Dec. 30, 1924. 1,520,916

J. S. TOWNSEND

SAND CUTTING AND SCREENING MACHINE

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Fig. 1.

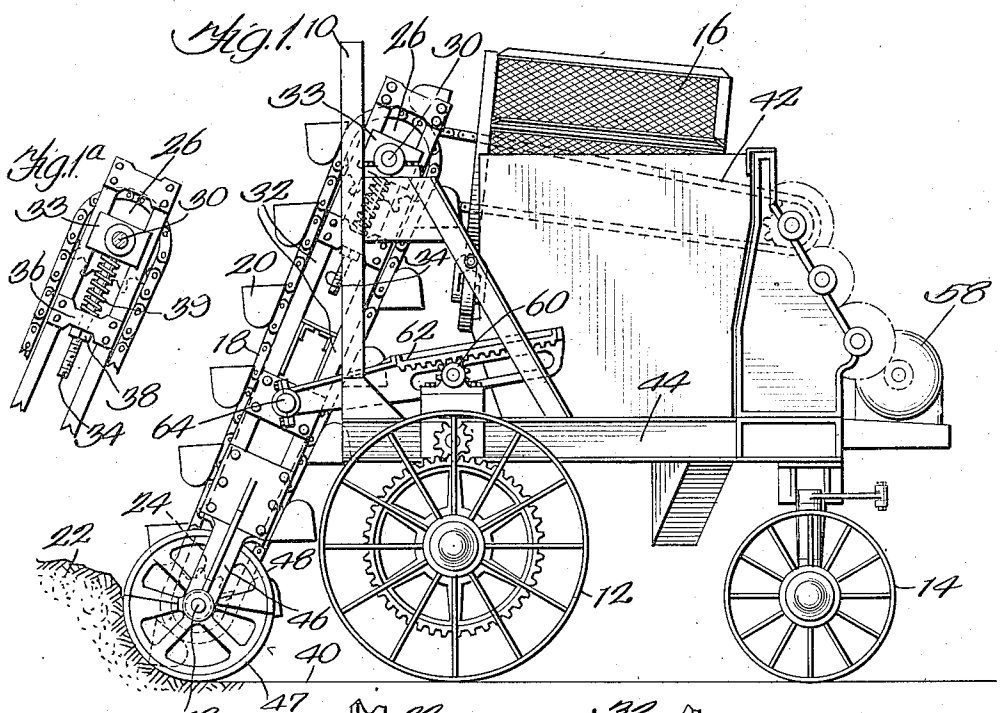
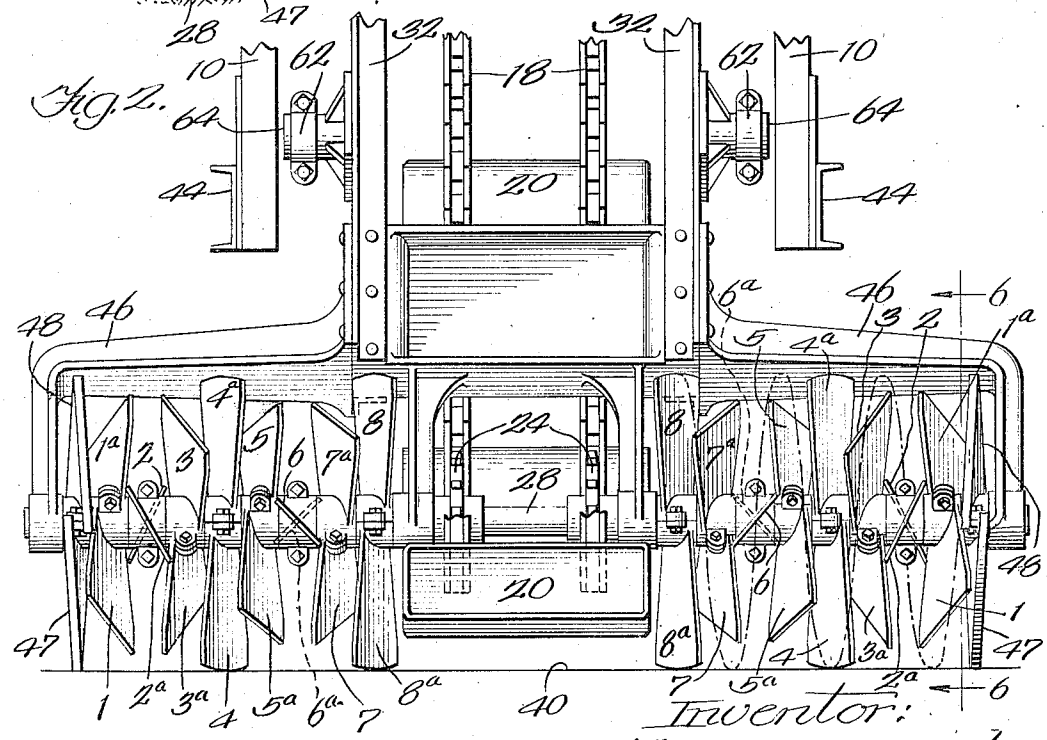


