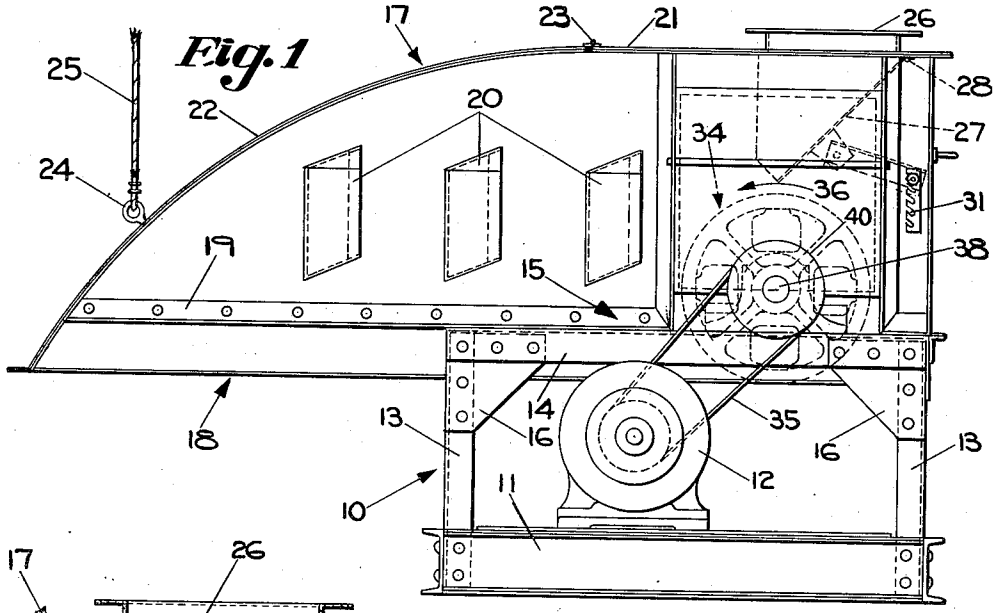
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FOUNDRY SAND CONDITIONING APPARATUS

