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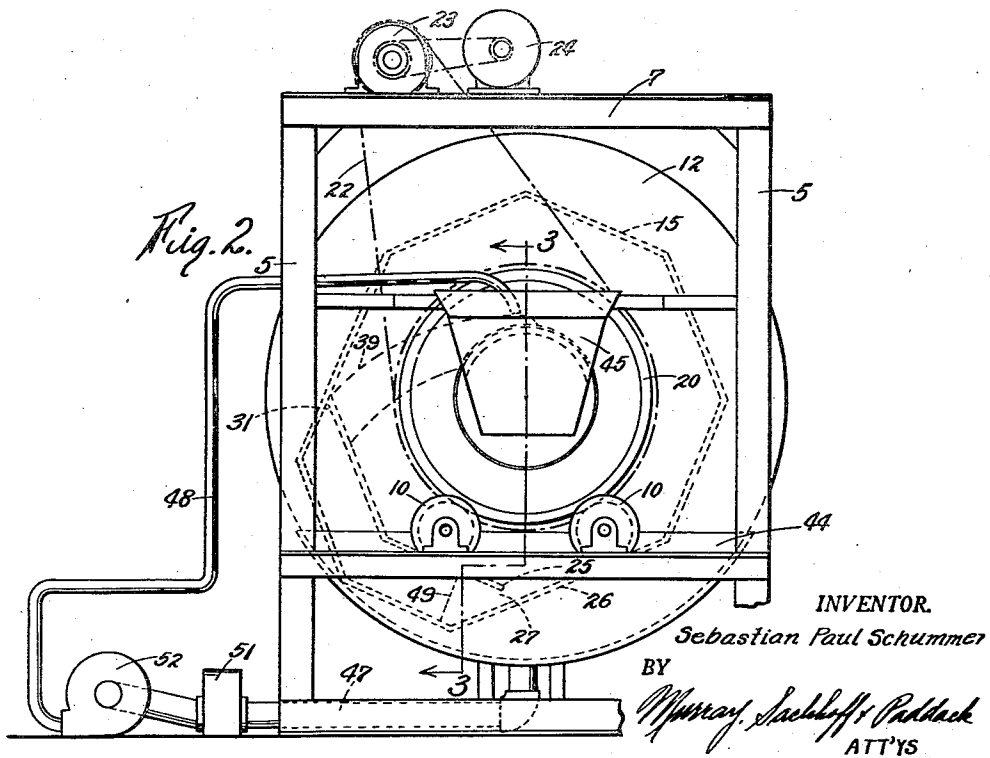
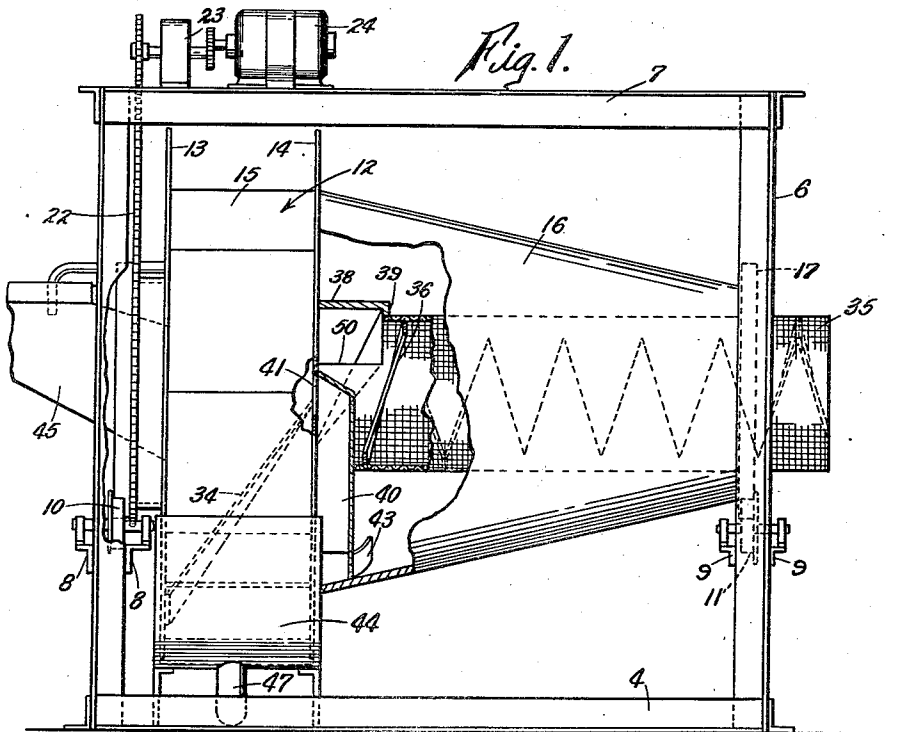
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2,359,944