Fig. 1a.

Fig. 2.



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Fig 3

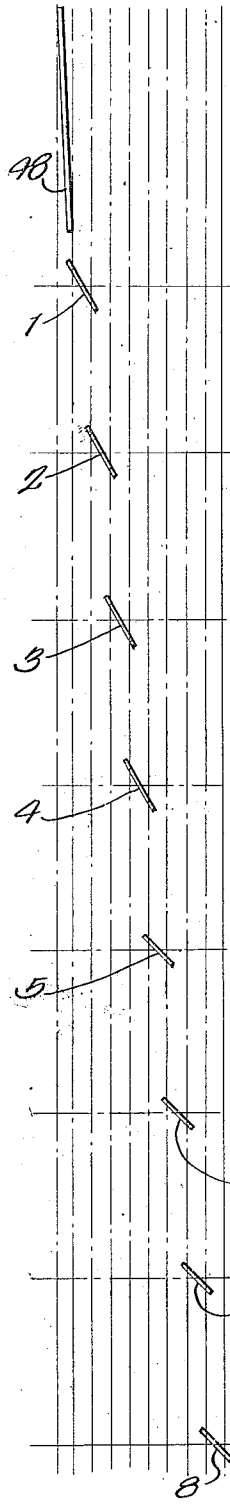


Fig. 4.

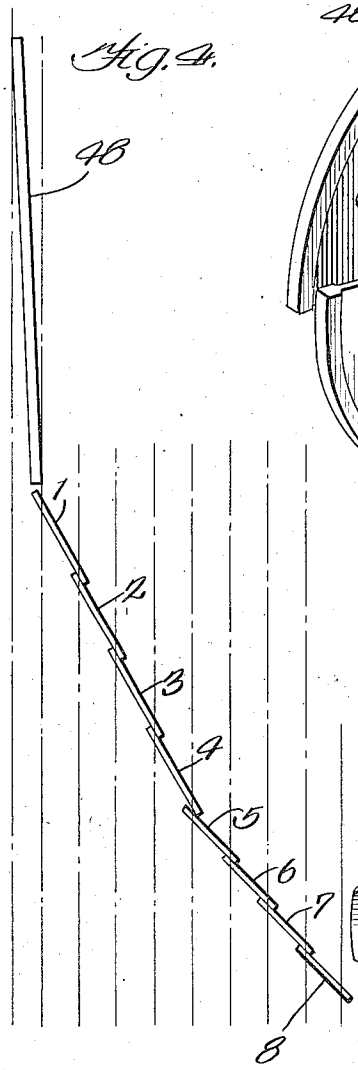


Fig. 5.

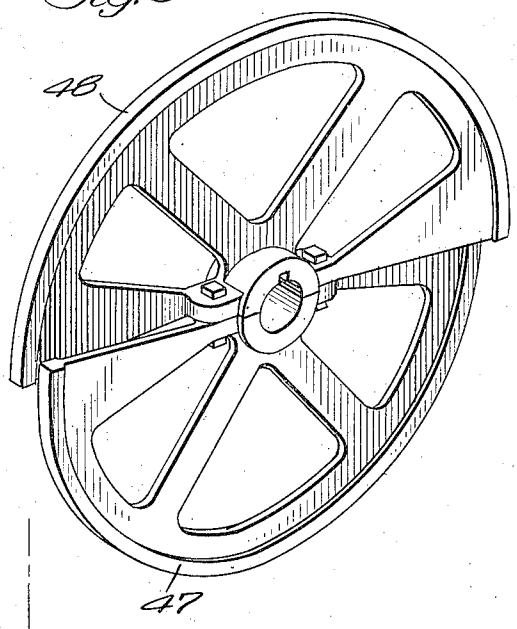
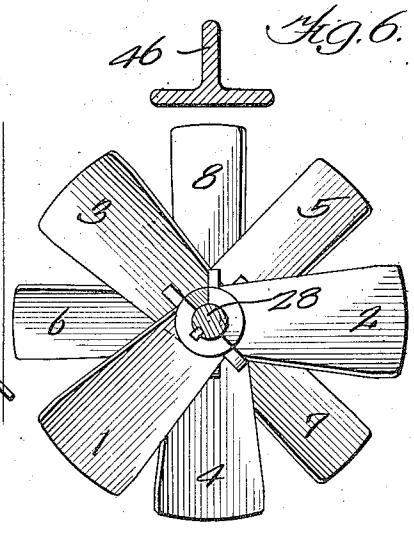