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Fig. 1



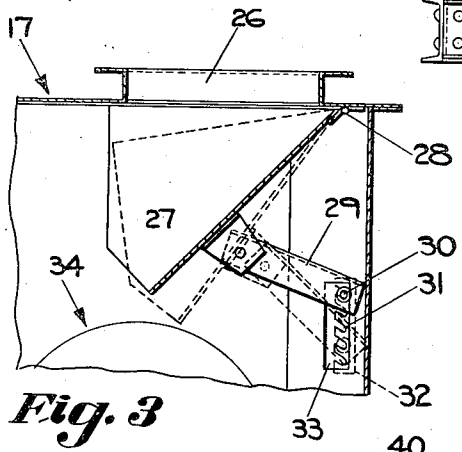


Fig. 3

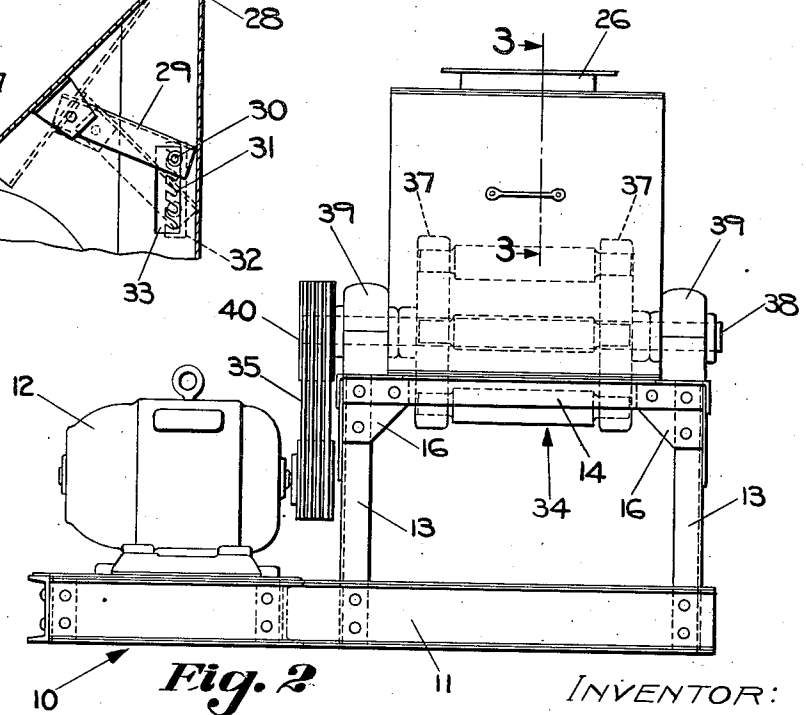


Fig. 2

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FOUNDRY SAND CONDITIONING APPARATUS

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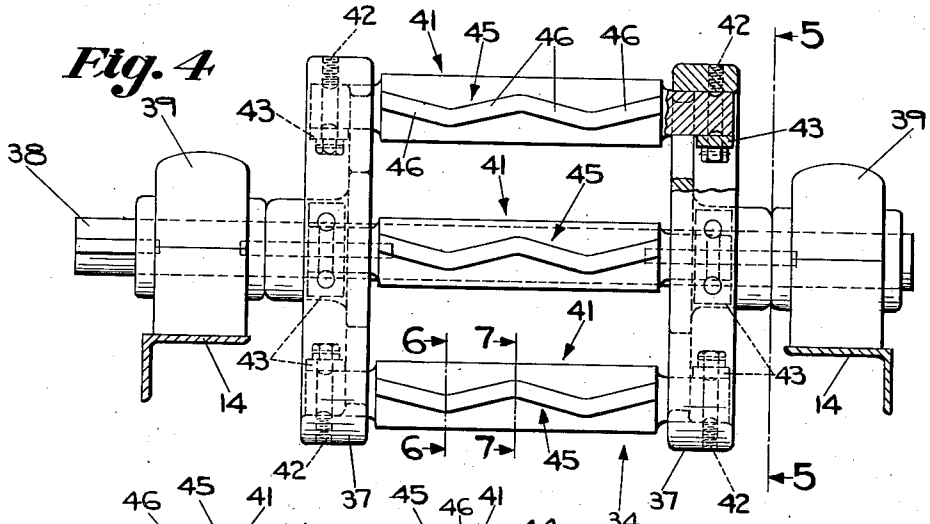


Fig. 4

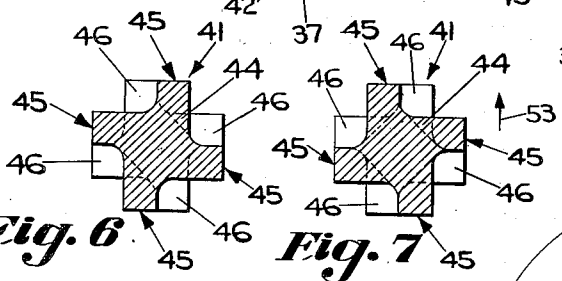


Fig. 6

Fig. 7

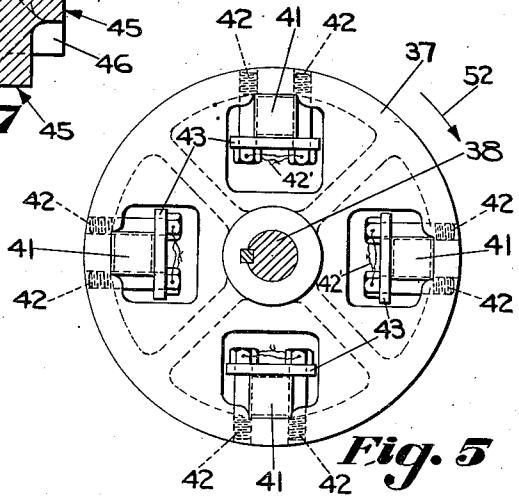


Fig. 5

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FOUNDRY SAND CONDITIONING APPARATUS

