passage of the sand through the screen.

Screening machines are subject to various difficulties. The screening of the sand is a relatively slow process particularly if a fine screen is employed. Considerable power is required to vibrate the screening machine. The screen tends to plug up, and there is the problem of removing the foreign material from the screen. To minimize plugging of the screen, while also accelerating the screening process, it is common practice to use a fairly coarse screen, even though a finer screen would produce better cleaning of the sand.

One object of the present invention is to provide a new and improved machine which will clean foundry sand or the like, without the use of any screen.

A further object is to provide such a new and improved machine which is capable of handling a high volume of sand, yet requires little power to operate.

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Another object is to provide a new and improved machine which removes foreign material very effectively from the used sand, yet is not subject to clogging.

In accordance with the present invention, the used sand is cleaned by a machine which accumulates a pile of the sand on a platform. The pile is struck into a conical shape by a plow or a scraper. Means are provided for producing relative rotation between the pile and the plow. Preferably, the plow is mounted on a rotary support, while the pile is held on a stationary platform. The used sand is directed upon the top of the pile. The sand itself sticks to the pile until it is struck off by the plow. The sand then falls downwardly from the edge of the platform. On the other hand, foreign bodies do not stick to the pile, but roll or slide at high speed down the inclined side of the pile, and fly outwardly and downwardly with considerable velocity from the edge of the platform. The foreign bodies are caught by receiving means, preferably in the form of an annular trough spaced outwardly and downwardly from the periphery of the platform. The trough preferably comprises a bottom wall or ledge which rotates with the plow. Thus, the foreign bodies may be removed from the ledge by a scraper or deflector which directs the foreign bodies outwardly upon a chute or the like.

Further objects and advantages of the present invention will appear from the following description taken with the accompanying drawings, in which:

FIG. 1 is a plan view of a sand separating and cleaning machine to be described as an illustrative embodiment of the present invention.

FIG. 2 is an elevational view, partly in a central vertical section.

FIG. 3 is a fragmentary enlarged vertical section, taken generally along the line 3—3 in FIG. 1.

FIG. 4 is a fragmentary vertical section, taken generally along the line 4—4 in FIG. 1.

FIG. 5 is a fragmentary horizontal section taken generally along the line 5—5 in FIG. 4.

As already indicated, the drawings illustrate a machine 10 for removing foreign bodies from foundry sand or the like. The machine will be described in connection with foundry sand, but it will be understood that the invention is also applicable to the cleaning or separation of other materials.

The illustrated machine 10 comprises a supporting member 12 adapted to hold a pile 14 of the foundry sand. The pile 14 is struck into a conical shape by one or more plows or scrapers 16.

The machine is arranged to produce relative rotation between the supporting member 12 and the plows 16. In the illustrated machine 10, the plows 16 are rotated relative to the supporting member 12, which is in the form of a stationary generally circular platform. However, it will be understood that the supporting member could be rotated relative to the plows.

While a single plow could be employed, it is preferred to use a plurality of angularly spaced plows. The illustrated machine 10 employs four equally spaced plows. It will be seen that each plow 16 is in the form of a scraper blade which is inclined upwardly toward the axis of the circular platform 12, from a point adjacent the periphery thereof.

As shown to best advantage in FIG. 4, the stationary platform 12 is mounted on a stationary vertical shaft 18 which extends along the axis of the platform 12. The illustrated shaft 18 projects a considerable distance above the platform 12.

To support the upper ends of the plows 16, a bearing 20 is preferably mounted around the upper end of the shaft 18. Pivot bolts 22 or the like are employed to connect the upper ends of the plows 16 to the bearing 20. It

will be seen that the bearing 20 is slideable along the shaft 18, to provide for adjustment of the angle of the plow 16.

A deflector 24 is mounted on the upper end of the shaft 18 to direct the used or contaminated sand upon the top of the pile 14. The deflector 24 is preferably conical in shape as illustrated. It will be understood that the deflector 24 protects the bearing 20 from the sand. At the same time, the deflector 24 causes the sand to slide evenly over the top of the pile.

Before the used sand is fed to the separating machine 10, the normal practice is to elevate the sand mechanically to a device 26 which breaks up any lumps in the sand, so that the sand will flow freely to the separating machine. The lump-breaking device 26 has an outlet pipe or chute 28 which directs the used sand upon the deflector.

