Nov. 13, 1951 W. I. GLADFELTER 2,574,867

WORK BLASTING EQUIPMENT

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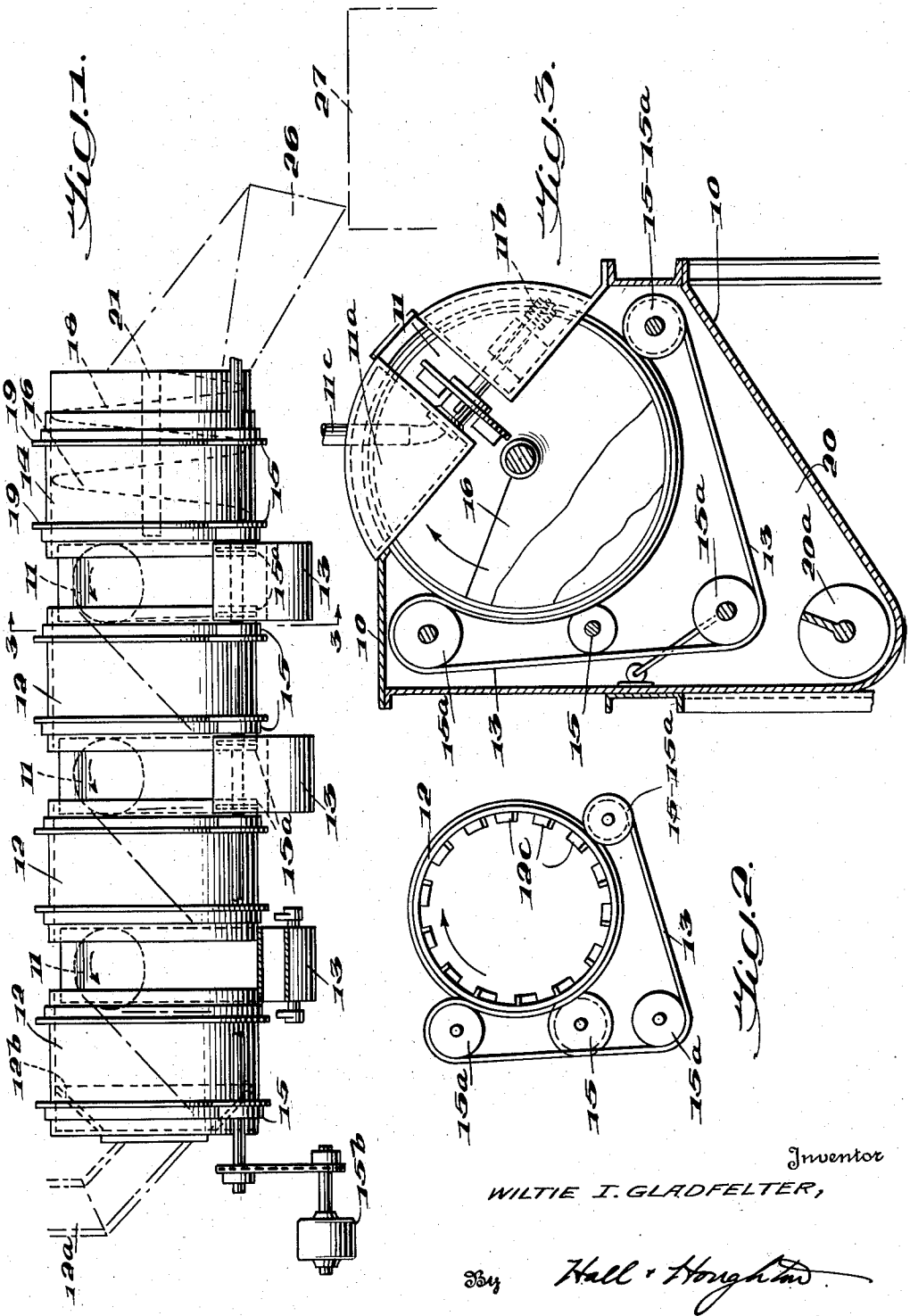

Fig. 1.

Fig. 3.

Fig. 2.

