

Jan. 29, 1957

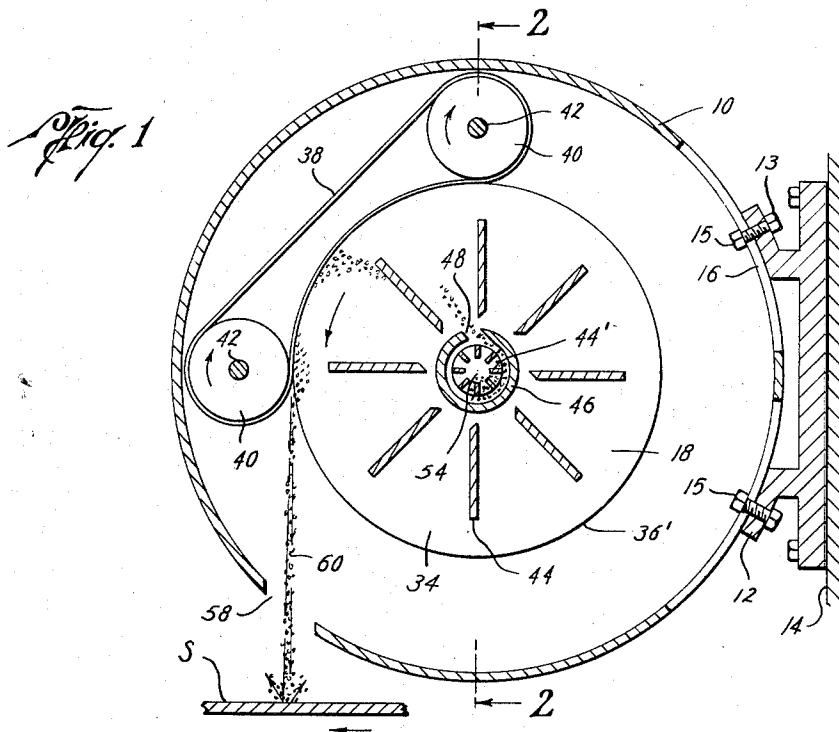
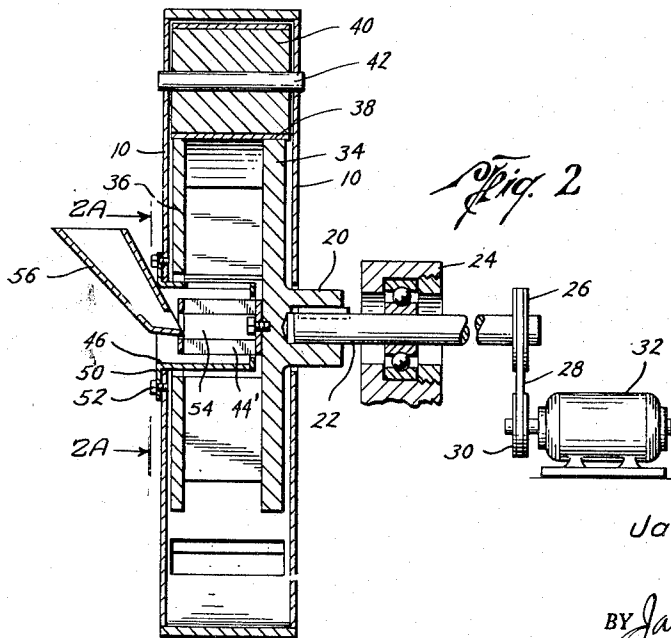
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THROWER APPARATUS FOR FORMING A MOVING COLUMN OF PARTICLES