Fig. 6.



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Fig. 7.

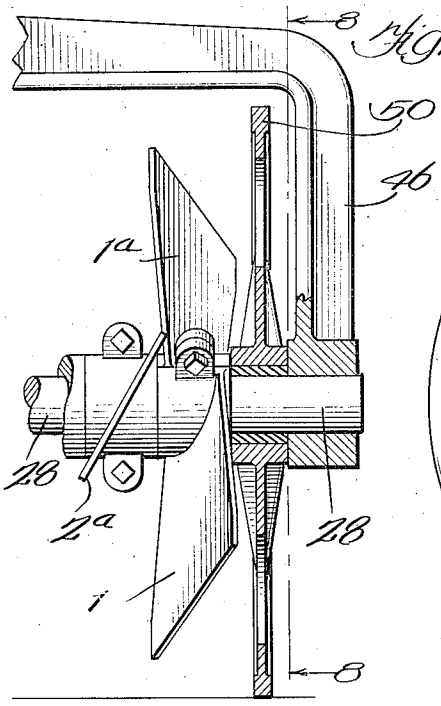


Fig. 8.

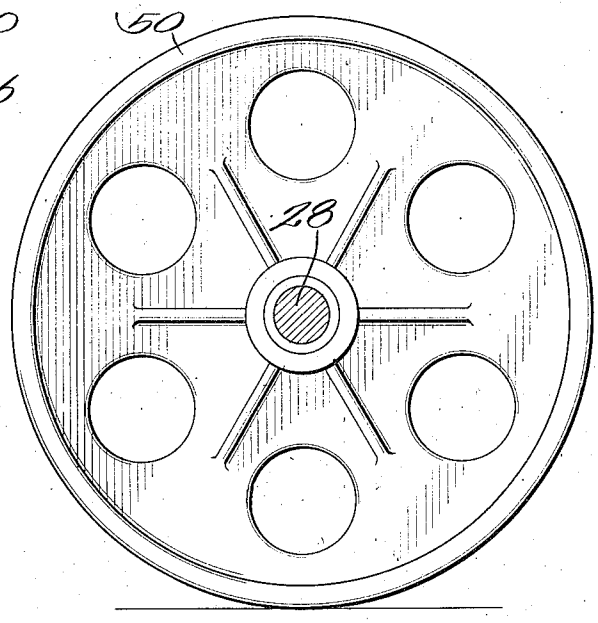


Fig. 9.