TUMBLING MILL

Filed Dec. 16, 1942

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

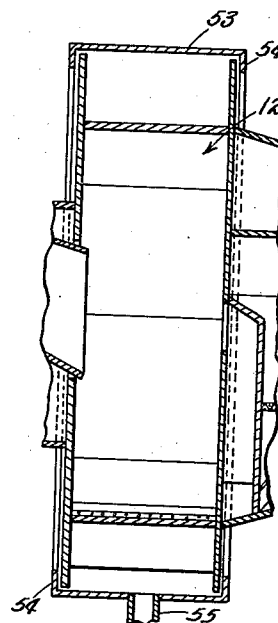
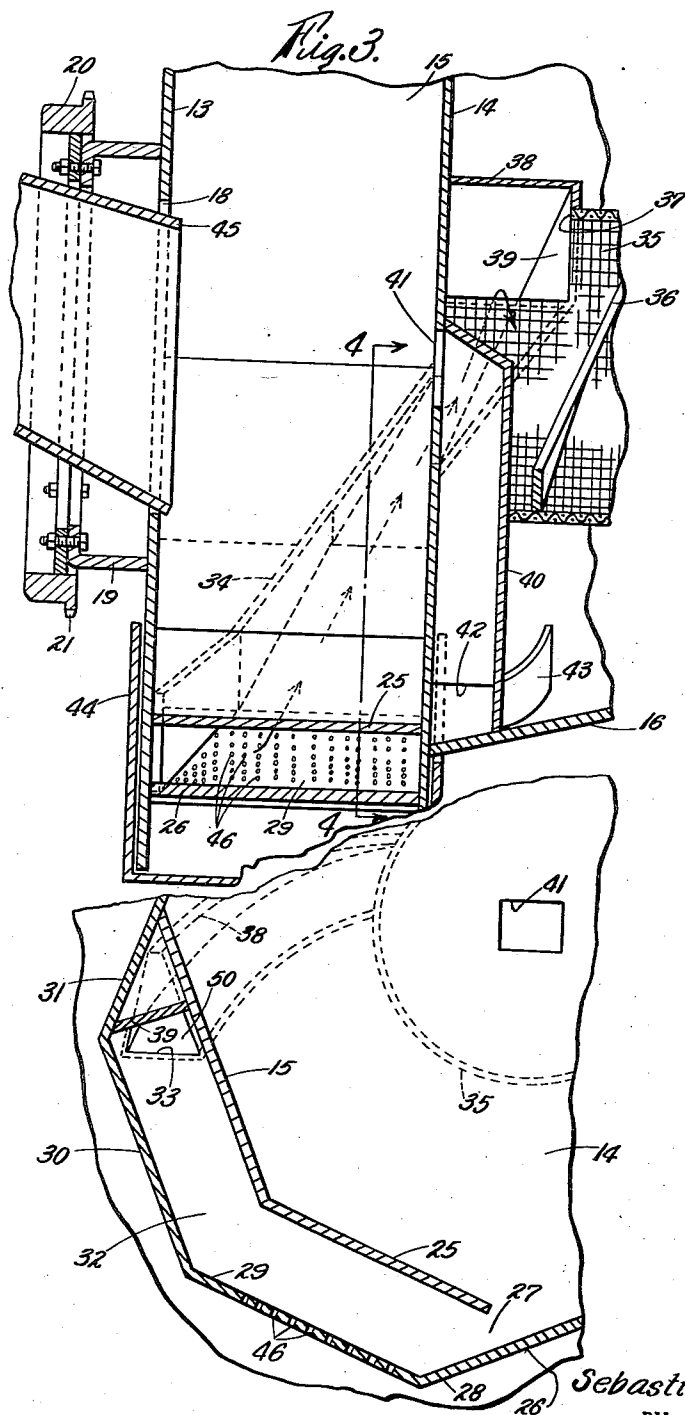


Fig. 5.

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TUMBLING MILL

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9 Claims. (Cl. 51-164)

This invention relates to a tumbling mill of the type in which castings, metal parts and other objects are placed in a rotatable drum along with a suitable abrasive or cleansing medium, either solid or liquid, though generally in the form of small solid fragments, slugs, and "stars."