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Fig. 8

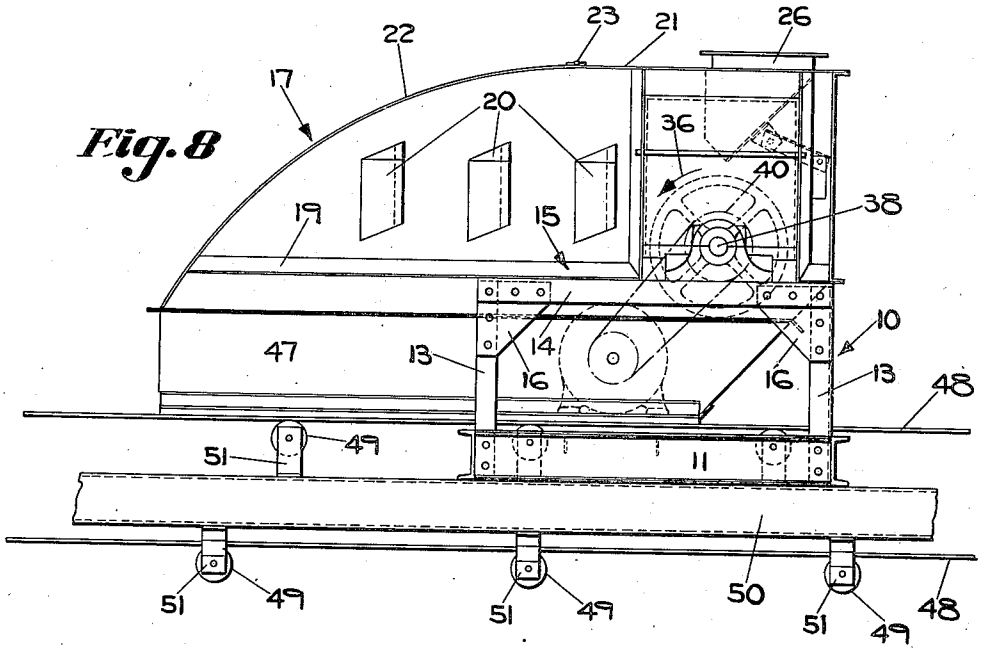
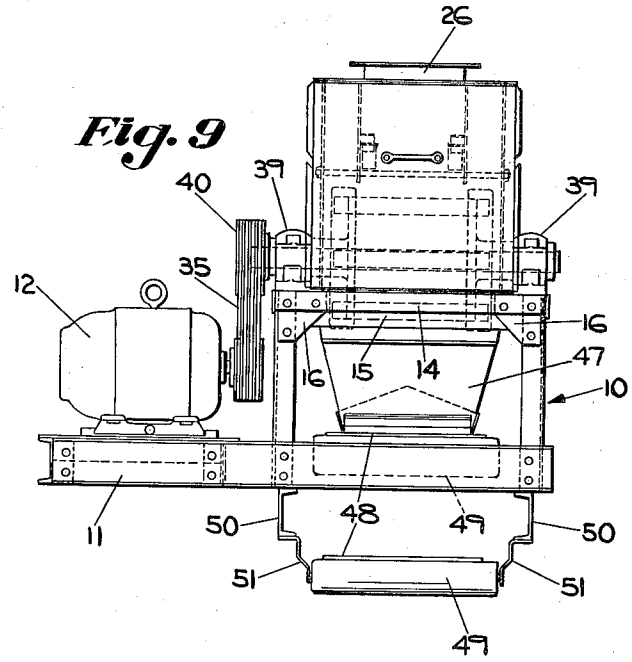


Fig. 9



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UNITED STATES PATENT OFFICE

2,132,164

FOUNDRY SAND CONDITIONING APPARATUS

Fred B. Henry, Columbus, Ohio, assignor to The Jeffrey Manufacturing Company, a corporation of Ohio

Application December 13, 1935, Serial No. 54,293

15 Claims. (Cl. 259—9)

This invention relates to foundry sand conditioning apparatus and particularly to an aerator which is adapted to cut, blend, aerate and cool foundry sand with improved efficiency.