Filed Aug. 25, 1952

3 Sheets-Sheet 1



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Fig. 3

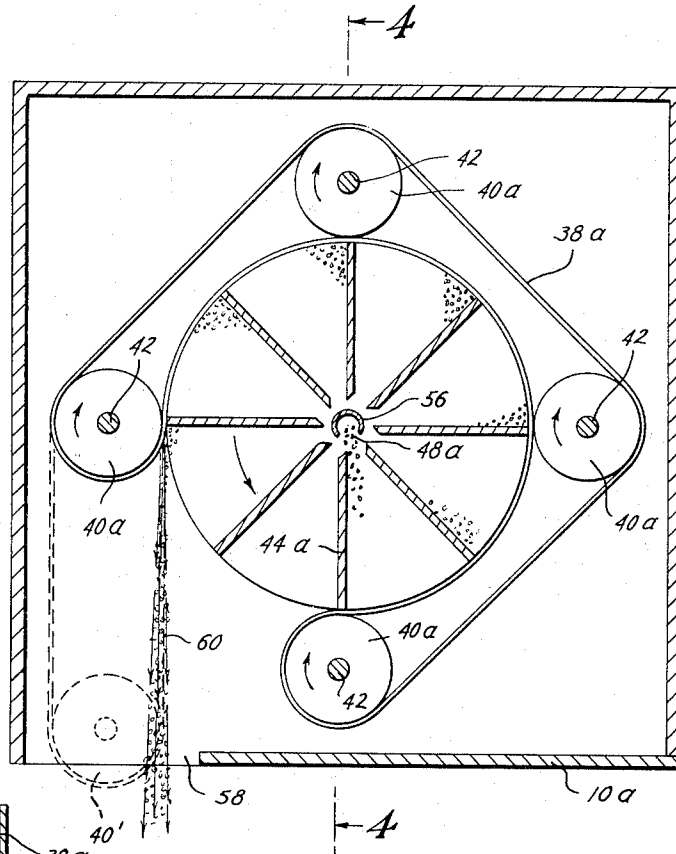
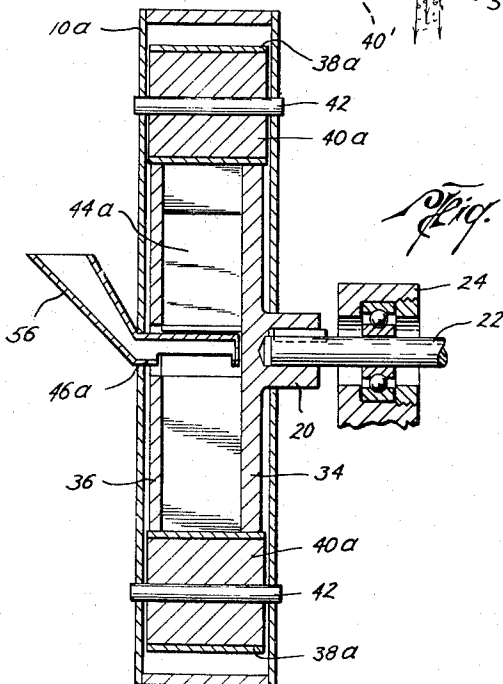