An object of the invention is to provide a mill of this kind in which the discharge of the load, that is the material operated upon in the tumbling drum, is effected at the periphery or side of the drum.

Another object is to provide novel means whereby the discharge of the load is effected by the mere change in direction of rotation of the drum.

Another object is to provide novel conduit means for carrying the discharged material from the drum to the separating mechanism or unit.

Another object is the provision of new and simplified means for returning the abrasive medium from the separating unit to the tumbling drum, during operation of the mill.

Another object is to provide a tumbling mill of reduced dimensions, without sacrificing load capacity.

Another object is the provision of a tumbling mill in which the bearing means are so positioned that the weight of the mill maintains the latter in proper rotatable position without danger of displacement.

Another object is to provide these various improvements by simple and efficient means.

These and other objects are attained by the means described herein and illustrated in the accompanying drawings, in which:

Fig. 1 is a side elevational view of a tumbling mill of the invention, with parts broken away for disclosing the interior construction.

Fig. 2 is a front elevational view of the mill.

Fig. 3 is an enlarged cross-sectional view on the line 3-3 of Fig. 2.

Fig. 4 is an enlarged cross-sectional view of the line 4-4 of Fig. 3, and Fig. 5 is a modification of the invention.

With reference to the drawings:

The mill of this invention may be supported upon a suitable frame comprising bottom members 4, front standards 5, rear standards 6, and horizontal supporting beams 7. The front standards 5 and rear standards 6 may have extending therebetween, adjacent the lower portions of the frame, a pair of supporting strips 8

and 9, upon which the bearing wheels or rollers 10 and 11 are mounted.

The mill itself, in accordance with this invention, comprises a drum 12 made up of a front wall member 13, a rear wall member 14 and a peripheral wall 15 which is here shown as octagonally formed. Figs. 1 and 2 show the manner in which, in accordance with this invention, the front and rear walls 13 and 14 project outwardly beyond the peripheral wall 15.

The rear wall member 14 has secured thereon the rearwardly projecting conical collector drum 16 which at the rear end is provided with a suitable circumferential track 17 (Fig. 1). It will be understood that the tumbling drum 12, collector drum 16, and the parts associated therewith, rotate as a unit during operation of the mill.

The front wall 13 of the tumbling drum is provided with an access opening 18 (Fig. 3), through which a suitable hopper 45 projects. The opening 18 is surrounded by outwardly projecting rim 19 to which a circular track 20 is secured, the inner edge portion of this track being formed with teeth 21.

The front track 20 rests upon the rollers 10 at the front of the drum 12, and the rear track 17, rests upon the rollers 11 at the rear of the mill, whereby the mill is rotatably positioned.

The teeth 21 are engaged by a sprocket chain 22, (Fig. 1), associated at the top of the supporting frame, with a speed reducing unit 23, which in turn is operated by an electric motor 24, whereby the mill is rotated in both directions, clockwise and counter-clockwise.

It should be noted that a considerable portion of the weight of the drum 12, especially when the latter is loaded, extends substantially below the rollers 10 so that the mill, due to this weight disposition resultant upon the positioning of the rollers 10 and track 20, precludes accidental displacement of the mill. In this connection, previous types of mills have been supported at the outermost periphery, so that it has been necessary to provide special independent weight means bearing against the top of the mill, to avoid accidental displacement of the mill. It has already been pointed out that the peripheral wall 15, as shown herein, is octagonal in form, so that the material rotated within the drum 12 is frequently spilled and dumped from each, in turn, of the interior faces of the drum, the material being thus efficiently worked and abraded. There is another purpose to the provision of

these plane faces provided interiorly of the drum, such structure having to do with the discharge of material from the drum. The angularly disposed faces within the drum are achieved by the use of suitably formed sheet metal. Two of the adjacently disposed wall portions, indicated at 25 and 26 are divided or separated from one another to form an outlet 27, (Figs. 2 and 4), extending transversely of the peripheral wall of the drum. In other words, the peripheral wall portion 25 overhangs the peripheral wall portion 26 and is spaced therefrom for forming said outlet 27.

The wall portion 26 is extended beyond the said outlet 27 as at 28 (Fig. 4), and to this extension are attached additional sections 29 and 30, the latter having its outer edge connected with an extension 31 of one of the angular face members of the peripheral wall 15.

