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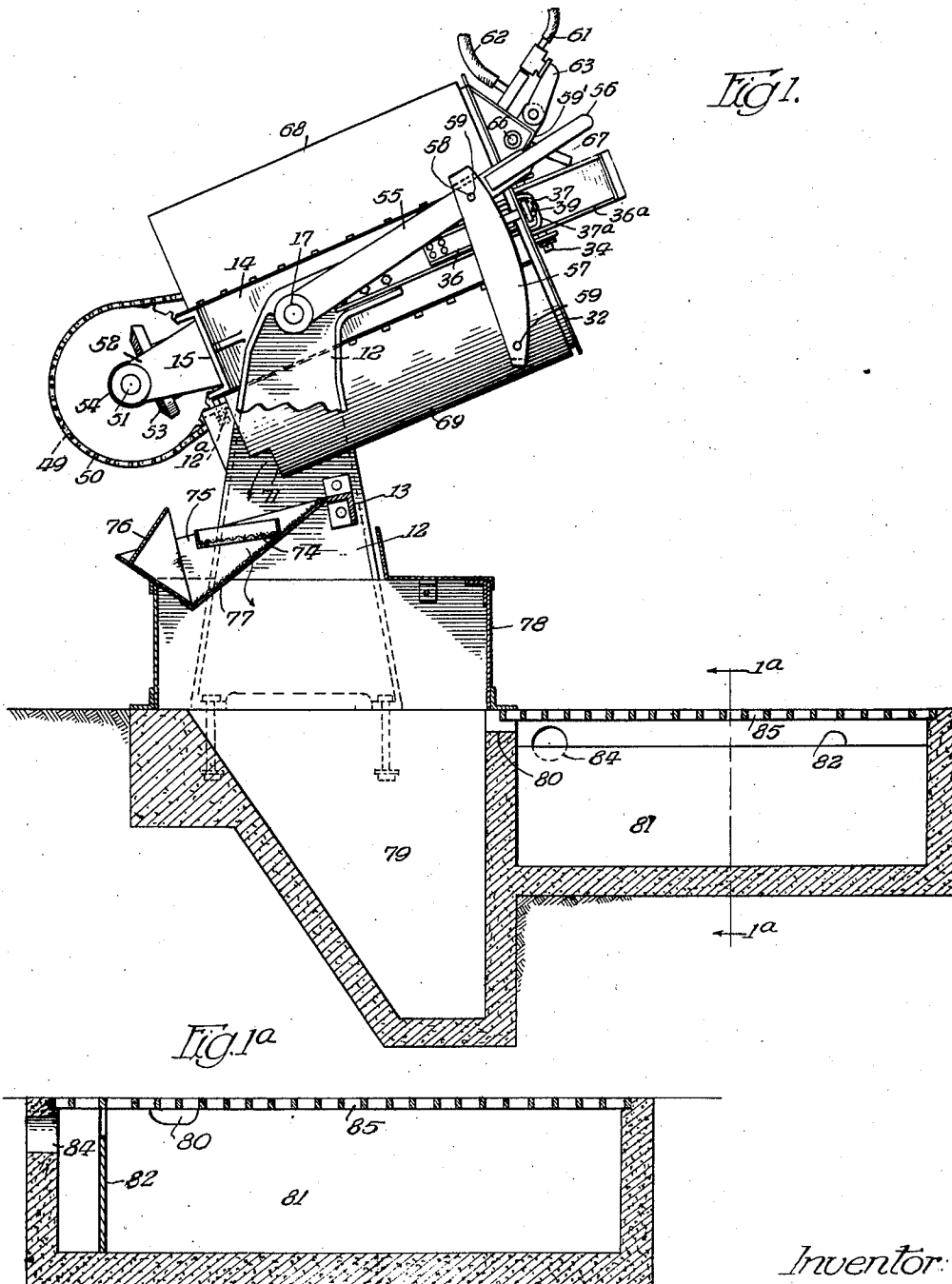
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2,351,453

APPARATUS FOR CLEANING CASTINGS OR METAL PARTS

Filed May 23, 1942

4 Sheets-Sheet 1



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June 13, 1944.