Fig. 4

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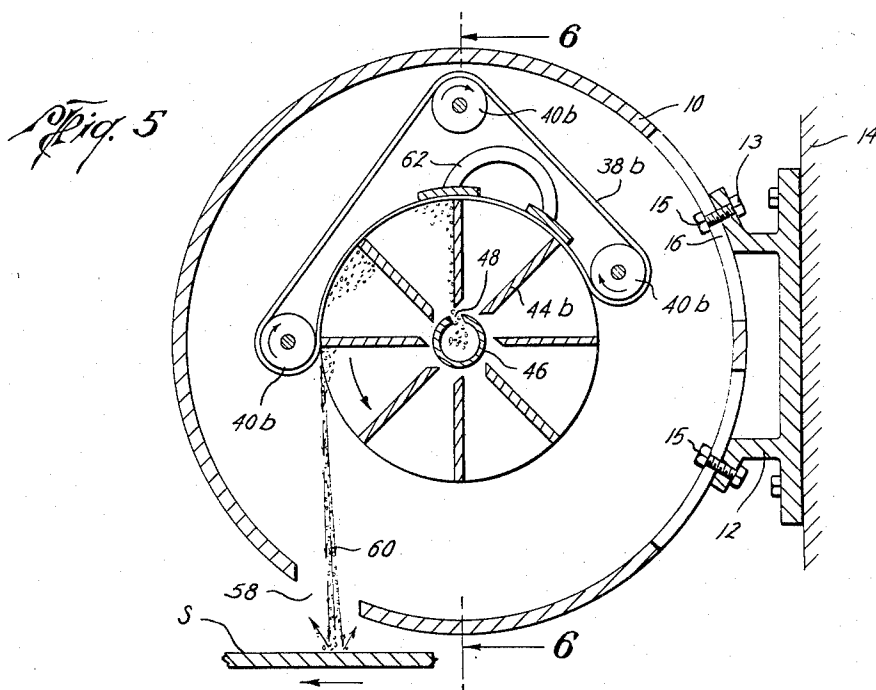
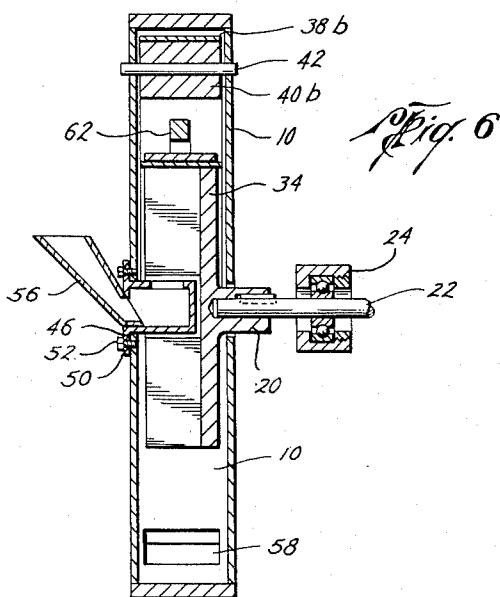
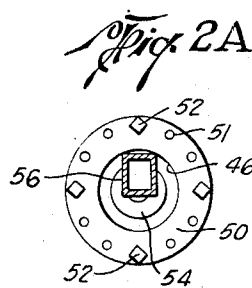
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3 Sheets-Sheet 3



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THROWER APPARATUS FOR FORMING A MOVING COLUMN OF PARTICLES

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9 Claims. (Cl. 198—128)

This invention relates to apparatus for forming a moving column of particles, and, more particularly, relates to such apparatus which discharge the column of particles tangentially of the apparatus.

Apparatus constructed according to the present invention find a wide variety of uses, such as moving or throwing a column of particles from one point to another, blasting a surface by directing a column of abrasives on the surface, and slinging particles into molds without requiring additional packing or tamping and the like. In blasting machines presently being used the abrasive particles are sprayed over a relatively large area and the column of abrasive is not of uniform concentration, the outer edges being relatively thin and considerable concentration of particles being provided in the central portion of the column. Due to the wide spread of the column of particles the moving parts of such machines have not been satisfactorily enclosed, and considerable wear has been caused by rebounding of the abrasives, which is a major cause of wear on such machines. In addition, considerable abrasion and wear is occasioned on the various moving elements and casing or housing of the blasting devices presently being used. Also, due to the relatively large area on which particles are sprayed the present blasting devices are not flexible and maximum efficiency of the blasting stream is not obtained inasmuch as a large portion of the particles strike the surface at a relatively sharp angle thereto; whereas, it is desirable for the abrasives to strike the surface at substantially right angles to obtain maximum efficiency.

It is therefore an object of the present invention to provide an apparatus for forming or throwing a moving column of particles which provides a minimum of wear and abrasion on the moving parts and casing or housing of the apparatus.

A further object of the present invention is the provision of such an apparatus in which the radial component of velocity of the column of solid particles is eliminated and the solid particles are discharged tangentially from the apparatus in a relatively concentrated and substantially uniform stream which may be directed against a surface to be blasted or thrown into a suitable receptacle or hopper, as desired.