The plows 16 are mounted on a rotary support which is illustrated in the form of a horizontal wheel 30 disposed beneath the platform 12. The wheel 30 rotates about the stationary shaft 18. As shown in FIG. 4, a thrust bearing 32 is preferably mounted around the shaft 18 to carry the weight of the wheel. As shown, the wheel 30 has a hub in the form of a sleeve 34. The thrust bearing 32 is between the lower end of the sleeve 34 and a stationary flange 36 on the shaft 18. A second bearing 38 is preferably provided between the upper end of the sleeve 34 and the shaft 18.

The illustrated wheel 30 has a channel shaped rim 40. A plurality of spokes 42 extend radially between the hub 34 and the rim 40.

A plurality of vertical bars or members 44 project upwardly from the wheel 30 to support the plows 16. The vertical members extend closely adjacent the periphery of the circular platform 12. To provide for adjustment of the plows 16, each plow is preferably clamped to the corresponding vertical member 44 by means of a pivot bolt 46 or the like, which extends through an elongated slot 48 in the plow. It will be apparent that the plows 16 can be adjusted by loosening the bolts 46 and sliding the bearing 20 along the shaft 18. At times, it may be desirable to change the angle of the plows, to suit the characteristics of the sand. The pile of sand is normally struck off at an angle somewhat less than the natural angle of repose of the sand, so that the sand itself will stick to the pile until it is struck off by the plows.

Means are provided to rotate the wheel 30 at a slow rate of speed. As shown to best advantage in FIG. 1, a drive belt 50 is employed to connect the wheel to a pulley 52 on a drive motor 54. The belt 50 is wrapped around the channel shaped rim 40 of the wheel 30. The motor 54 may incorporate reduction gears so that the pulley 52 is driven at low speed. Of course, the rotary speed of the wheel 30 is only a fraction of the speed of the pulley 52, because the wheel is much larger in diameter than the pulley.

When the used or contaminated sand is directed upon the sand pile 14, the sand itself sticks to the pile, due to the natural tackiness of the sand. The sand continues to adhere until it is struck off by the plows 16. The excess sand flows gradually down the pile along the plows 16, and drops off the outer edge of the platform 12. The sand drops through the spaces between the spokes 42 of the wheel 30. Means may be provided under the wheel 30 to receive and carry off the sand. Such means might take the form of a conveyor or the like, but, in this case, the sand separating machine 10 is mounted directly over the open upper end of a storage bin 60, in which the cleaned sand is accumulated for future use.

However, foreign particles or bodies roll or slide down the inclined side of the sand pile, because they are lacking in the natural adhesive properties of the sand. Such foreign bodies include stray pieces of metal derived from the previous casting operations, fragments of partially fused cores, glazed unbroken lumps of sand, and the like. Most foreign bodies of this kind bounce off the deflector 24, with the result that they are projected down

the side of the pile with considerable initial velocity. The foreign bodies tend to pick up additional velocity as they tumble down the side of the sand pile so that they fly outwardly and downwardly from the lower edge of the sand pile with considerable speed.

Means are provided to receive the foreign bodies and particles as they fly outwardly from the periphery of the supporting platform 12. As illustrated to best advantage in FIGS. 2 and 3, such means preferably take the form of an annular trough 62, spaced outwardly and downwardly from the outer edge of the platform 12. An opening or space 64 is provided between the platform 12 and the trough 64, so that the cleaned sand can drop downwardly without being intercepted by the trough 62.

The illustrated trough 62 comprises a generally horizontally lower wall or ledge 66. In this case, the ledge 66 is mounted on the upper side of the wheel 30, for rotation therewith.

As shown, the trough 62 has a substantially cylindrical outer wall 68 which intercepts the outwardly flying foreign bodies and directs them downwardly upon the ledge 66. In this case, the outer wall 68 is stationary and is spaced closely around the outer edge of the ledge 66. It will be seen from FIG. 4 that the outer wall 68 extends upwardly from a frame 70 which supports the lower end of the stationary shaft 18. The frame 70 and the cylindrical wall 68 are mounted on the upper end of the storage bin 60.

The illustrated trough 62 comprises a generally cylindrical inner wall 72 which is spaced inwardly from the outer wall 68. In this case, the inner wall 72 is mounted on the wheel 30 for rotation therewith.

It is preferred to arrange the inner wall 72 so that it can be adjusted radially, to suit various operating conditions. The inner wall 72 is adjusted so that substantially all of the foreign bodies fly over the inner wall and into the trough 62. The inner wall 72 retains the foreign bodies on the ledge 66 and prevents them from bouncing out of the trough 62.