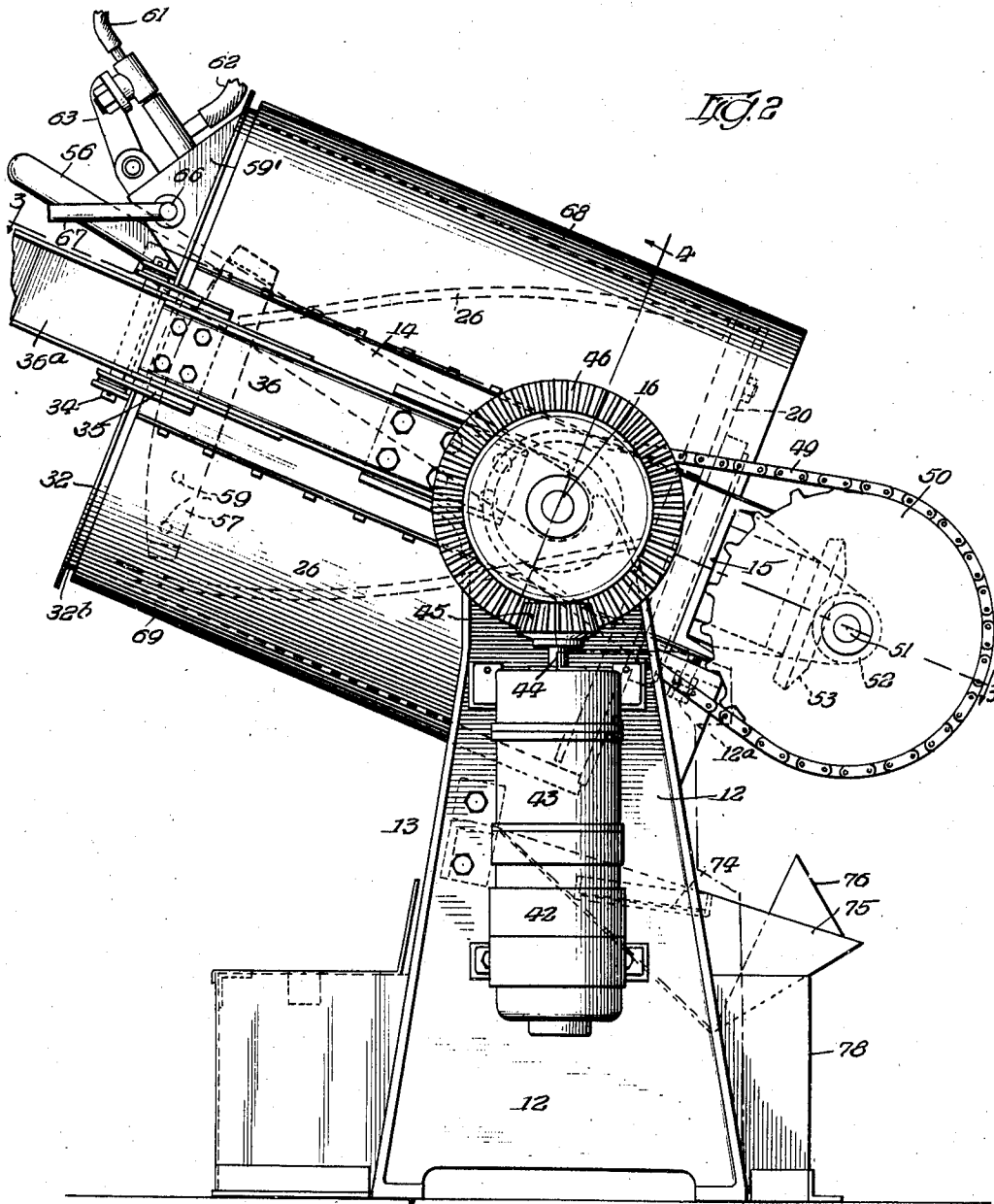
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APPARATUS FOR CLEANING CASTINGS OR METAL PARTS