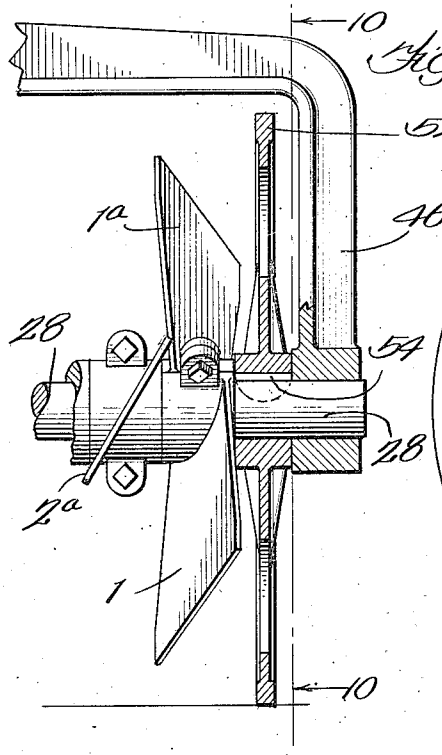
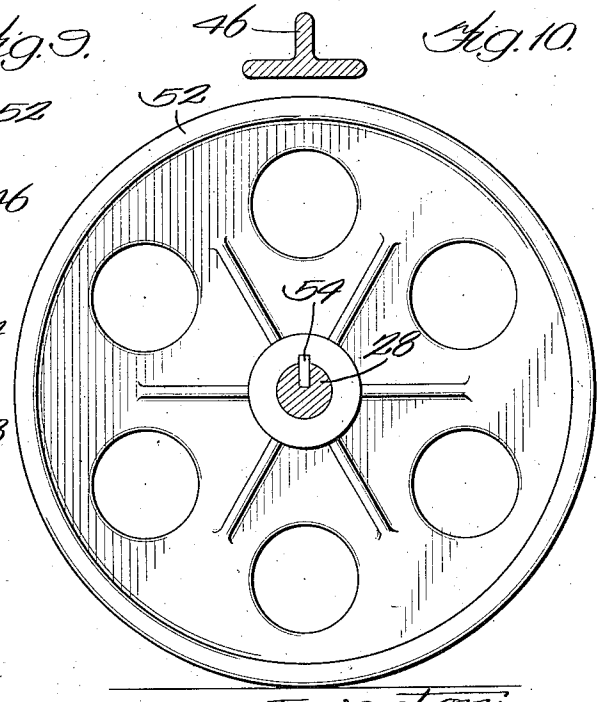


Fig. 10.



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Patented Dec. 30, 1924. 1,520,916

UNITED STATES PATENT OFFICE.

JOHN S. TOWNSEND, OF HARVEY, ILLINOIS, ASSIGNOR TO WHITING CORPORATION, OF HARVEY, ILLINOIS, A CORPORATION OF ILLINOIS.

SAND CUTTING AND SCREENING MACHINE.

Application filed December 19, 1921. Serial No. 523,257.

To all whom it may concern:

Be it known that I, JOHN S. TOWNSEND, a citizen of the United States, residing at Harvey, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Sand Cutting and Screening Machines, of which the following is a specification.

When in the art of casting iron and the like in a foundry, a finished cast product has been removed, used molding sand more or less mixed with pieces of rough iron which have to be removed, is left cluttered over the foundry floor. In order to prepare this sand for another use in a molding operation, it is necessary, as well understood in the art, to add a certain proportion of new sand, a certain amount of moisture by the addition of water, and to mix the whole into a uniformly mixed mass of sand arranged in piles for convenient use so that the molder can apply it in the preparation of new molds for new castings. Furthermore, it is necessary that all of the sand be aerated so that there is a certain amount of air adjacent each sand particle in the mix so that the composite sand in the new mold has scattered through it a certain percentage of air spaces, through which the gas from the molten metal of the new product being cast, can escape. It is well understood in the art that where sand not so properly aerated is used, defective castings may result.

The object of this invention is to provide a power driven machine adapted to pass over a foundry floor and properly cut, mix and aerate the sand, such for instance as the machine shown completely in my prior United States patent application, Serial No. 380,714, filed May 12, 1920 with an additional cutting and mixing mechanism located in advance of the path of travel of the machine proper, which at that point thoroughly cuts, mixes and aerates the sand which is in the path of travel of the machine.

More particularly this invention is, in certain features, an improvement on a machine of this particular class shown in my prior patent application, Serial No. 461,161, filed April 13, 1921.

The additional device referred to at the front of the machine not only does away with the necessity of using hand labor to cut a path through the sand on the floor for the machine proper, as has frequently been required heretofore in the prior art, but gives the sand, in the very operation of preparing the path for the machine proper, an additional cutting, mixing and aerating, thereby greatly improving the finished product delivered by the machine in rows on the floor.

In actual practice, a machine equipped with the device of this invention cutting and aerating the sand in advance of the travel of the machine, as well as in the machines of said last mentioned prior patent application, increases about twenty per cent the percentage of perfect castings produced by the use of sand prepared by the same type of machine when not equipped with the improved devices of this invention.

In the feature of this device which most closely approximates the second application heretofore referred to, the invention consists in so forming and spacing the blades of the sand cutting wheel at the front of the machine that when the device is operated at proper speed, practically all of the sand within reach of the cutting cylinder or set of disks, is thrown into the air, aerated and transferred towards the center of the machine for delivery into the elevator buckets of the machine, without any substantial portion of the sand being thrown over the cutting wheel or cylinder and back onto the floor without passing up through the machine and being further cleaned.