An object of the invention is to provide an improved and more efficient type of foundry sand conditioning apparatus of the general type above mentioned.

Another object of the invention is to provide an improved rotor cutter or impeller bar for a sand conditioning apparatus.

Other objects of the invention will appear hereinafter, the novel features and combinations being set forth in the appended claims.

In the accompanying drawings,

Fig. 1 is a side elevational view of a foundry sand conditioning apparatus comprising my invention;

Fig. 2 is an end elevational view of the device of Fig. 1;

Fig. 3 is an enlarged sectional elevational view taken on the line 3—3 of Fig. 2, looking in the direction of the arrows and illustrating particularly the adjustable feed chute for the device;

Fig. 4 is an end elevational view showing the rotor of my improved device;

Fig. 5 is a side elevational view of the rotor of Fig. 4 taken on the line 5—5 of Fig. 4, looking in the direction of the arrows;

Fig. 6 is a sectional elevational view taken on the line 6—6 of Fig. 4, showing the structure of the rotor cutter bars;

Fig. 7 is a sectional elevational view taken on line 7—7 of Fig. 4, showing the structure of the rotor cutter bars in a slightly different position;

Fig. 8 is a side elevational view of a modified form of the apparatus comprising my invention in which the sand is fed to a belt conveyor; and

Fig. 9 is an end elevational view of the device of Fig. 8.

This application comprises a continuation in part of my application for Foundry sand conditioning apparatus, Serial No. 747,042, filed October 5th, 1934.

The foundry sand conditioning apparatus comprising my invention, which for brevity will be hereinafter termed an aerator, comprises a frame 10 including a base 11, made of structural members such as channels which are riveted together, upon which is adapted to be mounted an electric motor 12. The frame also includes upwardly extending angle members 13 which support parallel angle members 14 to form a rotor supporting auxiliary base 15. The angle members 13 and 14 may be riveted together and reinforced by appropriate gusset plates 16.

Mounted upon the auxiliary base 15 is a hood 17 having an open bottom at 18 from which the treated sand is adapted to be discharged. It may be mentioned that the open bottom 18 extends the full length of the hood 17; this will be evident by reference to Fig. 2. The hood 17 is rigidly attached to the frame 10 and to the auxiliary base 15 and is reinforced by longitudinally extending angle members, one of which is seen at 19.

The upright side plates of the hood 17 are provided with air intake openings 20; such side plates may be of a louver type construction. The hood 17 is provided with a top plate 21 which is curved at one end, as seen at 22, thereby forming a guide means or deflector to direct the sand to the bottom opening 18, if it does not fall through said opening 18 under the influence of gravity alone. The downwardly curved end 22 may be hinged at 23 and provided with an eye 24 adapted to receive a lifting cable 25 whereby said curved end 22 may be raised about its hinge 23 to provide ready access to the interior of hood 17 where the rotor 34 is located. If desired, said curved end 22 may be attached rigidly to the hood side walls as by nuts and bolts, so as to always remain in fixed relation to the stationary frame 10.

At its rear end, the hood 17 is provided with a feed opening 26 (Fig. 3) through which foundry sand which is to be conditioned is fed to the aerator. Below the opening 26 there is provided a hinged chute 27 which is attached to the hood 17 by hinge 28. A bracket 29 is pivotally attached to the bottom of the chute 27 and carries a transversely extending rod 30 between spaced end pieces of said bracket 29, which rod 30 is adapted to co-operate with any one of a plurality of slots 31 formed in plates 32 which are carried at each side of the hood 17 and within an elongated aperture 33 in said hood 17.