A still further object of the present invention is the provision of a blasting apparatus which directs a column of abrasive particles in a relatively small area and at substantially right angles to the surface to be blasted.

A still further object and feature of the present invention is the provision of a blasting apparatus which may suitably be enclosed to minimize wear from rebounding particles.

A further object of the present invention is the provision of such an apparatus which is flexible in use, which is relatively inexpensive to construct and maintain and which is readily adjustable.

Other objects and features will be apparent from the following description of examples of the invention, given for the purpose of disclosure, taken in connection with

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the accompanying drawings, where like character references designate like or corresponding parts throughout the several views, and where

Fig. 1 is a side elevation, in section, of an apparatus constructed according to the invention,

Fig. 2 is a sectional view taken along the lines 2—2 of Fig. 1,

Fig. 2A is a view along the lines 2A—2A of Fig. 2,

Fig. 3 is similar to Fig. 1, but illustrates a modification,

Fig. 4 is a sectional view taken along the lines 4—4 of Fig. 3,

Fig. 5 is similar to Fig. 1 but illustrates a still further modification of an apparatus constructed in accordance with the invention, and

Fig. 6 is a sectional view taken along the lines 6—6 of Fig. 5.

Referring now to the drawings, and particularly Figs. 1 and 2, the reference numeral 10 designates a suitable housing or casing which is adjustably secured to the base member 12, which in turn may be secured to any suitable supporting member 14. The casing 10 and base member 12 may take any conventional form, but in Fig. 1 the housing 10 is substantially cylindrical in cross section in order that it might be adjustably secured to the supporting member 12 by means of the threaded bolts 13 secured in the slots 16 in the housing 10. Thus, the housing 10 may be rotated with respect to the support 12 in order to direct or throw the column of particles in any desired direction, as will be apparent later.

Centrally disposed within the housing 10 is the rotor 18 which is secured by means of the projection 20 to the driving shaft 22 extending through the bearing member 24 which has at its free end the wheel 26 which is driven by means of the endless belt 28 secured about the wheel 26 and the wheel 30 secured to the prime mover 32. No detailed description of the means and linkage to actuate the rotor 18 and moving parts of the apparatus is deemed necessary inasmuch as any conventional arrangement may be used; however, the arrangement illustrated is satisfactory.

The rotor 18 has the back plate 34 to which is secured, or may be made integral, the projection 20 into which the drive shaft 22 is keyed. If desired, a front plate 36 may be provided on the rotor 18, although one of these plates may be omitted if desired. The outer periphery 36' of the rotor 18 is open and a portion thereof is closed by the endless flexible belt 38 disposed about the wheels 40, the axles 42 of which are secured to the housing 10 for a purpose apparent later.

The rotor 18 has the vanes 44 radiating outwardly from the central portion of the rotor, but in this embodiment not extending completely to the central or outer portions thereof. It is desirable in some uses that the free velocity of the particles substantially equal the velocity of the belt 38 or the periphery 36' of the rotor 18 so that the particles merely change direction and the free velocity of the particles is changed in direction to that of the belt. This may be accomplished by providing the outer ends of the vanes at about 75% of the radius of the rotor. Stated another way, in order that the belt moves at the same rate of speed as the particles leave the vanes, so that the particles lay on the belt without losing speed, the belt should be positioned at a radius about 33 1/3% greater than a radius extending to the outer ends of the vanes.

A cylindrical or cup member 46 having the opening 48 is adjustably secured to the housing 10 by means of the bolts 52 extending through holes 51 through the annular flange 50 of the cup member 46. Thus, the cylindrical member 46 is disposed centrally at the inner portion of the rotor 18 and the opening 48 may be adjusted by

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means of removing the bolts 52 securing the flanged portion 50 of the cup member 46 to the casing 10, turning the cup member 46 as desired, and resecuring the bolts 52 through other holes 51.