The extension sections just described, although they project or bulge outwardly beyond the adjacent portions of the peripheral wall 15, are yet embraced at their side edges by the front and rear walls 13 and 14 of the drum, whereby a chamber 32 is formed (Fig. 4). At the upper end of this chamber, the rear wall 14 is provided with a discharge opening 33. As seen particularly in Fig. 3, a guide strip 34 is secured within the chamber 32, having its forward end secured inwardly beyond the outlet 27, as at 49 (Fig. 2), and thence proceeding diagonally through the chamber 32 to the discharge opening 33, so that materials operated upon within the drum will, when the latter is rotating in a counter-clockwise direction, enter the outlet 27 and be guided by the strip 34 to the discharge opening 33. It will be understood that when the drum is rotated in the clockwise direction, the material within the drum simply slides down the peripheral wall portion 25 (Fig. 4) and past the outlet 27, without entering the same, and the abrasive operation is continued for a sufficient length of time. When rotation of the mill is reversed, the discharge operation already described, takes place.

It has already been mentioned that the conical drum 16 is associated with and forms part of a separator mechanism. This separator comprises a perforate cylinder 35 (Figs. 1 and 3), secured at one end to the rear wall 14 of the drum 12, and projecting outwardly beyond the conical drum 16 to form the final outlet for the materials abraded or polished within the mill. The perforate cylinder 35 has secured therein, a helical guide 36, which, from a point near the inner end of the perforate cylinder progresses spirally to the exit end thereof.

In the operation of the mill it is necessary to transfer the materials discharged from the drum 12 into the perforate cylinder 35, where the abrading elements such as the so-called "stars" pass through the perforations of said cylinder, being smaller than said perforations, while the larger elements operated upon by the mill are passed outwardly by the action of the helical guide 36.

For effecting the transference mentioned, the present invention provides for an arcuate channel extending from the discharge outlet 33 of the drum to a port 37 in the said perforate cylinder 35 (Fig. 3). The said arcuate channel is formed by the rear wall 14 of the drum 12 with which are associated the channel walls 38, 39, and 50, extending from the discharge opening 33, then through the wall of the conical drum 16 and to

said port 37 in the perforate cylinder 35. The path of the material discharged from the tumbling drum is indicated by the arrows in Fig. 3, namely, the course through the chamber 32 in the tumbling drum, then through the discharge opening 33 and finally through the channel leading directly to the port 37 in the perforate cylinder 35.

The return of the abrading elements from the bottom of the rotating conical drum 16 to the interior of the tumbling drum 12 is effected, according to this invention, by a chute 40 (Fig. 3) which has one end disposed against the interior face of said conical drum, and the other end projecting to a point just beyond the middle of the wall 14 on the tumbling drum, at which point the latter is provided with an aperture 41. The lower end of the chute 40 has an entry 42 into which the abrading elements are directed by means of a deflector 43. As the mill turns clockwise, the collected elements are passed downwardly through the chute 40 and the aperture 41 into the interior of the tumbling drum to perform their abrading function again.

It is contemplated herein that the tumbling mill might be operated with liquid as the cleansing medium, and for this purpose, Figs. 1 and 2 show a trough 44 embracing the lower portions of the tumbling drum 12. Liquid from the interior of the tumbling drum is discharged into the trough through perforations 46 (Figs. 3 and 4) provided in the extension section 29, just inwardly of the outlet 27 of the drum. The liquid in the trough 44 is received into a suitable bottom pipe 47, (Fig. 1), and from thence is pumped back through a conduit 48 into the hopper 45, to be recirculated, having first been passed through a suitable filter 51 associated with the pump 52.

In Fig. 5 the tumbling drum is shown as adapted for use with air suction or an air blast as the cleansing medium. The drum 12 is embraced by a jacket comprising the peripheral portion 53 with lateral flanges 54, which members closely approach the drum but permit free turning thereof. The air injection or suction may be applied at any suitable point on the jacket, preferably at the bottom as at 55, in which position the air passes with particularly good action through the materials passing over the drum outlet during clockwise or non-discharge rotation of the drum. It will be understood that during the use of air, the hopper and exit ends of the mill are suitably covered.

The peripheral outlet from the tumbling drum, as provided in this invention, is a simple and highly efficient method of unloading material therefrom by the mere reversal of the direction of rotation of the drum. Moreover, it makes it possible to reduce the depth of the tumbling drum, from front to rear, since, as heretofore made, these drums were of a conical type, of the general character of the collector drum, which, of course, must possess a considerable depth to get an effective slant capable of directing the material to the lower portions thereof. In other words, the walls of the tumbling drum herein are parallel with the axis of rotation. Another advantage in this connection is that a larger load may be carried by the drum.