It will be evident that the rod 30 may be selectively placed in any one of the slots 31 to adjust the slope of the bottom of chute 27. By adjusting the slope of said chute 27 the rate of travel of the sand to the aerator rotor may be adjusted, and the position where it is fed to said rotor may likewise be adjusted. For instance, if the sand is wet, a high pitch position should be used whereas if the sand is dry a low pitch position will be better, the high pitch position being shown in dotted lines in Fig. 3 and the low pitch position in full lines. The chute bottom decreases the velocity of downward move-

ment of the fed-in material as compared with gravity, to assure the desired impact action by the flights of the rotor rotating in the direction of the arrow **36**.

Positioned within the hood **17** and below the chute **27** and adapted to receive foundry sand which is fed to the chute **27** and to impel said sand longitudinally of said hood **17** along diverging paths, thereby to cut, blend, aerate and cool the foundry sand, I provide a rotor **34**. Said rotor **34** is adapted to be driven from the motor **12**, as through a plurality of V-belts **35**, to rotate said rotor in the direction of the arrow **36**. It will be evident that as material falls from the chute **27**, under the influence of gravity, it will be impelled by the rotor **34** longitudinally of the hood **17** and fall through the bottom opening **18** thereof into a pile.

The structure of the rotor **34** is a feature of my invention and attention is directed to Figs. 4, 5, 6 and 7 which disclose in detail the structure of said rotor. Said rotor **34** comprises a pair of end castings or drum brackets **37, 37**, of sufficient rim weight to act as fly wheels, which are mounted upon a shaft **38**, which shaft is carried upon angle members **14** of the auxiliary base **15** by appropriate anti-friction dust-proof bearings carried in bearing housings **39, 39**. The shaft **38** will, of course, be driven by a pulley **40** associated with the V-belts **35**, and the end castings **37** will be keyed to said shaft **38** to rotate therewith.

Spaced 90 degrees apart around the peripheral portion of the end castings **37** and extending parallel to the axis of the shaft **38** between said end castings **37**, I provide a plurality of revolving cutter or impeller bars **41**. The cutter bars **41** are removably attached to the end plates **37** by appropriate machine screws **42** and a co-operating clamp plate **43**, locked and sealed by means of the wire loops **42'** to prevent the screws from working out of place.

The ends of the cutter bars **41** are preferably squared to provide flat faces whereby any cutter bar may be adjusted in any one of four angular positions on the rotor **34**. The cutter bars **41** each comprises a longitudinally extending body portion, seen at **44** in Figs. 6 and 7, from which extend four ribs, webs or flights **45** spaced 90 degrees apart about the axis of said body portion **44**. In the operation of the rotor only one of the ribs, webs or flights **45** will be in operative position at a time and thus the wearing surfaces of said bars may be renewed four times by the simple expedient of removing a cutter bar **41** and rotating it 90 degrees about its axis and relocking it in adjusted position. It is to be particularly noted that the flights **45** do not extend in a single plane but comprise sections **46** which are disposed at a slight angle with respect to the axis of the cutter bar **41**. As best seen in Fig. 5 of the drawings, the flights **45** form a double V of a very wide angle, or they may be described as forming a W. If the length of the cutter bar is longer than shown, the number of sections **46** may be increased. In small capacity machines the cutter bars **41** may be relatively short, only two sections **46** being present in which the flight **45** would form a single V, but in larger capacity machines, such as illustrated in the accompanying drawings, it is preferred to employ two V's end to end so as to treble the criss-crossing action of the opposing faces, there being two pair at the end positions and a third pair formed by the extreme end faces. This is particularly true when the cover or hood is elevated so high as to permit freedom of the mixing and aerating operation without the use of the deflector **22**. While the plane of each leading face of each section **46** makes an angle of approximately five degrees with the axis of the body portion **44** of the cutter bars **41** in the drawings, it should be understood that the relative angularity of opposing faces may be varied in accordance with the mixing action desired.