Disposed on the central portion of the rotor 18 and within the cup member 46 are the vanes 44' which are in effect extensions of the vanes 44 and a central open portion 54 is provided into which the inlet or spout 56 secured to the housing 10 is in communication by which abrasive particles are fed into the apparatus. If desired, the spout may be secured to the support 14 or other suitable members so that it is generally in an upright position.

An opening 53 is provided in the housing 10 through which the stream 60 of particles is directed onto the surfaces S which is desired to be blasted.

In operation abrasive particles are fed into the machine through the spout or inlet 56 into the tubular member or cup 46. The rotor 18 is rotated at a high rate of speed by means of the prime mover 32 and associated linkage. The strap 38 engaging the outer periphery 36' of the rotor 18 is also rotated at the same rate of speed as the outer rim 36' of the rotor 18.

As the abrasive particles are fed into the central portion 46 of the rotor 18 the inner vanes 44' by centrifugal action force the particles out through the opening 48 whereupon they come into engagement with the vanes 44 which move the abrasive particles out to the periphery 36' of the rotor 18 at a constantly accelerated speed. When the particles reach the periphery 36' they are traveling at the same rate of speed as the belt 38 and are discharged from the belt 38 tangentially as it leaves the periphery of the rotor 18. This permits of a relatively concentrated stream 60 of abrasive particles and very little scattering of abrasive particles is provided in the apparatus or on the surface S which is desired to be blasted. It seems apparent that a controlled change in direction of the particles is provided and that the radial component of velocity of the particles is eliminated in discharging the particles tangentially.

The width of the stream 60 of solid abrasive particles may be controlled by the width of the rotor and belt 38. The apparatus may be adjusted with respect to the direction of the stream 60 by manipulating the bolts 13 and the cup member 46 may be adjusted as desired by manipulation of the bolts 52.

It is noted in the above described embodiment that only about one-fourth of the rotor is in contact with the solid particles at any one time which also provides reduced wear and abrasion of the various elements of the apparatus.

Referring to Fig. 3, a modification is illustrated in that the housing 10a is substantially square in cross section and may be fixed to a supporting member, as desired. In addition, the endless belt 38a is disposed about the wheels 40a which extend substantially about three-quarters of the rotor 18. In this embodiment the inner vanes 44' are omitted and the vanes 44a extend to substantially the central portion and outer periphery of the rotor 18. The cup 46 is here illustrated as an extension 46a of the spout or inlet 56 and has the opening 48a at its underside.

The remaining parts are similar to those described in connection with the example of Figs. 1 and 2, and, in operation, solid abrasive particles are fed into the spout 46 and the cup 46a and fall through the opening 48a where they are contacted by vanes 44a. The particles are rapidly and uniformly accelerated and engage the under surface of the endless belt 38a and are discharged tangentially.

Four wheels 40a and a considerable extent of flexible belt 38a are shown in Figs. 3 and 4, but if the particles are not directed downwardly as they leave the apparatus, fewer wheels 40a and extent of belt 38a may be provided, as, for example, when throwing particles upwardly or horizontally and the like.

If desired, additional wheels 40' may be provided and

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the endless belt 38a extended when it is desired to convey or throw the material a considerable distance, or it is desired to provide a more concentrated column of moving particles.

A still further modification is illustrated in Fig. 5 from that of Fig. 1 in that different means are provided to initially move the solid particles from the cup 46. In this embodiment the vanes 44' are omitted and a permanent magnet 62 is disposed proximate the trailing portion of the endless belt 38b which is disposed about the three wheels 40b. The vanes 44b are constructed of a magnetic material and as they come in close proximity to the poles of the magnet 62 they are magnetized and in effect, become extensions of the magnet 62. The back plate 34 and cup 46 are constructed of non-magnetic material. In this embodiment, particles of a magnetic or paramagnetic quality are used and are attracted through the opening 48 by means of the force of the magnet 62. Once through the opening 48 they contact the vanes 44 which are rotating at a high speed and by centrifugal action are moved out to the underside of the endless belt 38b and discharged as in the case of the structure illustrated in Figs. 1 and 2. The other elements and operation of the structure is similar to that described in connection with Fig. 1. While a permanent magnet is illustrated, any type magnet may be used which is satisfactory, such as an electromagnet and the like, and the position of the magnet may be varied; for example, the magnet may be placed on the side of the housing.