The invention further consists in the use, in connection with the sand cutting blades at the front of the machine, of wheel devices of different selectable types for holding the sand cutting blades sufficiently clear of the floor over which the machine travels so that they do not strike the floor, and yet causing them to travel exceedingly closely to the floor, this for special reasons which will be hereafter pointed out in the specification.

The invention further consists in novel spring mounting for the elevator mechanism of the machine, by which should a cutting blade at the front of the machine actually strike the floor, the jar of this action is taken up sufficiently to allow the elevator to move vertically with reference to a truck or main machine which carries it, instead of lifting the front wheels of the truck off from the floor, as has heretofore frequently happened in prior devices not

equipped with this novel cushioning device.

The invention further consists in many features and details of construction which will be hereafter more fully set forth in the specification and claims.

Referring to the drawings, in which like numerals designate the same parts throughout the several views—

Fig. 1 is a side elevation of the main parts of a complete machine illustrating this invention in its preferred form;

Figure 1A is a detail view of the spring mechanism for permitting the elevator to move upwardly with reference to the truck mechanism proper, as heretofore referred to in the opening statement;

Figure 2 is a front end view, considerably enlarged from Figure 1, showing the sand cutting wheels located at the front of the machine;

Figure 3 is a developed plan view, showing the angular relationship of successive blades at one side of the elevator which cooperate serially in the operation of the device;

Figure 4 is an imaginary picture to illustrate the effective working relationship of the same set of blades as shown in Figure 3, the actual spacing of the blades which is shown in Figure 3 being entirely omitted;

Figure 5 is a perspective view of a conveying wheel located at the end of the same conveying cylinder;

Figure 6 is an end view on the line 6—6 of Figure 2, showing one blade of each pair referred to in relation to other blades with which it cooperates;

Figure 7 is a detail end view corresponding to the right hand end of the sand cutting and conveying cylinder of Figure 2, showing a modified form of wheel substituted for the device of Figure 5;

Figure 8 is an end view taken on the line 8—8 of Figure 7;

Figure 9 is another view exactly like Figure 7, except that another modified form of wheel is substituted for the device of Figure 5; and

Figure 10 is an end view taken on the line 10—10 of Figure 9.

One conventional type of machine to which the present invention may be applied has a main frame 10 carried by supporting wheels 12 and 14. On frame 10 is a rotatable riddle 16, whose main function is to do the final mixing and aerating of the sand. On the front of the machine, the left hand end as shown in Figure 1, is a sprocket chain 18—buckets 20, elevator which carries collected portions of sand 22 up from the foundry floor and delivers it into the riddle 16.

This elevator mechanism 18—20 is carried by two sprocket wheels 24 and 26 located on shafts 28 and 30, the former positively positioned with reference to parallel side frames 32, the latter carried by bearing supports 33 interfitting with the frame members 32 in such manner that the frame members may slide vertically of the shaft 30. Depending from and rigidly secured to the lower one of these members 30 just described is a screw 34 freely reciprocable through a cross connecting member 36 between the frame members 32. On the screw 34, below member 36, is an adjusting device, in the particular case here illustrated a nut 38, while above the member 36 is a spring 39 enclosing the screw and abutting against the lower member 33, whereby it is possible for the frame 32 and attached parts to move upwardly against the action of spring 39 when, due to some unforeseen condition, the sand cutting mechanism to be hereafter described strikes the floor 40.

The elevator mechanism described is propelled by power delivered through chain 42 from sources at the right of the drawings, not requiring description.

The elevator mechanism included between the frames 32 is mounted in approximately the longitudinal center of the entire machine between the side frame members 10—44 of the main machine, and is of very much less width than the distance between the traction wheels 12 at the front of the machine driven by power not entering into this invention, to convey the entire machine in either direction, it traveling to the left as viewed in Figure 1, in the act of cutting and screening portions of the sand 22. In so operating to throw sand the buckets 20 directly engage and scrape up sand 22 which is in front of them, as the machine travels over the foundry floor 40, but as the path cleared by these buckets is, for the reason just stated very much less than the width of the entire machine, particularly as evidenced by the wheels 12 passing over the floor and for which a path is to be cleared, one of the problems to be solved is to provide means which will effectively cut and aerate sand lying in the path of travel of the machine on each side of the path traveled by the lower end of the elevator mechanism, and deliver it in well aerated form to the buckets 20, which happen to be at the bottom of the elevator at a given moment so that all of the sand which is initially across the whole path of travel of the machine can and will be elevated by the narrow elevator mechanism shown, and finally delivered to the riddle 16.