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4 Sheets-Sheet 2



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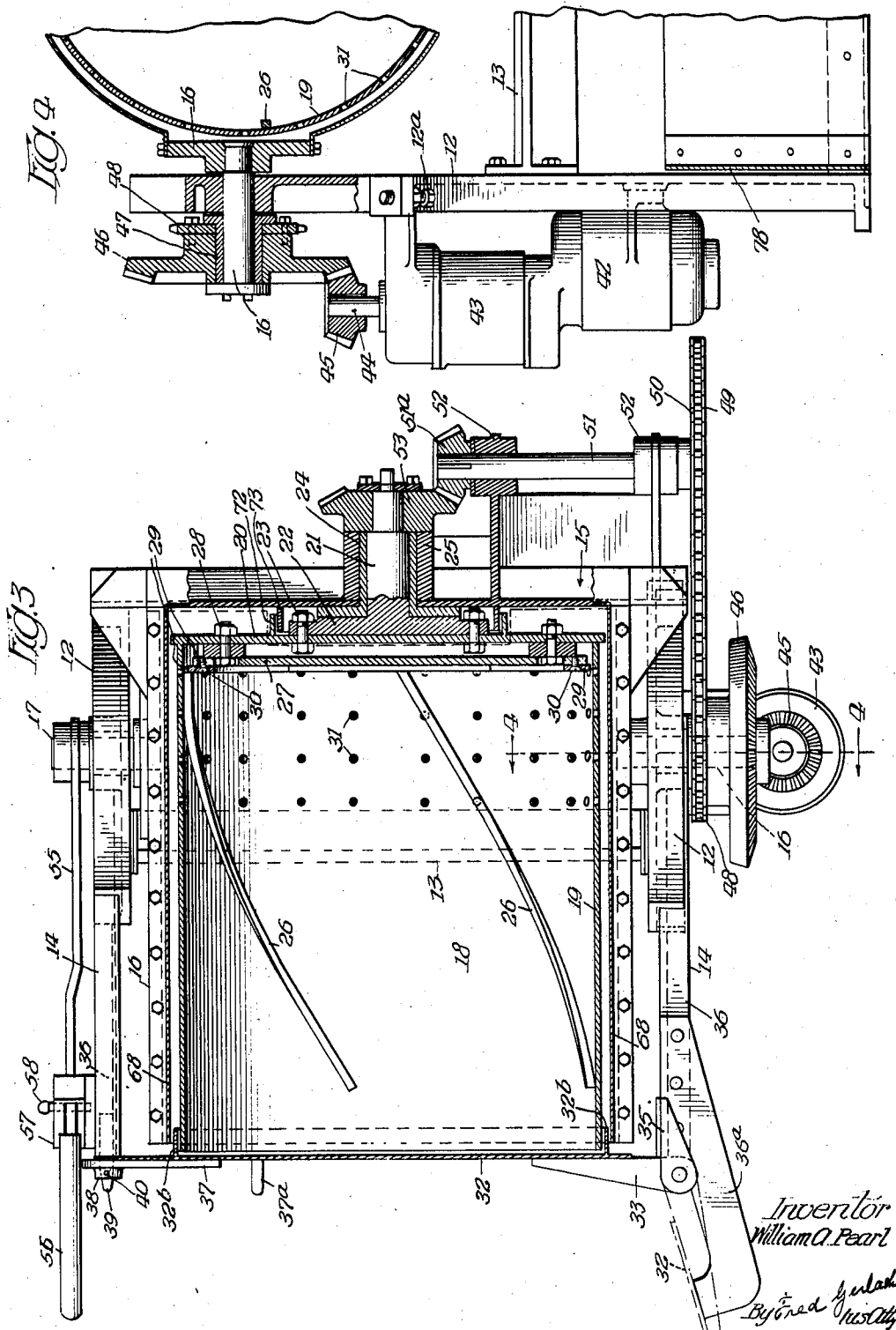
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APPARATUS FOR CLEANING CASTINGS OR METAL PARTS