It is noted that in all of the embodiments the abrasive when it leaves the endless belt is traveling at the same rate of speed as the endless belt and the vanes at their outer ends and that there is a controlled change of direction of the particles to eliminate their radial component of velocity so that a controlled stream or column of particles is thrown or slung from the apparatus.

As indicated heretofore, and as apparent during the description, various changes and modifications may be made in the details of the structure and arrangement of parts.

Thus, apparatus constructed according to the invention is well adapted to fulfill the objects set forth and other objects and features inherent therein and the invention is to be limited only by the spirit thereof as defined by the scope of the appended claims.

What is claimed is:

1. Apparatus for throwing a column of solid particles comprising, a rotor open about its outer periphery, means to feed the solid particles into the central part of the rotor including a generally cylindrical cup member of a relatively small diameter with respect to that of said rotor disposed centrally of the rotor and having an axially extending discharge opening at its upper portion for discharge of the solid particles therefrom, inlet means proximate such cup member adapted to feed the solid particles into such cup member, radially extending vanes on the rotor disposed interiorly and exteriorly of the cup member, such vanes having a depth substantially the same as the extent of said discharge opening, and an endless belt covering that portion of the periphery of the rotor to which the solid particles move.

2. Apparatus for throwing a column of solid paramagnetic particles comprising, a rotor formed of non-magnetic material and open about its outer periphery, means formed of nonmagnetic material to feed the solid particles into the central part of the rotor including a cup member disposed centrally of the rotor having an opening for discharge of the solid particles therefrom and inlet means proximate such cup member adapted to feed the solid particles into such cup member, radially extending vanes formed of paramagnetic material on the rotor disposed exteriorly of the cup member, an endless belt engaging and moving with the periphery of the rotor, the endless belt covering that portion of the periphery of the rotor to which the particles move, and a magnet disposed

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proximate the trailing portion of such endless belt and proximate the periphery of the rotor for magnetically attracting the solid particles from the cup member.

3. Apparatus for throwing a column of solid particles comprising, a housing having an opening for discharge of the solid particles therethrough, a rotor mounted in the housing, said rotor being opened about its outer periphery, means to feed the solid particles into the central part of the rotor including a generally cylindrical cup member disposed centrally of the rotor and having an axially extending discharge opening for discharge of the solid particles therefrom, inlet means proximate such cup member adapted to feed the solid particles into the cup member, radially extending vanes on the rotor disposed exteriorly of the cup member, the outer ends of the vanes extending to about 75% of the radius of the rotor, such vanes having a depth substantially coextensive with said discharge opening, and an endless belt engaging and moving with the periphery of the rotor, the endless belt covering that portion of the periphery of the rotor to which the solid particles move.

4. Apparatus for throwing a column of solid particles comprising, a housing having an opening for discharge of the solid particles therethrough, a rotor mounted in the housing, said rotor being open about its outer periphery, means to feed the solid particles into the central part of the rotor including a generally cylindrical cup member disposed centrally of the rotor and having an axially extending discharge opening for discharge of the solid particles therefrom, inlet means proximate such cup member adapted to feed the solid particles into the cup member, radially extending vanes on the rotor disposed exteriorly of the cup member, the outer ends of the vanes extending to about 75% of the radius of the rotor, such vanes having a depth substantially coextensive with said discharge opening, and a flexible belt engaging and moving with the periphery of the rotor, the flexible belt covering that portion of the periphery of the rotor to which the solid particles move.