In accomplishing the object just set forth, shaft 28 is made of a length, as shown in Figure 2, greater than the entire width of the machine, its ends being sustained by brackets 46 suitably secured to the side frames 32. On the end portions of this shaft 28, outside of the frames 32, are placed a series of cutting blades or arms adapted to

cut and aerate the portions of sand lying on the floor 40 in the path of travel of the machine and between the elevator mechanism and the outer ends of the brackets 46. One of the special objects of this invention is to so proportion the angularity and the spacing of successive blades or arms which cooperate with each other that when the machine operates at its normal, standard speed, all of the sand picked up by this blade mechanism will be retained in the air or otherwise adjacent to the blade mechanism while it is being conveyed over to the center of the machine and delivered into the elevator mechanism, instead of some of the sand being thrown outside of the control of the mechanism and returned to the floor 40 without passing up the elevator to the riddle 16, as is apt to occur in a device in which all of the blades on this shaft 28 are exactly alike.

In the preferred form of the device shown in the drawings, each end of the shaft 28 is equipped with corresponding but oppositely disposed sets of blades arranged in pairs, one blade of each pair being designated by the numerals 1 to 8 inclusive, and the opposite blade of each pair by similiar numerals followed by the letter "a". In the particular case here illustrated, the single blades of Figure 6 which cooperate with each other in the operation of sand throwing, are placed as shown in Figure 3, 135° apart. In the structure shown in Figure 2, there is placed between the blade 1 and the outer end of bracket 46, a conveying wheel shown in perspective in Figure 5, made up of two semicircular, angular blades 47 and 48, so positioned on the shaft that in the travel of the machine over the floor 40, one of these members moves sand slightly from the end of shaft 28 toward the elevator into reach of one of the blades 1, and the other performs the same function for the opposite blade 1^a. Aside from this conveying function, the device 47—48 acts as an ordinary wheel to sustain the lower end of the elevator with the tips of the blades 1 to 8 inclusive a fixed distance above the floor 40 so that they may cut close to the floor and thus pick up substantially all of the sand thereon without danger of striking the floor and thus throwing the elevator upward against the action of the emergency spring 39, an action which is not desired.

Figure 7 shows an alternative construction, differing from that of Figure 2 in that a plain wheel 50 is substituted for the device 47—48, this wheel being freely rotatable on the shaft 28. In the alternative construction of Figures 9 and 10, another wheel 52 is substituted for the wheel 50 and differs from it only in that it is rigidly secured to the shaft 28 by any suitable means, as for instance the key 54. These two wheel constructions just described do not perform the advantageous act of partially conveying the sand 22 towards the first of blades 1—1^a, but they do perform the same function as wheel 47—48 in sustaining the mechanism so that the blade ends cannot strike the floor 40. The structure of Figure 9, with the wheel rigid on the shelf, has the advantage over that of Figures 7 and 8, in that the power which is in shaft 28 as the machine operates causes this wheel to cut its own way through sand 22, as the machine works, whereas the wheel 50 loose on the shaft, has the advantage of not being under powerful, continuous rotation and therefore does not wear out through being rotated through the sand, as is the case with wheel 52. The use of these wheel mechanisms 47—48, 50 and 52 is particularly important in a machine of this class for the following reasons:—

When a foundry floor is left covered with hot, previously used sand, which is to be cut and aerated for re-use, the workman goes over the sand covered floor with a hose and, in so far as possible, wets and cools down the sand by liberal application of water, but as a matter of fact, this water, even when delivered under comparatively high pressure, never reaches the bottom of the sand, and when a machine of the class described goes over it, the sand on the floor is frequently as hot as 400° F. If the machine fails to take from the floor substantially all of this hot sand which is left thereon, and temper, aerate and screen it, it is a certainty that if the untempered sand left on the floor gets into a mold in which casting is being done, it will spoil the casting. The device of this invention, particularly the use of the wheels described, allows the blades 1 to 8 inclusive to so thoroughly clean the floor of untempered sand that when tempered sand is delivered on top of this thin layer of untempered sand, the moisture in the tempered sand actually tempers this thin layer, and prevents any injurious result. This causing of the blades 1 to 8 inclusive to travel very close to the floor has the further advantage that in actual practice, they pick up and carry over to the elevator a very much greater proportion of the sand on the floor below the actual tips of the blades than when the blades do not travel so closely to the floor.