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Fig. 4.

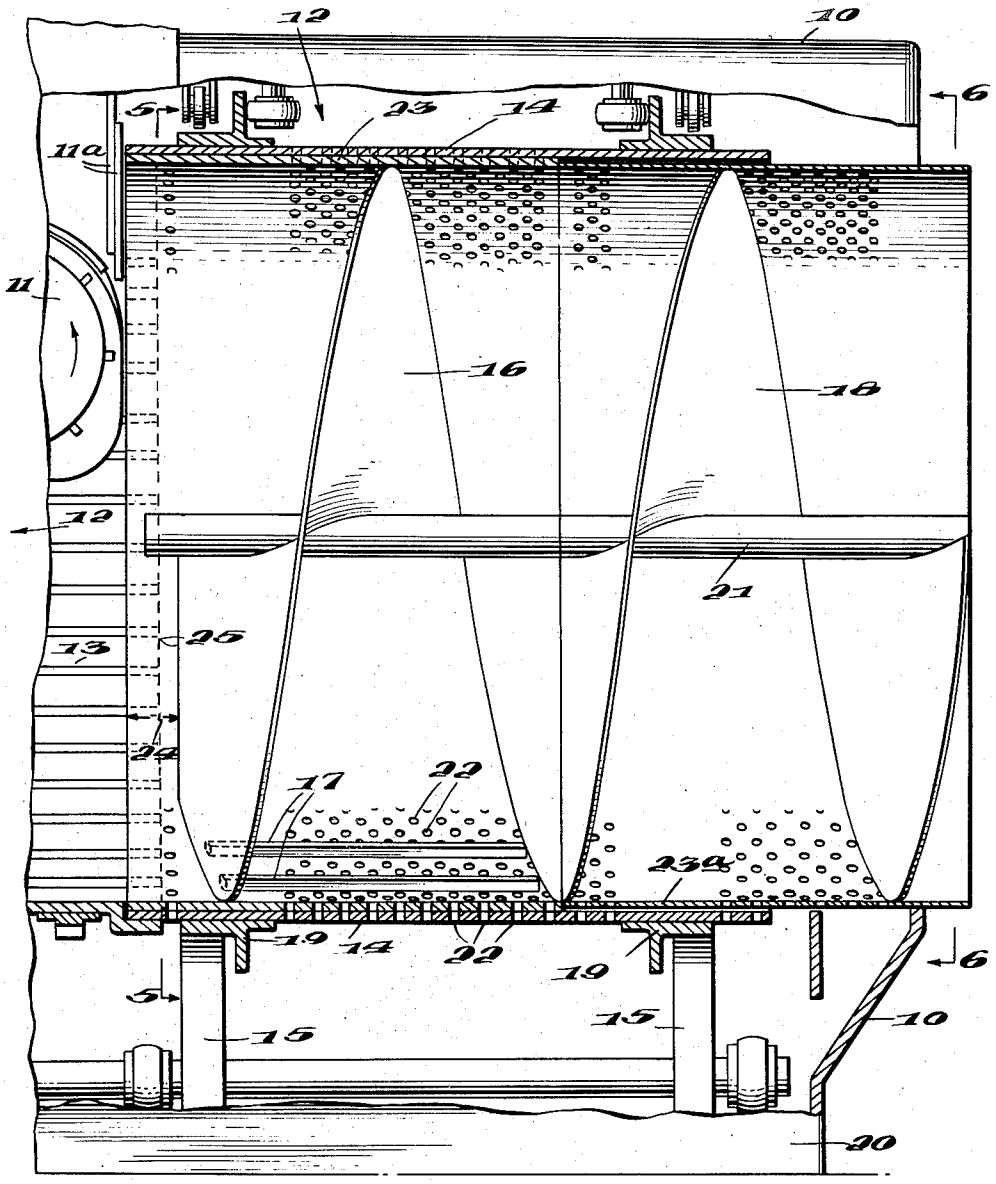

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Fig. 5.