Fig. 4 is a rear view of the rotor assembly or a side view of Fig. 5 looking from the left toward the right. The flights **45** are integral with the bars **41** and the flat faced extensions are clamped to the rims of the fly wheels **37**. The bars **41** together with the flights **45** and the said flat faced extensions may be cast in one piece of metal and their clamped positions at the peripheries of the wheels **37** render the rotor as a whole an effective fly wheel unit, having not only an impelling action but also a fan action to assist in the throwing of the granular material in a general horizontal direction from the top of the rotor when driven in the direction of the arrow **36** shown in Fig. 1.

In Figs. 8 and 9 I illustrate a somewhat modified form of my invention or what in fact is an addition to the invention above described. Instead of discharging the treated sand onto the ground under the curved deflector **22**, as would be the case in the device of Figs. 1 and 2, except when the hood **17** is elevated when it will be discharged into a pile remote from the machine, I may provide a belt type conveyor which is adapted to travel below the hood **17** and to receive the treated sand. This conveyor may comprise a four walled hopper **47** adapted to receive material from the hood **17** and to guide it to an endless belt **48** adapted to roll upon idler rollers **49** supported upon a longitudinally extending frame built up of channel members **50, 50** and carried by brackets **51, 51**.

The operation of the device of Fig. 8 is not altered from that described in connection with Figs. 1 to 7 when the hood **17** is down, except for those particulars specifically mentioned, namely, that the conditioned sand is confined by the hopper **47** to fall onto the belt **48** rather than onto the ground.

It may also be mentioned that in the device illustrated specifically in Figs. 1 and 2, the bottom of the hood **17** is spaced sufficiently above the ground or any frame upon which the base **11** of the aerator rests, that any receptacle may be inserted beneath the opening **18** to catch the conditioned sand as it issues from the hood **17**.

In the operation of the device, sand will be fed to the aerator through the opening **26** and will slide down the chute **27**, being discharged over the end thereof under the influence of gravity. The rotor **34** will rotate at high speed in the direction of the arrow **36** under the control of the motor **12**. The sand particles falling from the chute **27** will fall into the cylindrical path of the rotating cutter or impeller flights **45** on the bars **41** and be struck by the forward or W-shaped leading faces of the sections **46** thereof. It is to be particularly noted that due to the angular relation of the sections **46** of the flight **45**, the particles of sand struck by different sections **46** will be impelled longitudinally through the hood **17** along diverging angularly disposed paths. As a consequence, when the sand is impelled or struck by the flights **45**, it will be completely cut, blended, aerated, tempered and

cooled as it discharges from the bottom opening 18 of said aerator. The angular disposition of the sections 46 of the flights 45 forming part of the cutter or impelling bars 41, insures a complete blending and intermixing of the particles of sand treated by said aerator.

It will be understood that by the term "cut", is meant the complete mixing of the sand and the breaking up of all large particles, while "blending" refers to the mixing of the proper proportions of silicon and bond thereby to insure a sand which will provide a satisfactory mold after the pattern is removed. Tempering refers to the proper mixing of the sand with water, evenly throughout, to such a degree as to provide a satisfactory mold, as aforesaid, yet without an excess of water which would result in a generation of an excessive amount of steam when the mold is poured.

Obviously those skilled in the art may make various changes in the details and arrangement of parts without departing from the spirit and scope of the invention as defined by the claims hereto appended, and I therefore wish not to be restricted to the precise construction herein disclosed.

Having thus described and shown an embodiment of my invention, what I desire to secure by Letters Patent of the United States is:

1. In a sand aerator, the combination with a frame, of sand feeding means, a rotor carried by said frame and positioned to strike sand delivered by said feeding means, said rotor comprising end supporting means mounted on a rotating shaft, a striking bar spaced axially from said shaft and carried at both ends by said supporting means, said bar comprising a straight body portion having a polygonal cross-section with continuous radially projecting longitudinally extending ribs carried by each face, said ribs having impelling faces providing surfaces at an angle with the axis of the bar, whereby sand struck thereby will travel in angularly related paths, said bar being rotatable about its own axis to bring successive ribs into operative position as they become worn, and mounting means for attaching the ends of said bar to said end supporting means and constructed and arranged to provide for rotation of said bar about its own axis as aforesaid and to clamp it rigidly to said supporting means in any selected position.