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4 Sheets-Sheet 3



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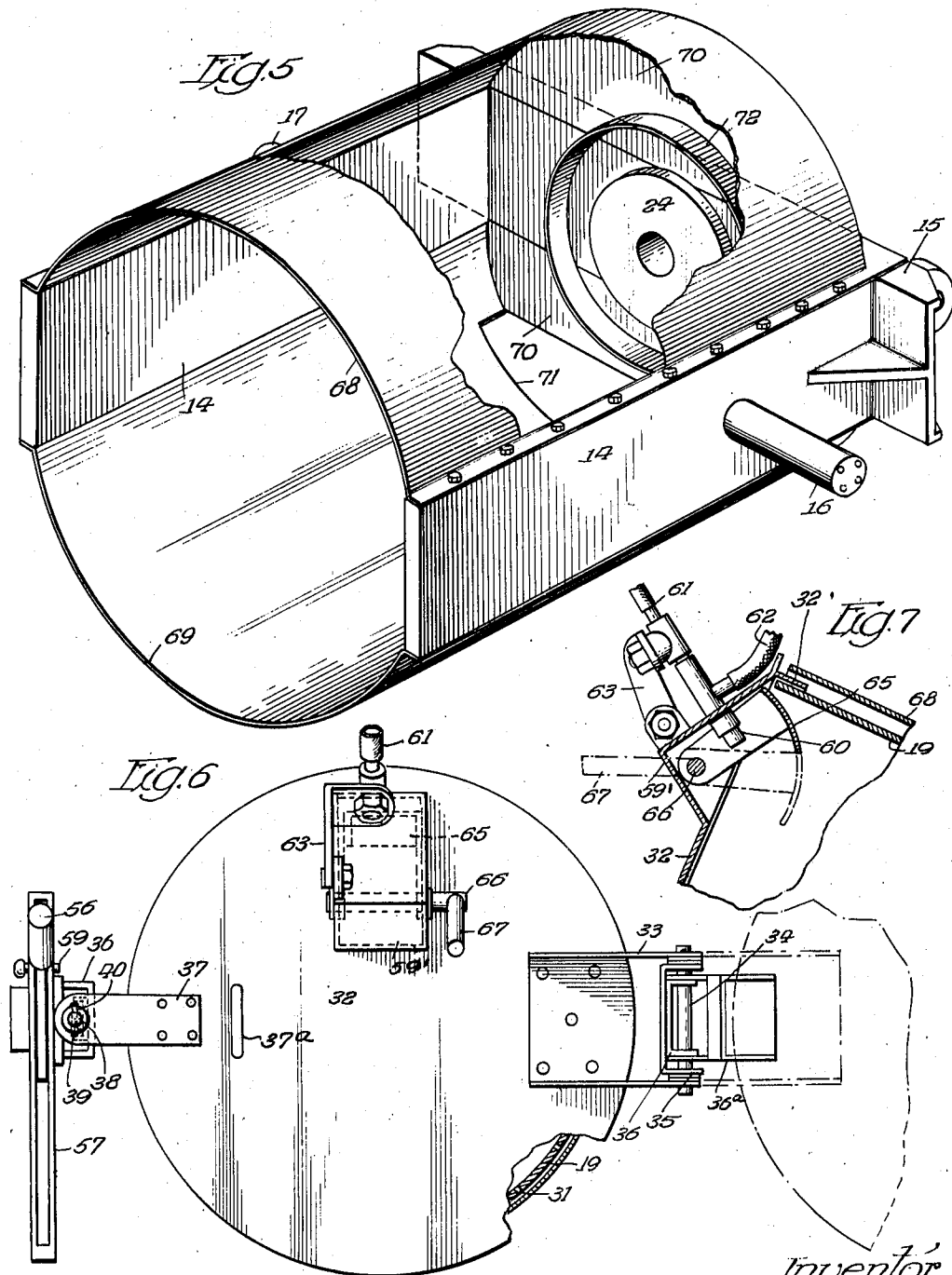
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APPARATUS FOR CLEANING CASTINGS OR METAL PARTS

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4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

2,351,453

APPARATUS FOR CLEANING CASTINGS
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11 Claims. (Cl. 51-13)

The invention relates to apparatus for cleaning castings or metal parts.

One object of the invention is to provide apparatus of the rotary tumbler type in which an abrasive is hydraulically projected against the castings and which is tiltable for convenience in charging the drum with castings and discharging them therefrom.

Another object of the invention is to provide an apparatus of this type which is compact so it can be installed in foundries where space must be economized.

Another object of the invention is to provide apparatus of this type which efficiently cleans the castings and can be economically operated.

Other objects of the invention will appear from the detail description.

The invention consists in the several novel features hereinafter set forth and more particularly defined by claims at the conclusion hereof.

In the drawings, Fig. 1 is a side elevation of apparatus embodying the invention, parts being shown in section.

Fig. 1a is a section taken on line 1a-1a of Fig. 1.

Fig. 2 is an opposite side elevation.

Fig. 3 is a section taken on line 3-3 of Fig. 2.

Fig. 4 is a section taken on line 4-4 of Fig. 3.

Fig. 5 is a perspective of the tiltable frame in which the drum is journaled, and the shell around the drum.

Fig. 6 is an end elevation illustrating the door for closing one end of the drum.

Fig. 7 is a detail section illustrating the blast nozzle for water and abrasive which is mounted on the door.

The invention is exemplified in apparatus which comprises a stationary supporting structure, a substantially U-shaped frame tiltable mounted in the structure; a drum or barrel, one end of which is open for receiving and discharging castings and the other end of which is journaled in the tiltable frame; a shell carried by the tiltable frame for catching water and sand from the drum; gearing for rotating the drum on its longitudinal axis; a door or cover for closing the open end of the drum while the castings are being cleaned, and a hydro-blast nozzle for delivering high pressure water and sand onto the castings in the drum.