In the operation of the device, assume that the machine is moving to the left into the pile of sand 22, with the shaft 28 rotating at a predetermined desired speed. Under these conditions, the two outside sets of blades 1 to 8, with or without the assistance of the wheel mechanism 47—48, tend to take the portions of sand at the opposite ends of the shaft 28 and because of the angularity and positioning of the blades 1,

convey it towards the elevator mechanism without throwing it very much into the air, but nevertheless throwing it sufficiently so that the portions of sand so thrown do fall into the path of travel of the next succeeding blades 2, which in turn convey it to blades 3 and 4 and 5, which are in the particular case here shown, all of the same angularity. The sand thus conveyed from the ends of the shaft towards the elevator at the center of the shaft, increases in volume at each blade towards the center, and it becomes necessary at about blade 6 to change its angularity, as shown, which angularity is carried out in blades 7 and 8, to throw this increased volume of sand into the air for aerating purposes and to convey it along to the elevator buckets 20. In actual practice, the blades 1 are set at a very small angular position. As shown in Figure 3 the blades 2—5 are set at about 60 degrees and the blades 6 to 8 at about 45 degrees. The result of this construction is that when operated at proper speed, the blade mechanism on shaft 28 actually aerates and conveys the sand from the sides of the machine into the elevator without throwing any substantial portion of the sand once cut and lifted, back onto the floor without its reaching the elevator.

When the sand reaches the elevator, it is conveyed upwardly by it to the riddle 16, screened in the ordinary way and delivered back onto the floor.

Figure 4 is intended as an illustrative development showing the effective corelationship of the different blades of Figure 3, as it might be imagined they would operate if placed close together, it being noticed that the blade at the top of the figure is almost at right angles to the axis of shaft 28, and the blade at the bottom of the figure closely approaches being parallel to the axis of that shaft.

The elevator mechanism is propelled by any convenient source of power, that conventionally shown being a driving chain 42 and driven by a motor gear mechanism 58 supplied with power in any conventional manner not entering into this invention and therefore not shown. The elevator mechanism with the sand collecting device described is moved angularly of the machine about the shaft 30 through the rack and pinion mechanism 60 operating the bar 62 pivoted to the elevator at 64. This arrangement of power device does not in any way prevent the lifting of the entire elevator against the action of spring 39 when emergency requires, as heretofore described.

Photographs of machines of this type in actual operation show the spiral mechanism 1 to 8 completely enveloped in a thick cloud of sand which is being carried by the blade mechanism from the outer ends of the shaft over to the elevator, and ultimately deposited therein.

It is well understood in the art that molding sand is made up of particles of so-called sharp sand, mixed with a certain percentage of clay, or other binding material, which makes the molded sand stick together in the molding operation. When this sand has been used in casting, these particles of sand tend to stick together in comparatively hard lumps and the successive blades 1–8 inclusive, referred to perform the added function, of successively batting or pounding such small lumps of sand and clay in their path of travel to the elevator, thus insuring their more thorough disintegration than is possible where they are only struck or handled once. It is believed that this in a large measure accounts for the very satisfactory product of aerated sand produced by the use of this invention.

What I claim is:

1. In mechanism of the class described, a rotatable shaft, a plurality of cutting blades along said shaft, arranged angularly to each other around the shaft in a spiral of such a form that beginning with one end blade each blade picks up sand in the plane of its rotation and throws it into the plane of rotation of the next blade, each of said blades being placed at an angle to the axis of the shaft and certain of them varying progressively in angularity with reference to the axis of the shaft from the first blade to the last, and a motor operating the parts at the necessary speed to handle foundry sand, partly in the air.

2. In mechanism of the class described, a rotatable shaft, a plurality of cutting blades along said shaft, arranged angularly to each other around the shaft in a spiral of such a form that beginning with one end blade each blade picks up sand in the plane of its rotation and throws it into the plane of rotation of the next blade, each of said blades being placed at an angle to the axis of the shaft and certain of them varying progressively in angularity with reference to the axis of the shaft from the first blade to the last, the angular distance between the blades around the shaft being approximately 135°, and a motor operating the parts at the necessary speed to handle foundry sand, partly in the air.