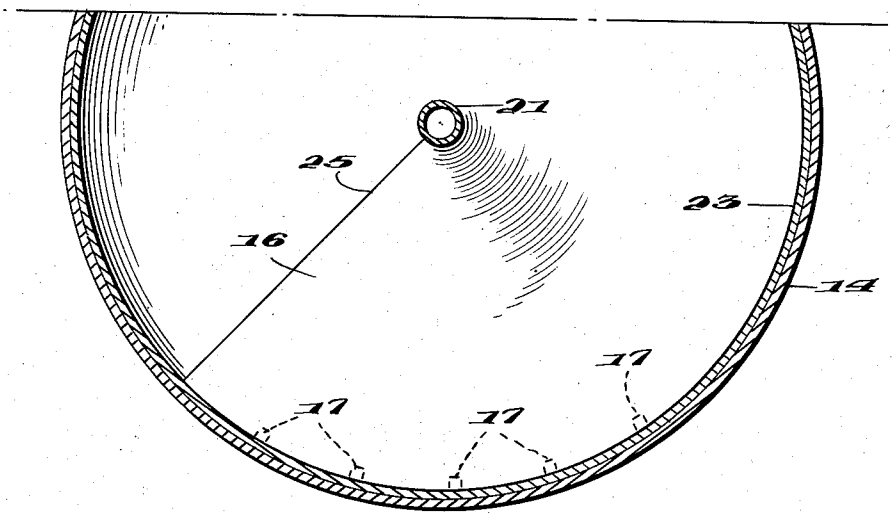
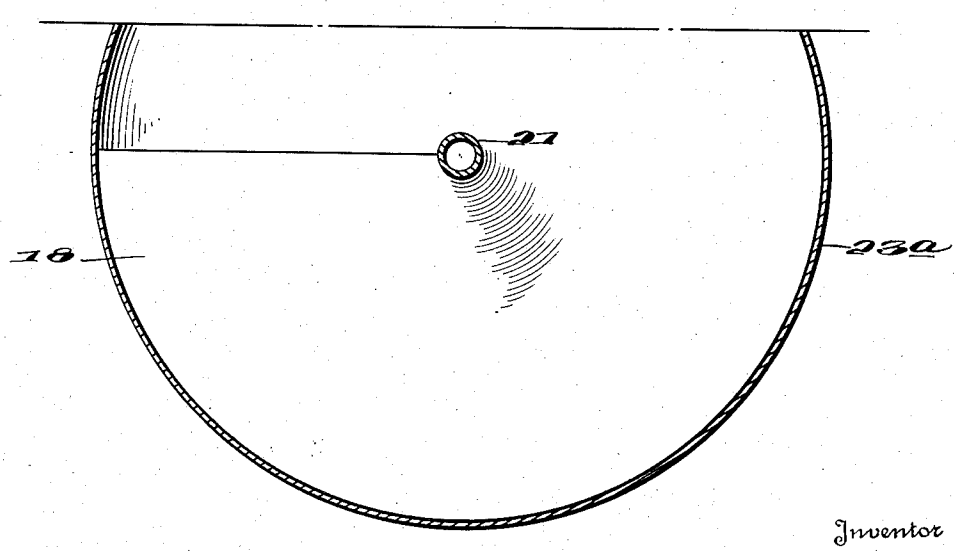


Fig. 6.



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UNITED STATES PATENT OFFICE

2,574,867

WORK BLASTING EQUIPMENT

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Application August 3, 1948, Serial No. 42,209

17 Claims. (Cl. 51—13)

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This invention relates primarily to an apparatus for the surface treatment of articles, and more particularly for the surface cleaning of castings, wherein the articles to be treated are supplied to one end of the apparatus and are discharged from its opposite end, and are tumbled in their passage therethrough, and wherein a stream of abrasive or like treating particles, or a plurality of streams thereof, is propelled therein and caused to impinge upon the articles traveling therethrough, and more particularly it relates to such an apparatus having an end member incorporated therein for arresting and precipitating flying abrasive and detritus and effecting the separation of the particles of abrasive and detritus from the treated articles and discharging the same from the end member apart from the articles, the end member thus sealing the apparatus against egress of the flying particles while discharging the work-pieces therefrom.