5. Apparatus for throwing a column of solid particles comprising, a housing having an opening for discharge of the solid particles therethrough, a rotor journaled in the housing, such rotor being open about its outer periphery, means to feed the solid particles to the central portion of the rotor, such means including a generally cylindrical cup member disposed centrally of the rotor and having an axially extending discharge opening for discharge of the solid particles therefrom, inlet means proximate such cup member adapted to feed the solid particles into the cup member, radially extending vanes on the rotor disposed exteriorly of the cup member, the outer ends of such vanes extending to about 75% of the radius of the rotor and such vanes being of a depth substantially coextensive with the discharge opening, a plurality of wheels secured to such housing, and an endless belt secured about such wheels and engaging and moving with the periphery of the rotor, such endless belt covering that portion of the periphery of the rotor to which the solid particles move.

6. Apparatus for throwing a column of solid particles comprising, a supporting member, a housing adjustably secured to such supporting member, such housing having an opening for discharge of the solid particles therethrough, a rotor journaled in the housing, such rotor being open about its outer periphery, means to feed the solid particles to the rotor including a generally cylindrical cup member disposed centrally of the rotor and having an axially extending discharge opening for discharge of the solid particles therefrom, inlet means proximate such cup member adapted to feed the solid particles into the cup member, radially extending vanes on the rotor disposed exteriorly of the cup member, the outer ends of said vanes extending to about 75% of the radius of the rotor, the depth of the vanes being sub-

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stantially coextensive with the discharge opening, a plurality of wheels secured to such housing, and an endless belt secured about such wheels and engaging and moving with the periphery of the rotor, the endless belt covering that portion of the periphery of the rotor to which the solid particles move.

7. Apparatus for throwing a column of solid particles comprising, a housing having an opening for discharge of the solid particles therethrough, a rotor open about its outer periphery journaled in the housing, means to feed the solid particles into the central portion of the rotor including a generally cylindrical cup member adjustably secured to the housing and disposed centrally of the rotor, such cup member having an axially extending opening for discharge of the solid particles therefrom, inlet means proximate such cup member adapted to feed solid particles into the cup member, radially extending vanes on the rotor, the outer ends of the vanes extending to about 75% of the radius of the rotor, the vanes being of a depth at least as great as the axial extent of the discharge opening, a plurality of wheels secured to such housing, and an endless belt secured about such wheels and engaging and moving with the periphery of the rotor, the endless belt covering that portion of the periphery of the rotor to which the solid particles move.

8. Apparatus for throwing a column of solid particles comprising, a supporting member, a housing adjustably secured to such supporting member, such housing having an opening for discharge of the solid particles therethrough, a rotor open about its outer periphery journaled in the housing, means to feed the solid particles into the central part of the rotor including a generally cylindrical cup member of relatively small diameter with respect to that of said rotor adjustably secured to such housing and disposed centrally of the rotor, such cup member having an opening for discharge of the solid particles therefrom, inlet means proximate such cup member for feeding the solid particles into the cup member, radially extending vanes on the rotor, wheels rotatably secured to the housing, and an endless belt disposed about such wheels and engaging and moving with the periphery of the rotor, such belt covering that portion of the periphery of the rotor to which the solid particles move.

9. Apparatus for throwing a column of solid particles comprising, a supporting member, a housing adjustably secured to such supporting member, such housing having an opening for discharge of the solid particles therethrough, a rotor open about its outer periphery journaled in the housing, means to feed the solid particles into the central part of the rotor including a generally cylindrical cup member of relatively small diameter with respect to that of said rotor adjustably secured to such housing and disposed centrally of the rotor, such cup member having an opening for discharge of the solid particles therefrom, inlet means proximate such cup member for feeding the solid particles into the cup member, radially extending vanes on the rotor, wheels rotatably secured to the housing, and an endless belt disposed about such wheels and engaging and moving with the periphery of the rotor, such belt covering that portion of the periphery of the rotor to which the solid particles move, and drive means to rotate the rotor.

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