To provide for such adjustment, the inner wall 72 is preferably formed as a plurality of overlapping sections 74, as shown to best advantage in FIG. 1. Each of the sections 74 is in the form of a cylindrically curved plate. The sections 74 overlap so as to form a continuous wall. In the illustrated construction, each section 74 is secured to the wheel 30 by means of an adjustable threaded stud or bolt 76. Each stud 76 projects outwardly from an upright member 78 secured to the wheel 30. Each section 74 is apertured to receive the corresponding stud 76 and is clamped to the stud by means of a pair of nuts 80. Thus, the section 74 can be adjusted by loosening the nuts 80 and screwing them along the threaded stud 76. It will be seen that the lower edge of the section 74 engages the upper side of the ledge 66.

Means are provided to remove the foreign bodies and particles from the trough 62. In the illustrated construction, as shown to best advantage in FIG. 1, the foreign bodies are deflected outwardly by a scraper or plow 82 which extends into the trough 62 through an opening 84 in the outer wall 68. The plow 82 may actually scrape along the ledge 66, or may be spaced closely therefrom. Clearance is provided between the inner end of the plow 82 and the inner wall 72. The rotating wheel 30 brings the foreign bodies to the plow 82, which scrapes them off the ledge 66 and deflects them outwardly through the opening 84. In the illustrated construction, the foreign bodies drop from the opening 84 into a chute 86 which carries them away by gravity to any desired storage facility or point of disposal. It will be understood that some other type of conveyor may be employed to carry off the foreign material.

The illustrated plow or scraper is adjustably mounted for swinging movement about a vertical pivot 88, supported by brackets 90. The plow 82 is clamped in its adjusted position by means of a slotted arm 92 which is

secured to the plow by a clamping bolt 94. A second clamping bolt 96 is provided between the arm 92 and a stationary bracket 98.

It may be helpful to review the operation of the sand separating machine 10. During the operation of the machine, the wheel 30 is rotated at a slow speed by the drive motor 54. The used or contaminated sand is directed downwardly from the pipe or chute 28 upon the conical deflector 24, which distributes the sand uniformly onto the platform 12. When the sand pile 14 rises high enough on the platform 12, the excess sand is struck off by the scraper blade 14 which rotates with the wheel 30. Thus, the sand pile is formed into a conical shape.

As the contaminated sand is dropped on the conical pile 14, the sand itself sticks to the pile until the excess sand is struck off the pile by the plows 16. The excess sand flows slowly down the side of the pile along the plows 16 and drops off the outer edge of the platform 12. Because the sand is traveling at low speed, it drops substantially straight down from the periphery of the platform 12 through the spaces between the spokes 42 of the wheel 30, and directly into the storage bin 60.

The foreign bodies in the contaminated sand are harder, smoother, and less tacky than the sand itself. Thus, the foreign bodies do not stick to the sand pile 14, but bounce off the deflector 24 and tumble or slide down the side of the pile 14 at considerable speed. From the periphery of the platform 12, the foreign bodies fly outwardly and are caught by the annular trough 62. Some of the foreign bodies strike the ledge or bottom wall 66 directly, while others are deflected upon the ledge 66 by the cylindrical outer wall 68. The adjustable inner wall 72 retains the foreign bodies on the ledge 66. The ledge 66 rotates with the wheel 30 so that the foreign bodies are brought to the plow or scraper 82 which deflects the foreign bodies outwardly through the opening 84 in the outer wall 68. The foreign bodies drop into the chute 86 and are carried away to the point of disposal.

The angle of the plows or scrapers 16 may be changed to suit the properties of various types of sand or other materials. The plows are adjusted by loosening the mounting bolts 46 and sliding the bearing 20 along the shaft 18. Thus, the bearing 20 may be moved downwardly from its full line position to its broken line position in FIG. 4. When the plows 16 have been adjusted, the clamping bolts 46 are again tightened. Normally, the angle of the plows 16 is adjusted so that it is somewhat less than the natural angle of repose of the particular sand which is to be cleaned. The natural angle of repose is the maximum angle at which the sand will stick to the pile, rather than sliding down the side of the pile. Inasmuch as the plows 16 strike off the sand at an angle somewhat less than its natural angle of repose, the sand itself will stick to the pile until it is struck off by the plows.

The curved sections 74 of the inner wall 72 may be adjusted radially to insure that the foreign bodies will be intercepted by and retained in the annular trough 62. The sections 72 are normally adjusted inwardly until substantially all of the foreign bodies fly over the inner wall and are intercepted by the ledge or lower wall 66.