The object of the invention is to provide an arrangement of this sort which is particularly simple and durable in construction and highly efficient in use.

The invention comprises generally a tumbling barrel or blasting zone into which a stream of abrasive is propelled to act upon articles to be treated traveling therethrough, and a cylinder, or shell, arranged substantially coextensive with the discharge end of the same and having intermediate of its length a circumferentially-extending screening zone, or perforated area, and a wide-blade helix, or helicoid, arranged coaxially of the shell and rotating therewith and having its outer edge at or in juxtaposition to the inner wall and its inner edge at or in juxtaposition to the axis of the shell or located a substantial distance inwardly from the surface of the articles traveling through the shell; the helix providing a barrier of substantially the full cross-sectional area of the shell. One end of the helix preferably terminates at or in proximity to the discharge end of the shell, and the opposite end of the helix preferably is spaced from the entrance end of the shell. Portions of the exposed surface of the helix act as a barrier for arresting and precipitating wild flying abrasive particles and detritus while the outer marginal edge portion of the helix acts to push the material resting on the inner wall of the shell along the same for insuring the travel thereof across the screening section of the shell and effecting the discharge of the treated articles.

One exemplification of the invention is shown in the accompanying drawings, wherein:

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Fig. 1 shows diagrammatically elements of a treating apparatus of the character described having incorporated therein an end member characteristic of this invention;

Fig. 2 is a diagrammatic transverse section showing one of the barrel sections and one of the endless conveyor-type bridging members of the apparatus of Fig. 1;

Fig. 3 is a similar diagrammatic transverse section taken approximately on the line 3—3, Fig. 1, in the direction indicated by the arrows, showing the end member and contiguous parts viewed from inside the machine, and showing a structural housing therefor;

Fig. 4 is a longitudinal section, on an enlarged scale, of the end member, or shell, and the adjacent parts of the blasting barrel;

Figs. 5 and 6 are partial transverse sectional views taken on the lines 5—5 and 6—6 of Fig. 4 in the directions indicated by the arrows, respectively.

In the illustrative embodiment, shown more or less diagrammatically in the drawings, the apparatus includes a housing 10 (Figs. 3 and 4) for a tumbling barrel, and an end member for arresting and precipitating flying abrasive and detritus, effecting separation of the abrasive and detritus from the treated articles and delivery of the latter apart from the abrasive and detritus. While the end member may be applied to various types of tumbling barrels, it is herein illustrated as associated with a continuous blasting machine of the type shown in Keefer Patent No. 2,441,578 granted May 18, 1948, in which the work is fed through a series of axially aligned barrels within which it is tumbled and blasted, being transferred between the barrel sections by endless conveyor type flexible bridging means moving with the barrel sections and spanning the gaps therebetween. In this machine, blasting wheels, designated at 11, are located at the gaps and propel blasting streams into the preceding drums or barrels 12 to impinge upon the work therein. Such machines may further include a feeding means, or chute, 12a (Fig. 1) for feeding work to the blasting barrel, a corner filler 12b in the barrel adjacent thereto to move the work away from the entrance end of the first barrel section and prevent piling thereof adjacent the inlet, and tumbling and advancing means herein shown as inclined cleats 12c (Fig. 2) carried by the walls or wall liners of the barrel sections 12, for aiding in tumbling the work and in advancing it through the barrel.

In the illustrative embodiment, as best shown

in Figs. 1, 3 and 4, the end member, shell, or delivery section 14, forms a continuation of the discharge end of the contiguous tumbling barrel or blasting section 12, or of bridge member 13 at the outlet end thereof.

The blasting medium used in machines of this type generally is metallic grit or shot. This medium is expensive and that which escapes from the apparatus during its operation is generally lost. Hence it is highly desirable to separate from the work before it leaves the machine the abrasive and to recover the latter, both that leaving the final barrel with the work, and flying abrasive such as the abrasive ricochetting from the tumbling barrel. Further, it is desirable to arrest and precipitate the flying abrasive and detritus and effect the separation thereof from the work in the end member so that the treated work will be discharged entirely apart from the abrasive and detritus particles and there will be an absence of all dust or flying particles in the vicinity of the discharge end of the apparatus.