The supporting structure comprises a pair of standards 12 which are anchored to a suitable foundation and are cross connected by an angular beam 13. The standards 12 are spaced apart to support between them the drum and the tilting

frame pivoted in said frame. The tiltable frame comprises side-beams 14 and a channeled cross-beam 15 which cross connects one end of the beams. One side-beam 14 has fixedly secured thereto a trunnion 16 and the other has secured thereto a co-axial trunnion 17, which are rotatably supported by the standards 12, respectively. Screws 12^a on standards 12 limit the tilting of said frame in one direction.

A drum 18 comprises a cylindrical wall 19 and an end wall 20. A shaft 21, provided with a flange 22, is secured by bolts 23 to the end wall 20 of the drum and is journaled in a bushing 24 which is supported in a bearing 25, which is fixedly attached to the cross-beam 15. The drum is rotated to tumble the castings by gearing hereinafter described. The inner periphery of the cylindrical wall 19 of the drum is provided with helical flights 26 for tumbling the castings and deflecting them away from the closed end of the drum. A liner-plate 27 is secured by bolts 28 to the end 20 of the drum. A sectional wear-ring 29 is secured to the outer portion of the plate 27 by screws 30. The cylindrical wall 19 of the drum is provided adjacent its closed end with perforations 31 for the escape of water, sand and the materials cleaned from the castings.

During the washing operation the open end of the drum is closed by a door 32 which is supported by beams or extensions which are fixed to and project from the stationary standards 12 along the sides of the drum. This door is adapted to be locked so it extends across the open end of the drum, when the drum is in its operative position and is inclined downwardly from its open end and to be swung laterally to one side of the drum when the drum is to be swung downwardly to its discharging position. The door 32 is provided with a bracket 33 which is hinged by a pin 34 so the door can be swung laterally away from the open end of the drum to one side thereof. Pin 34 is held in a bracket 35 which is supported by a beam 36 which is secured to and serves as an arm for supporting the hinged side of the door from one of the standards 12. The door 32 has secured to its opposite side, a bar 37 which is provided with a hole 39 adapted to receive a pin 39, which is supported from a beam 36 which is secured to and forms an arm on the other standard 12. Pin 39 and bar 37 are adapted to support the door 32 in its closed position. A lock-pin 40 is adapted to be extended through bar 37 and pin 39 to secure the door in its closed position. A bracket 36^a on one of the beams 36

serves as a door-stop. A handle 37^a is provided on the door.

The mechanism for driving the drum comprises an electrical motor 42 mounted on the outer side of one of the standards 12; speed reducing gearing 43, driven by the motor, and comprising an output shaft 44; a bevel pinion 45 on shaft 44; a bevel gear 46 meshing with pinion 45 and provided with a bushing 47 which is journaled on the trunnion 16 outwardly of the standard 12; a sprocket wheel 48 secured to gear 46; a sprocket chain 49, driven by sprocket 48; a sprocket wheel 50, driven by chain 49; a transverse shaft 51 journaled in bearings 52 which are fixed on cross beam 15 of the tiltable frame; a bevel pinion 51^a fixed to the inner end of shaft 51, and a bevel gear 53, which is keyed to the outer end of shaft 21 on the drum.

Co-axial trunnions 16 and 17 support the tiltable frame in which the drum is journaled, so the frame and drum will tilt longitudinally on an axis transverse of the drum, which is located longitudinally between the ends of the drum and said frame. This transverse axis is located so that with an average load in the drum, the drum and frame will be approximately balanced for vertical tilting between unloading and charging positions. A lever 55, for manually tilting the drum and the frame in which it is journaled, is keyed to the trunnion 17 on the outside of one of the standards 12. Lever 55 is provided with a handle 56 and extends through a guide 57 which is fixed to and supported by the beam 36 which is fixed to one of the standards 12. Lever 55 has a limited vertical movement between the sides of guide 57. Lever 55 is provided with a hole which is adapted to receive a pin 58, which is adapted to extend through holes 59 in guide 57 for locking the lever 55 and the tilting frame in its raised and lowered positions, respectively. The locking pin 58 for lever 55 is adapted to lock the tiltable frame so that the longitudinal axis of the drum, during the cleaning operation, will be inclined upwardly from its closed end at a suitable angle to cause the flights 26 on the drum to tumble the castings toward the door 32 and against gravity. This causes the castings to gravitate toward the closed end of the drum during the cleaning of the castings, and the flights to move them in the opposite direction, during the cleaning operation. When the lever 55 is tilted to its lower predetermined position, the longitudinal axis of the drum will be inclined downwardly from its closed end to facilitate the discharge of the cleaned castings from the drum.