Variations will suggest themselves upon consideration of the means herein disclosed, but these are believed to be comprised within the spirit and scope of the invention.

What is claimed is:

1. A tumbling mill comprising a rotatable drum having front, rear and peripheral walls, the peripheral wall being formed with an outlet intercepting material in the drum only when the latter is rotated in one direction, the rear wall of the drum being provided with a discharge opening, and a diagonally disposed conduit extending from the drum outlet to the discharge opening and adapted upon rotation of the drum in said one direction to direct the material from said outlet to said opening.

2. A tumbling mill comprising a rotatable main drum having front, rear and peripheral walls, a collector associated with the rear wall of the main drum, a separator in said collector, the peripheral wall of said drum being formed with an outlet accessible to material in the drum from one direction only such that when the drum is rotated in the opposite direction said material passes said outlet without entering, the rear wall of said drum being formed with an opening, and conduit means extending from said drum outlet to said opening and from the latter through the collector to the separator.

3. A tumbling mill comprising a rotatable main drum having front, rear and peripheral walls, a collector associated with the rear wall of the main drum, a separator in said collector, the peripheral wall of said drum being formed with an outlet accessible to material in the drum from one direction only such that when the drum is rotated in the opposite direction said material passes said outlet without entering, the rear wall of said drum being formed with an opening, conduit means extending from said drum outlet to said opening and from the latter through the collector to the separator, and a return chute in said collector and communicating at one end with the interior of the drum and at the other with the interior of the collector.

4. A tumbling mill comprising a rotatable main drum having front, rear and peripheral walls, a collector associated with the rear wall of the main drum, a separator in said collector, the peripheral wall of said drum being formed with an outlet accessible to material in the drum from one direction only such that when the drum is rotated in the opposite direction said material passes said outlet without entering, the rear wall of said drum being formed with an opening, conduit means extending from said drum outlet to said opening and from the latter through the collector to the separator, a return chute in said collector and communicating at one end with the interior of the drum and at the other with the interior of the collector, and a deflector associated with the chute for directing material in the collector into the chute.

5. A tumbling mill comprising a rotatable drum having front and rear walls and a peripheral wall parallel with the axis of rotation, a separator and collector unit associated with the drum in substantial axial alignment therewith,

an outlet in said peripheral wall, means whereby material in the drum is discharged through said outlet when the drum is rotated in one direction and is retained in the drum when the latter rotated in the opposite direction, and conduit means associated with the drum and with said unit for directing material from the former to the latter during discharge rotation of the drum.

6. A tumbling mill comprising a rotatably-mounted drum formed with front, rear and side walls and provided with an outlet opening in the side wall thereof, means providing for entry of material in the drum into said outlet opening upon rotation of the drum in one direction and precluding such entry upon rotation of the drum in the opposite direction, means associated with the rear wall of the drum for separating operated materials from abrading elements, a connecting conduit between said outlet and separator for directing materials ejected from said outlet to the separator, the rear wall of the drum being provided with an inlet port, and means for returning abrading elements from the separator into the drum through said port.

7. A tumbling mill comprising a drum formed with front, rear and peripheral walls, the peripheral wall being provided with an outlet and the rear wall with an inlet, a separator adjacent to and rotatable with the rear wall and communicating with said inlet, a conduit connecting said outlet with the separator, means for selectively directing the abrading or cleansing and the abraded or cleansed materials together into said outlet for transference through said conduit to the separator upon rotation of the drum, and means for returning the abrading materials into the drum through said inlet.

8. A tumbling mill comprising a drum formed with front, rear and peripheral walls, the peripheral wall being provided with an outlet and the rear wall with an inlet centrally disposed and relatively remote from said outlet, a separator adjacent to and rotatable with the rear wall and communicating with said inlet, a conduit connecting said outlet with the separator, means for selectively directing the abrading or cleansing and the abraded or cleansed materials together into said outlet for transference through said conduit to the separator upon rotation of the drum, and means for returning the abrading materials into the drum through said inlet.

9. A tumbling mill comprising a drum with front, rear and peripheral walls, the peripheral wall being provided with an outlet, means operative upon rotation of the mill in one direction for retaining materials in the drum and for discharging the materials through said outlet upon rotation of the drum in the opposite direction, a separator adjacent to and rotatable with the drum and in substantial axial alignment therewith, and conduit means connecting said outlet with the separator for transferring materials discharged through said outlet to the separator.

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