In the illustrative embodiment of the invention, the end member or shell 14 is mounted for rotation on driving rolls 15 (Fig. 4), its axis is generally horizontal, and it is provided with baffling means of substantially the full cross-sectional area of the shell, means for facilitating work tumbling and a screening area. The baffling means is contrived for also advancing the work through the shell and the abrasive and detritus resting upon or contiguous the work across the screening area of the shell, for delivering the work while intercepting and recovering entrained and flying particles, as will now appear.

In the form shown, the shell 14 is provided with a helix 16, having its turns widely spaced apart or separated sufficiently to allow for the free passage therebetween of the largest work-pieces the machine is designed to treat. The peripheral marginal portions of the helix in contact with the work and entrained abrasive and detritus in the drum or shell act to advance the same therein so that the abrasive and detritus particles are screened out in the screening area and the work, separated therefrom, is delivered at the discharge end of the abrasive sealing drum, and the exposed portions of the helix above the work traveling through the drum at the same time act as baffling means for obstructing the cross-section of the drum against the passage through the latter of flying abrasive and detritus. For this purpose the helix or helicoid has at least one complete turn.

In the form shown the shell 14 also comprises a series of work-piece upsetting cleats 17 (Figs. 4 and 5) between the turns of the helix for facilitating tumbling within the shell. Thus after the work has been engaged by or drawn into the helix or helicoid it is effectively tumbled and the release of the abrasive and loose detritus trapped in pockets thereof is insured.

In the illustrative embodiment, following the cleated section, the shell comprises a section in advance of the turn 18 of the helix in which the work and abrasive and detritus may slide or roll more or less steadily along the lower portions of the rotating shell as it is forced longitudinally thereof.

As is well shown in Fig. 4, the side wall of the shell is perforated, preferably throughout a major portion of the space embraced within the helix, the perforated region in the embodiment shown extending throughout the cleated and uncleated sections therein except for those regions where the flanged tires 19 embrace the shell. Thus as the work is tumbled in the cleated section, and as it slides and rolls along the uncleated section, the free abrasive and detritus passes through the perforations into an underlying hopper or receptacle 20, from which it may be removed for classifying and for recirculation of the blasting medium, by any suitable means, exemplified herein by the screw conveyor 20a, Fig. 3.

It will be appreciated that the section 18 of the shell is preferably smooth-walled so that there will be no abutments behind which loose abrasive can collect to be lifted and deposited into the work-pieces. Hence the abrasive, dumped from the casting pockets as the castings are tumbled, gravitates to the lower inner surface of the shell, and that which does not at once pass out through the perforations slides along the shell wall and that lying against the advancing edge of the helical blade is pushed along by it so that it is sure to be carried to perforations juxtaposed to portions of the helical wall.

As a result of this arrangement it has been found that the castings discharged from the delivery end of the shell are free from foreign particles.

In a working embodiment employing a shell four and a half feet in diameter and a helix having a pitch of two feet to the turn, as shown in Fig. 4, about two and three-eighths turns have been employed with highly satisfactory results. In that embodiment of the invention the helix is made up of one-fourth inch plate and winds about a central core 21 about six inches in diameter. The shell is provided with five cleats 17 each about one and one-half inches square spaced about twelve degrees apart and commencing about twenty degrees inwardly from the radial edge 25 of the helicoid. In the embodiment of Fig. 4, the shell or end member 14 comprises an outer section and two inner sections 23 and 23a. This arrangement facilitates the replacement of the section 23, which is subject to maximum wear. The perforations 22 extend through the outer section 14 and the inner sections 23 and 23a, which are appropriately aligned for this purpose. As little abrading occurs in the exit section 18 of the shell, the inner section 23a thereat is formed as a relatively light-weight perforated discharge liner which extends beyond the outer section 14 and the machine housing, as shown, to effect economy of material and provide for discharge of the delivered castings to any form of take-away means, herein exemplified by the chute 26 and tote-box 27 (Fig. 1). In the illustrative embodiment herein the endless conveyor type bridging member 13 (diagrammatically shown in Figs. 1–3) is of the chain and slat type as more fully indicated in Fig. 4, and is carried on suitable guiding and driving sprockets 15a located as shown in Figs. 2 and 3, while the drum or barrel sections 12 thereof are carried by rolls 15 (Figs. 2 and 3) similar to the end-member supporting and driving rolls 15 (Fig. 4). As is indicated in Fig. 1, at least one set of the driving rolls and sprockets 15, 15a is suitably driven as by a chain drive from the driving motor 15b.