The side beams 14 and end beam 15 form a rigid three-sided frame which pivotally supports the drum, the shell around the drum and the gearing for driving the drum whereby the drum can be tilted and inclined downwardly from its open end while loading the castings into the drum and during the cleaning operation, and inclined upwardly from said end while discharging them from the drum. The extensions or arms formed by means 36 stationarily support from the standards 12, and the door 32, which closes the drum during the washing operation and permits it to be swung to one side to clear the open end of the drum for loading and unloading.

A nozzle 60 is mounted in an angular offset 59¹ on the door 32, and is supplied with water under high pressure from a flexible pipe 61, and with sand and water from a flexible pipe 62 for projecting water and abrasive onto the castings

in the drum. The nozzle is supported by a bracket 63 which is supported from angular offset 59¹ of the door 32. Normally, the jet of water and sand from nozzle 60 is directed to the castings being tumbled around the longitudinally central portion of the drum. After the castings have been hydro-blasted it is sometimes desirable to flush them with water to carry off the sand and material which have been removed from the castings. It is desirable to spread the stream of water in the end of the drum adjacent the door 32, and for this purpose a deflector 65 is pivotally supported by a shaft 66, which is provided with a handle 67, whereby the deflector 65 may be swung to deflect the stream from nozzle 60 and spread it in the drum.

A shell is provided around the drum to catch the discharged water, sand and material removed from the casting, and to direct them to suitable separating devices. This shell comprises an upper semi-cylindrical section 68, and a lower cylindrical section 69, each provided with an end wall 70. These sections have flanges secured to the top and bottom, respectively, of the sides 14 and end-beam 15, and form with the frame a housing into which the water and sand will be discharged through the openings 31 in the drum 18. Adjacent the closed end of the drum the lower section 69 is provided with opening 71 through which the water, sand and material removed from the castings will be discharged from the shell. This shell is tiltable with the frame and drum. The open end of the shell terminates adjacent the inner face of the door 32, and an annular flange 32^b on the door extends around the drum and directs any splash from the drum into the shell. While castings are being cleaned, the shell is inclined so gravity will cause the water and sand to flow to discharge opening 71. Annular flanges 72 and 73 on the cross-beam 15 and end 20 of the drum 18 prevent the flow of water and sand to the bearing for the shaft 21 which drives the drum 18.

The material discharged from the shell around the drum flows to a coarse screen 74 which catches pieces of casting or the like to separate them from the water and the sand, which is recovered for reuse. The screen 74 is supported in a hopper 75 which includes a splash-plate 76 and an inclined finer screen 77. From screen 77 the water and sand pass through a box 78 into a sand-pit 79. The sand is collected in pit 79 for reuse with the hydro-blast. From pit 79 the water overflows and passes through an opening 80 to a pit 81 in which the fines will be deposited. From the pit 81 the water will flow over a baffle 82 which retains the fines in pit 81, to an outlet 84 which leads to the sewer. The pit 81 slows down the flow of water to settle the fines in pit 81. Pit 81 is covered by a floor-grid 85.

The operation of the apparatus will be as follows: The drum, the shell around the drum and the tilting frame in which the drum is journaled will be locked in the position illustrated in Fig. 1, for charging, while the door 32 is swung to one side, as illustrated by dotted lines in Fig. 6, so the castings can be dumped into, and will be retained in, the drum. The castings can then be easily dumped into the drum. Next the door 32 will be closed and locked in its closed position by the lock-pin 40. The motor 42 will then be started to tumble the castings in the drum and the hydro-blast nozzle will be controlled to project water and abrasive under high pressure against the castings in the rotating drum. When the

drum is rotating in this position it will be inclined so gravity will tend to move the castings toward the closed end of the drum. The flights 26 will direct the castings against gravity so that the castings will be continuously moved longitudinally and tumbled in the drum. During this operation, the water, sand and materials washed from the castings will flow through the openings 31 adjacent the inner end of the drum and be discharged into the shell around the drum. From the shell they will escape through the opening 71 and be directed to screen 74 where pieces of iron or larger particles will be retained for removal. Next the water and sand will pass through screen 77 into the sand-pit 79, where the sand will settle and be available for reuse. The water will overflow from pit 79 through opening 80 into pit 81 where the flow of water will be retarded for the settling of the fines. After a batch of castings has been cleaned, the flow of sand from the hydro-blast nozzle will be stopped and water will be discharged from said nozzle and spread by deflector 65 to flush the sand and material removed from the castings. From the pit 81 the water will be carried off as waste. After a batch of castings has been cleaned, the operator will unlock lever 55 and depress it until the axis of the drum is inclined downwardly toward the end at which the door 32 is located, and open said door. The castings will then be quickly discharged, and if desired the drum can be rotated so that the flights will move them through the open end of the drum into a suitable receptacle for transportation. The drum may be locked in said position during this operation by pin 58 and the hole in the lower end of guide 57. During the tilting of the drum between charging and discharging positions the driving connections for the drum will remain operative, by reason of the gear 45 being coaxial with the axis of trunnions 16, 17.