3. In mechanism of the class described, a rotatable shaft, a plurality of cutting blades along said shaft, arranged angularly to each other around the shaft in a spiral of such a form that beginning with one end blade each blade picks up and in the plane of its rotation and throws it into the plane of rotation of the next blade, each of said blades being placed at an angle to the axis of the shaft and certain of them varying progressively in angularlity with reference

to the axis of the shaft from the first blade to the last, the first blade being at a very slight angle to a plane transverse of the shaft, the last blade at an angle of approximately 45° to the same plane, and a motor operating the parts at the necessary speed to handle foundry sand, partly in the air.

4. In mechanism of the class described, the combination of an elevator mechanism, a shaft extending outside the elevator mechanism and rotating in unison therewith, a plurality of cutting blades on said shaft placed side by side and angularly to each other on the portion of the shaft which is outside the elevator mechanism, and means at the cutting edges of said blades so arranged that each blade, beginning with the one most remote from the elevator, throws sand cut by it towards the elevator and into the path of the next succeeding blade, said means at the cutting edges of the blades being angularly disposed to parallel planes transverse to the axis of said shaft and varying progressively in angularity from the outer end of the shaft to the elevator mechanism, for the purposes set forth, and a motor operating the parts at the necessary speed to handle foundry sand, partly in the air.

5. In mechanism of the class described, a machine adapted to travel over a foundry floor, an elevator capable of carrying sand from the floor into the machine, a sand cutting and aerating element at the side of the elevator adjacent to where it passes along the floor, capable of picking up sand at the side of the elevator and by repeatedly striking it while in the air, transporting it largely in the air from the side of the elevator to the elevator, said picking up and striking means consisting of a series of blades spaced apart longitudinally along and circumferentially around said sand cutting and aerating element and varying in angularity to each other in proportion to the amount of sand along said element to be cut, aerated and transported to the elevator, and a motor operating the parts at the necessary speed to handle foundry sand.

6. In mechanism of the class described, a truck carrying a sand receiving member, an elevator mechanism having one end adjacent to the floor and the other end delivering to said sand receiving member, sand cutting devices on the bottom of the elevator for delivering sand to the elevator, means for propelling said sand cutting devices and elevator, and yielding mechanism between the elevator and truck permitting vertical movement of the elevator should the sand cutting devices accidentally engage the floor.

7. In mechanism of the class described, a truck carrying a sand receiving member, an elevator mechanism having one end adjacent to the floor and the other end delivering to said sand receiving member, sand cutting devices on the bottom of the elevator for delivering sand to the elevator, means for propelling said sand cutting devices and elevator, and spring controlled yielding mechanism between the elevator and truck permitting vertical movement of the elevator should the sand cutting devices accidentally engage the floor.

8. In mechanism of the class described, a truck carrying a sand receiving member, an elevator mechanism having one end adjacent to the floor and the other end delivering to said sand receiving member, sand cutting devices on the bottom of the elevator for delivering sand to the elevator, means for propelling said sand cutting devices and elevator, spring controlled yielding mechanism between the elevator and truck permitting vertical movement of the elevator should the sand cutting devices accidentally engage the floor, and wheels on the bottom of the elevator sustaining the cutting devices a fixed distance above the floor.

9. In mechanism of the class described, a truck carrying a sand receiving member, an elevator mechanism having one end adjacent to the floor and the other end delivering to said sand receiving member, sand cutting devices on the bottom of the elevator for delivering sand to the elevator, means for propelling said sand cutting devices and elevator, yielding mechanism between the elevator and truck permitting vertical movement of the elevator should the sand cutting devices accidentally engage the floor, and wheels on the bottom of the elevator sustaining the cutting devices a fixed distance above the floor.

10. In mechanism of the class described, a truck carrying a sand receiving member, an elevator mechanism having one end adjacent to the floor and the other end delivering to said sand receiving member, sand cutting devices on the bottom of the elevator for delivering sand to the elevator, means for propelling said sand cutting devices and elevator, and wheels on the bottom of the elevator sustaining the cutting devices a fixed distance above the floor.

11. In mechanism of the class described, a floor engaging wheel adapted to support an elevator and made up of a plurality of segmental parts, each placed angularly to the wheel axis adapted to convey sand or the like sideways of the wheel as the wheel rotates, for the purposes described.

In witness whereof, I have hereunto subscribed my name in the presence of two witnesses.

JOHN S. TOWNSEND.

Witnesses:
L. D. REED,
PAUL W. BIELFELDT.