As is best shown in Fig. 4, in the illustrative embodiment of the invention the receiving end of the shell 14 extends a substantial distance beyond the adjacent end of the helix 16. Thus as the radial edge 25 of the helix passes into the body of castings, those which may be pushed backwardly are not forced backwardly against the conveyor 13. The receiving threshold 24

thus provided insures smooth feeding of the work-pieces toward and into the helix **16**. Because this threshold **24** is not cleated, rough tumbling of the castings against the edge **25** of the helix is avoided and wear is reduced at this point. Preferably the edge **25** is spaced from the drum end by a distance approximately half the greatest dimension of any castings to be cleaned in the machine. With this provision, even if a casting should balance on the edge **25** and be carried upwardly thereby, it would not jam against the stationary wheel-supporting box or housing **11***a* (Fig. 3), which accommodates the wheel **11** and its driving and feeding connections **11***b*, **11***c* (Fig. 3).

It will be apparent from the foregoing that the shell or end member **14** constitutes a sealing shake-out member and that it can be employed for feeding work to a succeeding tumbling barrel while shaking out detritus from the work-pieces and preventing the escape of the blasting medium, or blastant, which may enter the drum from a preceding section.

The inner sections or liners **23**, **23***a* of the end member **14** may be secured in the outer section thereof in any desired manner, as by tack welding, for example, and the helices **16**, **18** may be similarly secured to the liners. As the abrasive baffling and tumbling sections of the helicoid and liner **23** are subjected to more wear than the uncleated sections **18**, **23***a* thereof, these two sections are preferably constructed separately, as shown.

In the preferred form of the invention the central drum or core **21** of the helicoid, about which the helix **16**, **18** extends, is of relatively small diameter to provide maximum clearance within the helix. While the recovered particles, in the form shown, enter the underlying hopper of the whole machine, it will be apparent that they may be separately received, if desired.

The embodiments of the several features of the invention shown herein are to be considered as illustrative and not restrictive, the scope of the invention being defined by the appended claims.

I claim as my invention:

1. The combination with a blasting mill comprising a work tumbling drum and means associated therewith for propelling thereinto a blasting medium for acting upon the surface of articles traveling along the bottom of the drum, of a blastant seal and shake-out member constituting an end of the mill and through the lower part of which the articles travel, said seal and shake-out member comprising a cylindrical shell rotatable about its longitudinal axis and having therein baffle means comprising at least one complete turn of a wide-blade helicoidal baffle substantially completely closing the projected cross-section of said shell against the flight through the shell of flying particles of blasting medium and detritus, said shell having perforated wall portions defining a screening zone between the turns of said baffle, and means for rotating said shell and baffle for delivering the articles across the screening zone of the shell through the space between the turns of the flying-particle arresting baffle.

2. The combination with a blasting mill comprising a work tumbling drum and means associated therewith for propelling thereinto a blasting medium for acting upon the surface of articles traveling along the bottom of the drum, of a blastant seal and shake-out member constituting an end of the mill and through the lower part of which the articles travel, said seal and shake-out member comprising a shell rotatable about a

substantially horizontal axis and having therein a central longitudinal core with at least one turn of a wide blade helix extending from said core to the inner periphery of the shell for arresting the flight through said shell of flying particles of blasting medium and detritus, said shell having a screening zone between the turns of said baffle, and means for rotating said shell and baffle for advancing the treated articles, detritus and blasting medium across the screening zone and continuing the advancement of the article to discharge the same from the end of the shell.