The invention exemplifies apparatus of the drum type for cleaning castings, in which the drum is tiltable on a transverse axis intermediate its ends for shifting the drum between charging and discharging positions. This approximately balances the drum under load and facilitates manual tilting. The driving connections remain operative in both positions of the drum. The deflector for the stream from the hydro-blast nozzle makes it possible to thoroughly rinse the castings after each cleaning operation. The apparatus as a whole can be installed where small space is available. It is simple in construction and efficient in operation.

The invention is not to be understood as restricted to the details set forth since these may be modified within the scope of the appended claims without departing from the spirit and scope of the invention.

Having thus described the invention, what I regard as new and desire to claim by Letters Patent is:

1. In apparatus for cleaning castings, the combination of a supporting structure comprising standards, a frame between the standards, having sides and an end, a drum having an open end and a substantially closed end, extending longitudinally of, journaled to rotate in, and bodily movable with the frame, means for supporting the frame to swing on the structure on a transverse axis, disposed longitudinally between the ends of the drum so that the drum can be inclined downwardly for moving the castings along the drum toward its closed end, and its inclination varied for unloading, means for discharging water and an abrasive under pressure into the drum, the

drum being provided with outlets for the water and sand, a shell around the drum supported by and movable with the frame, and provided adjacent the closed end of the drum with a discharge opening, mechanism for driving the drum, and a door for closing the open end of the drum.

2. In apparatus for cleaning castings, the combination of a supporting structure comprising standards, a frame between the standards, having sides and an end, a drum having an open end and a substantially closed end, extending longitudinally of, journaled to rotate in, and bodily movable with the frame, means for supporting the frame to swing on the structure on a transverse axis, disposed longitudinally between the ends of the drum so that the drum can be inclined downwardly for moving the castings along the drum toward its closed end, and reversely inclined for unloading, means for discharging water and an abrasive under pressure into the drum, the drum being provided with outlets for the water and sand, a shell around the drum supported by and movable with the frame, and provided adjacent the closed end of the drum with a discharge opening, mechanism for driving the drum, a door for closing the open end of the drum, the shell having its end open adjacent the door, and means under the discharge opening for receiving water and sand from the shell.

3. In apparatus for cleaning castings, the combination of a supporting structure comprising standards, a frame between the standards comprising side-beams and an end-beam, a drum having an open end and a substantially closed end, extending longitudinally of, journaled to rotate in, and bodily movable with the frame, means for supporting the frame on the structure to swing on a transverse axis, disposed longitudinally between the ends of the drum so that the drum can be inclined downwardly for moving the castings along the drum toward its closed end, and otherwise inclined for unloading, means for discharging water and an abrasive under pressure into the drum, the drum being provided with outlets for the water and sand, a shell around the drum comprising sections on the top and bottom of the sides and ends of the frame, and provided adjacent the closed end of the drum with a discharge opening, mechanism for driving the drum, and a door for closing the open end of the drum.

4. In apparatus for cleaning castings, the combination of a supporting structure comprising standards, a frame between the standards having sides and an end, a drum having an open end and a substantially closed end, extending longitudinally of, journaled to rotate in, and bodily movable with the frame, means for supporting the frame to swing on the structure on a transverse axis, disposed longitudinally between the ends of the drum so that the drum can be inclined downwardly for moving the castings along the drum toward its closed end, and its inclination varied for unloading, means for discharging water and an abrasive under pressure into the drum, the drum being provided with outlets for the water and sand, a shell around the drum on the frame and provided adjacent the closed end of the drum with a discharge opening, mechanism for driving the drum, and a door for closing the open end of the drum, an annular flange on the door and extending into the shell.

5. In apparatus for cleaning castings, the combination of a supporting structure comprising standards, a frame between the standards, a drum having an open end and a substantially closed end, extending longitudinally of,

and journaled to rotate in, and bodily movable with the frame, means for pivotally supporting the frame on the structure, a nozzle for discharging water and an abrasive under pressure onto the castings in the drum, a deflector for spreading water over the castings in the drum for rinsing them after they have been cleaned, a door pivotally supported on the structure, and means for driving the drum.