The sand separating machine keeps itself clean, so that it may be operated for an extremely long period of time without attention. A large volume of sand can be cleaned by the machine in a given period of time, so that the machine operates on an extremely efficient and economical basis.

Various other modifications, alternative constructions and equivalents may be employed without departing from the true spirit and scope of the invention, as exemplified in the foregoing description and defined in the following claims.

I claim:

1. A machine for separating foreign bodies from foundry sand or the like,

said machine comprising a supporting member for supporting a pile of the foundry sand or the like, a plow disposed at an inclined angle above said supporting member for striking off the pile of sand, said angle corresponding generally to but not greater than the natural angle of repose of the sand or the like being treated,

means for producing relative rotation between said supporting member and said plow so that the plow will strike off the pile of sand into a generally conical shape,

means for directing contaminated sand upon the top of the pile on said supporting member, and receiving means spaced outwardly and downwardly from said supporting member for receiving foreign bodies and separating the foreign bodies from the sand,

the foreign bodies being adapted to travel down the sides of the pile of sand without sticking and at relatively high velocity so as to fly outwardly upon said receiving means, while the sand sticks to the pile and is struck off by said plow so as to fall between said supporting member and said last mentioned means.

2. A machine according to claim 1, in which said supporting member comprises a circular platform for holding the pile of sand.

3. A machine according to claim 1, in which said plow comprises an inclined blade.

4. A machine according to claim 1, in which said supporting member is stationary, and in which said plow is mounted on a rotary support for rotation relative to said supporting member.

5. A machine according to claim 1, in which said supporting member comprises a stationary, generally circular, platform, said plow comprising a blade extending upwardly from a point adjacent the periphery of said platform toward a point above said platform and adjacent the axis thereof, said plow being mounted on a rotary support for rotation relative to said platform.

6. A machine according to claim 1, in which said receiving means comprise a ledge disposed outwardly and downwardly from said supporting member for catching the foreign bodies, an opening being provided between said supporting member and said ledge, the sand being adapted to fall through said opening.

7. A machine according to claim 6, including means for removing the foreign bodies from said ledge.

8. A machine according to claim 1, in which said receiving means comprise a trough disposed outwardly and downwardly from said supporting member for receiving the foreign bodies, an opening being provided between said trough and said supporting member, the sand being adapted to fall through said opening.

9. A machine according to claim 1, including a rotary member supporting said plow for rotation relative to said supporting member, said supporting member comprising a generally circular platform for holding the pile of sand, said receiving means comprising a ledge mounted on said rotary member and disposed outwardly and downwardly from said platform for catching the foreign bodies, an annular space being provided between said platform and said ledge, the sand being adapted to fall downwardly through said space, and means for removing the foreign bodies from said ledge.

10. A machine according to claim 1,

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in which said supporting member comprises a stationary horizontal generally circular platform for holding the pile of sand,
 said plow comprising a blade inclined upwardly toward the axis of said platform from a point adjacent the periphery thereof, 5
 a rotary member being provided under said platform for rotatably supporting said plow,
 said receiving means comprising an annular trough disposed outwardly and downwardly from said platform for catching the foreign bodies, 10
 said trough having a bottom wall in the form of an annular ledge mounted on said rotary member,
 said trough having a stationary cylindrical outer wall adjacent the outer edge of said ledge, 15
 said trough having cylindrically curved inner wall means mounted on said rotary support,
 a stationary deflector being mounted over said ledge for removing the foreign bodies from said trough,
 an opening being provided between said platform and said ledge, 20
 the sand being adapted to fall through said opening.
11. A machine according to claim 10,
 comprising a shaft projecting upwardly from the center of said platform and supporting the inner end of said plow, 25
 a deflector being provided above the upper end of said

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shaft for directing the contaminated sand upon the pile on said platform.
12. A machine according to claim 10,
 in which a plurality of such plows are provided at angular intervals for striking off the pile of sand on said platform.
13. A machine according to claim 10,
 including means for radially adjusting the position of said inner wall means of said trough.
14. A machine according to claim 10,
 including a stationary shaft projecting upwardly from the center of said platform,
 a bearing adjustably mounted on said shaft for supporting the inner end of said plow,
 and means for adjustably mounting the outer end of said plow on said rotary support whereby the angle of said plow can be adjusted.

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FRANK W. LUTTER, *Primary Examiner.*