3. The combination with a blasting mill comprising a blasting drum and means associated therewith for propelling thereinto a blasting medium for acting upon the surface of articles traveling along the bottom of the drum, of a shake-out member constituting an end of the mill, and comprising a cylindrical shell rotatable about its longitudinal axis, said shell being perforated to provide a screening zone for the articles moved therein, and means comprising a wide-blade helix, said helix being fixed to the shell for rotation with the shell and having a width substantially equal to the shell radius and extending along and juxtaposed against the inner wall of the shell for moving the treated articles and blasting medium across said screening zone and effecting the discharge of the articles from the shell, while substantially completely obstructing the direct passage of flying particles longitudinally through the shell.

4. In a blasting mill and in combination, a blasting section having a discharge end and an entrance end, means for supplying articles to be treated to the entrance end and advancing the same through the blasting section, means for propelling at blasting velocity blasting particles into the section and against the articles aforesaid, a terminal member for the blasting mill providing a continuation of the blasting section, said member comprising a shell rotatable on a generally horizontal axis and having an open end in open communication with the discharge end of the blasting section, a discharge end, and an intermediate perforated circumferentially extending area, and a spiral blade substantially closing the cross-sectional area of the shell for preventing the passage of flying particles therethrough and for arresting and precipitating the same, means for rotating the shell, said blade in the rotation of the shell advancing the precipitated particles and the articles across the perforated area aforesaid and further advancing said articles for effecting the discharge thereof from the shell.

5. In a work blasting machine, in combination, a blasting zone, means for propelling blasting particles at a blasting velocity into said zone and against articles of work therein, and means for delivering the articles with respect to the blasting zone and preventing egress of blasting particles from the machine, which means comprises a drum having an open end adjacent the blasting zone, an article-unloading end remote therefrom, and blastant-sealing and article-conveying means therein comprising a spiral screw fitting in said drum and extending through a major portion thereof, the lower peripheral portion of said screw constituting spiral work feeding means for feeding the articles from the inlet end to the unloading end of said drum, said screw substantially completely obstructing the cross-section of said drum adjacent the blast-

ing zone against passage through the drum of flying particles.

6. In a work blasting machine, in combination, a blasting zone, means for propelling blasting particles at a blasting velocity into said zone and against articles of work therein, and a shell mounted for rotation in substantially a horizontal position, means for arresting passage of flying blasting particles through said shell comprising a wide-blade helix therein substantially coaxial thereto having the outer marginal edge portion of its blade in juxtaposition to the inner wall of the shell, said helix rotating with said shell for effecting the advance of the articles of work lengthwise therethrough, and means between turns of said helix for effecting overturning of the articles being advanced thereby, portions of said shell between the turns of said helix being perforated for the passage of particles therethrough.

7. In a shake-out drum for a work blasting machine and in combination, a cylindrical shell mounted for rotation around its longitudinal axis and having a work tumbling zone with perforated wall portions between its ends, and blastant-sealing and article-conveying means in said shell comprising a helix extending longitudinally thereof and having its outer marginal edge portion in juxtaposition to the inner wall of the shell for effecting the advance lengthwise of the shell and across said zone, of articles leaving the blasting zone of the machine, said helix having at least one turn and substantially completely filling the shell for arresting the flight longitudinally through the shell of wild flying particles from the blasting zone.

8. In a shake-out drum for a work blasting machine, and in combination, a threshold zone, a tumbling zone, and a delivery zone, spiral vane means for feeding work through said tumbling and delivery zones, said vane means extending across substantially the entire cross-section of said drum adjacent said threshold zone, work tumbling means between the convolutions of said vane in said tumbling zone, said drum being perforated at least adjacent the advancing side of said vane in said delivery zone.

9. A continuous blasting mill comprising at least two coaxial tumbling barrels mounted for rotation with their contiguous ends substantially in alignment and with a wide gap therebetween, an airless blasting machine and a housing therefor extending into the upper portions of said gap between said contiguous ends and discharging its blast stream into the first of said two barrels, a bridging member extending across the lower portions of said gap, and the second of said barrels having a perforated screening zone intermediate its ends and a helicoidal baffle in the second of said barrels obstructing the cross section thereof and preventing the egress of wild flying particles of abrasive and detritus therethrough, said helicoidal baffle rotating with said second barrel to pass work-pieces between its turns and out of said barrel, and means for feeding work-pieces to be blasted into the first of said barrels.