2. A rotor for an aerator comprising a rotary shaft, spaced spiders secured thereto to rotate therewith, a plurality of straight elongated bars each having continuous zig-zag cutting and impelling ribs spaced about the same in spaced-apart relation circumferentially, flat-faced extensions at the ends of said bars, and clamping devices for securing said flat-faced extensions about the peripheries of said spaced spiders in adjusted position to locate the ribs of each bar successively in operative position at the periphery of the rotor.

3. A rotor for an aerator comprising a rotary carrier, an elongated straight bar having distributed about the same circumferentially a plurality of cutting and impelling ribs, flat-faced extensions on the ends of said bars, and U-shaped clamping devices associated with said flat-faced extensions for securing said bar to said carrier spaced from the axis of rotation of the same and in such adjusted positions as to bring into operative position another rib when one becomes worn.

4. A rotor for an aerator comprising a shaft, spaced-apart wheels mounted thereon to rotate therewith, a plurality of straight elongated bars each having distributed about the same a plurality of circumferentially spaced-apart cutting and impelling ribs each continuous from one end of the bar to the other, flat-faced extensions on the ends of said bar, and mechanisms for clamping said extensions to the inner peripheries of the rims of said wheels, said clamping mechanisms each comprising a pair of bolts and a clamping plate engaging one side of the associated extension.

5. A rotor for a sand aerator comprising a shaft, spaced wheels thereon, an elongated straight bar parallel to the axis of rotation of the shaft and spaced therefrom, a plurality of cutting and impelling ribs distributed circumferentially about said bar and each continuous from one end of the bar to the other, the ends of the ribs being in radial planes relative to the axis of rotation of the rotor, non-circular extensions at the ends of said bar, and clamping devices between said extensions and the peripheries of said wheels to enable any one of said ribs to be brought to operative position at the periphery of the rotor.

6. In an aerator for granular material, the combination with a frame, of feeding means carried by said frame, a rotor positioned below said feeding means and provided with peripheral impact elements in angular relation to each other, an open bottomed air chamber having a downwardly extending curved deflector wall horizontally spaced from the top of the rotor, said chamber branching laterally from said rotor, and means for driving said rotor while receiving granular material which falls by gravity from said feeding means to cause the uppermost impact elements of the rotor to strike and throw granular material along approximately horizontal intersecting paths into said chamber and against said deflector wall to effect aeration and mixing and breaking up of lumps of the granular material.

7. In an aerator for granular material, the combination with a frame, of feeding means carried thereby, a rotor having impact elements disposed in angular relation to form a W in the plane where the material receives the impacts, mechanism for supporting said rotor relative to said feeding means to cause said impact elements to strike the material when it falls from said feeder means when said impact elements are in their uppermost positions and thereby throw the material tangentially from the rotor along horizontal paths extending from the upper side thereof, a hood having an open bottomed chamber extending horizontally from the rotor in position for receiving material in intersecting horizontal paths from the top of said W-formed impact elements, and a downwardly curved deflector at that end of said chamber remote from said rotor but in position to be engaged by the horizontally thrown material.

8. In a rotor for granular material, the combination with a frame, of a feeding device having an adjustable inclined chute bottom, a rotor below said feeding device in position to receive said granular material which falls from said feeding device by gravity, said rotor having impact elements in angular relation to each other and spaced from the axis of rotation of the rotor for travel along a cylindrical path the uppermost side of which is adjacent to the discharge end of said inclined chute bottom, and means for rotating the rotor in the direction of inclination

of said chute bottom, a hood mounted in position to form a horizontal aerating chamber branching laterally from the top of said rotor for receiving along horizontal intersecting paths the material thrown by said rotor elements from the top of said cylindrical path in a general horizontal direction to secure aeration of the material.