6. In apparatus for cleaning castings, the combination of a supporting structure comprising standards, a frame between the standards, a drum having an open end and a substantially closed end, extending longitudinally of, and journaled to rotate in, and bodily movable with the frame, means for pivotally supporting the frame on the structure, a nozzle for discharging water and an abrasive under pressure onto the castings in the drum, a deflector for spreading water over the castings in the drum for rinsing them after they have been cleaned, a door on which the discharge means and deflector are mounted, pivotally supported on the structure, and means for driving the drum.

7. In apparatus for cleaning castings, the combination of a supporting structure comprising standards, a frame, a drum having an open end and a substantially closed end, extending longitudinally of, and journaled to rotate in, and bodily movable with the frame, trunnions for supporting the frame on the structure to swing on a transverse axis, means for discharging a jet of water and an abrasive under high pressure into the drum, the drum having discharge openings adjacent its closed end, a shell around the drum, supported by the frame, and having a discharge opening adjacent the closed end of the drum, a pit below the discharge opening in the shell, for catching sand for reuse, and a pit into which the water overflows from the sand-pit, for separating the fines from the water.

8. In apparatus for cleaning castings, the combination of a supporting structure comprising standards, a frame, a drum having an open end and a substantially closed end, extending longitudinally of, and journaled to rotate in, and bodily movable with the frame, trunnions for supporting the frame on the structure to swing on a transverse axis, means for discharging a jet of water and an abrasive under high pressure into the drum, the drum having discharge openings adjacent its closed end, a shell around the drum supported by the frame, and having a discharge opening adjacent the closed end of the drum, a pit below the discharge opening in the shell, for catching sand for reuse, screens between the shell and the sand-pit, and a pit into which the water overflows from the sand-pit for separating the fines from the water.

9. In apparatus for cleaning castings, the combination of a supporting structure comprising stationary standards, a frame having sides and an end, a drum between said sides, having an open end and a substantially closed end and extending longitudinally of and journaled on the end of the frame to rotate in, and bodily movable with the frame, trunnions projecting laterally from the sides of the frame for supporting the frame on the structure to swing on a transverse axis disposed longitudinally between the ends of

the drum so that the drum can be inclined longitudinally downward from its open end for moving the castings toward the closed end of the drum and its inclination changed for unloading, the standards being provided with fixed arms projecting from the trunnions and extending longitudinally to the open end of the drum, a door for closing the open end of the drum pivotally supported on the fixed arm at one side of the drum, means for locking the door to the other fixed arm, means supported by the door for discharging a jet of water and an abrasive under high pressure through the drum, and mechanism for rotating the drum.

10. In apparatus for cleaning castings, the combination of a supporting structure comprising stationary standards, a frame having sides and an end, a drum between said sides, having an open end and a substantially closed end and extending longitudinally of and journaled on the end of the frame to rotate in, and bodily movable with the frame, trunnions projecting laterally from the sides of the frame for supporting the frame on the structure to swing on a transverse axis disposed longitudinally between the ends of the drum so that the drum can be inclined longitudinally downward from its open end for moving the castings toward the closed end of the drum and its inclination changed for unloading, the standards having fixed thereto beams forming arms projecting from the trunnions to the open end of the drum, a door for closing the open end of the drum pivotally supported on the fixed beam at one side of the drum, means for locking the door to the other fixed beam, means supported by the door for discharging a jet of water and an abrasive under high pressure through the drum, and mechanism for rotating the drum.

11. In apparatus for cleaning castings, the combination of a supporting structure comprising stationary standards, a frame having sides and an end, a drum between said sides, having an open end and a substantially closed end and extending longitudinally of and journaled on the end of the frame to rotate in, and bodily movable with the frame, trunnions projecting laterally from the sides of the frame for supporting the frame on the structure to swing on a transverse axis disposed longitudinally between the ends of the drum so that the drum can be inclined longitudinally downward from its open end for moving the castings toward the closed end of the drum and its inclination changed for unloading, the standards being provided with fixed arms projecting from the trunnions and extending longitudinally to the open end of the drum, a door for closing the open end of the drum pivotally supported on the fixed arm at one side of the drum, means for locking the door to the other fixed arm, a lever for shifting the drum fixed to one of the trunnions and extended longitudinally to project beyond the doors, means between one of the arms and the lever and adjacent the door for locking the lever, means supported by the door for discharging a jet of water and an abrasive under high pressure through the drum, and mechanism for rotating the drum.

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