10. A continuous blasting machine according to claim 9, said second barrel having a threshold zone between its entrance end and the contiguous end of said helicoidal baffle.

11. A continuous blasting machine according to claim 10, said threshold zone having a width adjacent the contiguous end of said helicoidal baffle about equal to half the largest dimension of the work-pieces to be treated in the machine.

12. A continuous blasting machine according to claim 9, said helicoidal baffle comprising at least two complete turns, and said second barrel being provided with tumbling cleats within the first of said two turns.

13. A continuous blasting machine according to claim 12, said second barrel having smooth perforated walls within the second of said two turns to promote separation of loose particles from the work-pieces.

14. A continuous blasting mill of the type in which the work-pieces are passed through and tumbled in a drum-like chamber rotating on a generally-horizontal axis, and in which blasting particles are projected at blasting velocity against the work-pieces tumbling in said chamber, said mill including a generally-cylindrical end section rotating with said chamber and having its cross-section substantially closed by a wide-blade helical baffle against passage therethrough of wild flying particles from said chamber, the wall of said end section being perforated between turns of said baffle, and said baffle having its outer peripheral edge contiguous to the wall of said end section and rotating therewith for feeding the treated work-pieces therethrough and discharging them apart from entrained and wild flying particles.

15. In a blasting mill and in combination, a tumbling barrel having an open egress end, means for supplying articles to be treated to the opposite end of the barrel, means for effecting the travel of the articles through the barrel, means associated with the barrel for propelling thereinto a blasting medium stream for impinging upon the articles traveling through the barrel, a sealing and shakeout drum for the end of the mill comprising a shell forming a continuation of the barrel and having an intermediate circumferentially extending screening area and a helix arranged coaxial of the shell having a blade substantially as wide as the radius of the shell providing a baffling surface for arresting and precipitating flying particles of the blasting medium and detritus discharging from the egress end of the barrel, the outer marginal edge portion of the helix advancing the treated articles, the blasting medium, and the detritus across said screening area for effecting the separation of the blasting medium and detritus from said articles and for further advancing the latter to discharge them from the shell.

16. In a blasting mill and in combination, a tumbling barrel having an open egress end, means for supplying articles to be treated to the opposite end of the barrel, means for effecting the travel of the articles through the barrel, means associated with the barrel for propelling thereinto a blasting medium stream for impinging upon the articles traveling through the barrel, a sealing and shake-out drum for the end of the mill comprising a shell forming a continuation of the barrel and having an intermediate circumferentially extending screening area and a helix arranged coaxial of the shell having a blade substantially as wide as the radius of the shell providing a baffling surface for arresting and precipitating flying particles of the blasting medium and detritus discharging from the egress end of the barrel, the outer marginal edge portion of the helix advancing the treated articles, the blasting medium, and the detritus across said screening area for effecting the separation of the blasting medium and detritus from said articles and for further advancing the lat-

ter to discharge them from the shell, the end of the helix nearer the tumbling barrel terminating at a point spaced apart from the latter a distance at least as great as half the greatest diameter of the articles treated in the mill, and the turn of the helix next adjacent said end thereof being spaced therefrom a distance at least substantially as great as the greatest diameter of the articles undergoing treatment.

17. The combination with a blasting mill comprising a work tumbling drum and means associated therewith for propelling thereinto a blasting medium for acting upon the surface of work articles traveling along the bottom of the drum, of a blastant seal and shake-out drum constituting an end of the mill and through the lower part of which the articles travel, said seal and shake-out drum comprising a cylindrical shell rotatable about its longitudinal axis, said shell being perforated to provide a screening zone for the articles carried therein and baffle means comprising a wide-blade helix having no more

than approximately 2⅜ turns extending along and juxtaposed against the inner surface of the shell, said helix blade having a width substantially equal to the shell radius and rotatable with the shell to move work articles through and across the screening zone of the shell while substantially completely obstructing the direct passage of flying particles longitudinally through the shell.

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