9. In an aerator, the combination with a casing, of an aerating rotor journaled therein, an open bottomed hood hinged to said casing in position to receive the granular material thrown from the top of said rotor in a general horizontal direction, means for rotating said rotor with its top moving toward the aerating chamber formed by said hinged hood, and a feed plate positioned to feed material to be struck by the top of said rotor.

10. In an aerator for granular material, the combination with a main frame, of an aerating rotor mounted in said frame and constructed to impel material particles along intersecting paths, feeding mechanism mounted in said frame above said rotor, a hood mounted on said frame to afford an open bottomed chamber for receiving granular material from the top of said rotor, that end wall of said hood remote from said rotor being curved downwardly to the open bottom of said hood, a motor mounted on said frame and connected to said rotor to drive the same in such direction as to move the top of said rotor from under said feeding means toward said chamber to throw the granular material horizontally into the latter and against said downwardly curved end wall, and a base frame for supporting said main frame and comprising upright supports at the opposite sides of said main frame to afford space under said hood for the travel of a conveyor belt in position to receive granular material from said hood.

11. In an aerator for granular materials, the combination with a main frame, of a rotor mounted thereon, said rotor comprising a central shaft and end bar carriers, a straight elongated bar carried by said carriers having its axis substantially parallel with the axis of said central shaft and spaced therefrom, said bar having flattened end portions, means cooperating with said flattened end portions and said bar carriers to carry said bar in a selected one of a plurality of positions, said bar having material impelling ribs on different faces thereof adapted to be brought selectively into working and non-working position by rotation of said bar about its longitudinal axis where it may be secured by the aforementioned means, said ribs being of non-linear formation whereby they operate to impel struck material along intersecting paths thereby aerating and mixing it thoroughly.

12. In an aerator for granular material, the combination with a main frame, of a rotor mounted thereon, said rotor comprising a rotatable frame, a plurality of straight elongated bars rigidly attached at their ends to said frame and having their longitudinal axis parallel with but spaced from the axis of rotation of said frame, each of said bars having end fastening portions, means cooperating with said end fastening portions to fasten the bar ends rigidly with said frame in a selected one of a plurality of positions, said bars each having material impelling ribs on different faces thereof adapted to be brought selectively into working and non-working position by rotation of a bar about its longitudinal axis where it may be secured by the aforementioned means, said ribs being of non-linear formation whereby they operate to impel struck material along non-parallel paths.

13. A rotor for an aerator comprising a plurality of elongated bars each having a longitudinally extending body and a plurality of longitudinally extending non-linear ribs spaced apart circumferentially thereon, a rotatable frame for supporting said bars, clamping end portions on the ends of each bar, and clamping devices associated with said end portions for securing the bars to the frame to bring the circumferentially spaced ribs selectively into operating and non-operating positions.

14. A rotor for an aerator comprising a plurality of elongated bars each having a longitudinally extending body and a plurality of longitudinally extending ribs spaced apart circumferentially thereon, a rotatable frame for supporting said bars, clamping end portions on the ends of each bar, and clamping devices associated with said end portions for securing the bars to the frame to bring the circumferentially spaced ribs selectively into operating and non-operating positions.

15. In an aerator for granular material, the combination with a main frame, of a rotor mounted thereon, said rotor comprising a rotatable frame, a plurality of straight elongated bars rigidly attached at their ends to said frame and having their longitudinal axis parallel with but spaced from the axis of rotation of said frame, each of said bars having end fastening portions, means cooperating with said end fastening portions to fasten the bar ends rigidly with said frame in a selected one of a plurality of positions, said bars each having material impelling ribs on different faces thereof adapted to be brought selectively into working and non-working position by rotation of a bar about its longitudinal axis where it may be secured by the aforementioned means.

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