Feb. 26, 1957 A. J. LIEBMAN 2,782,564

CENTRIFUGAL ABRADING MACHINE

Filed Oct. 11, 1953 3 Sheets-Sheet 1

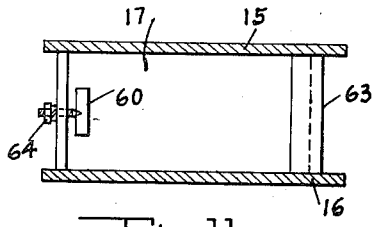


Fig. 11.

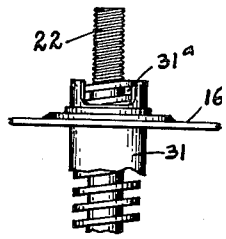


Fig. 12.

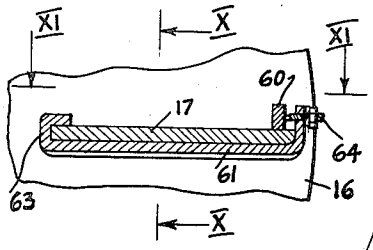


Fig. 9.

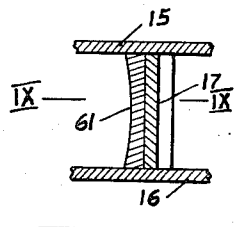


Fig. 10.

Fig. 1.

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CENTRIFUGAL ABRADING MACHINE

Filed Oct. 11, 1953 3 Sheets-Sheet 2

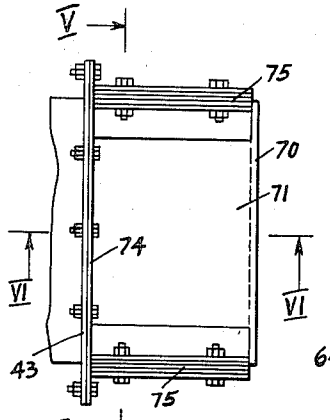


Fig. 4.

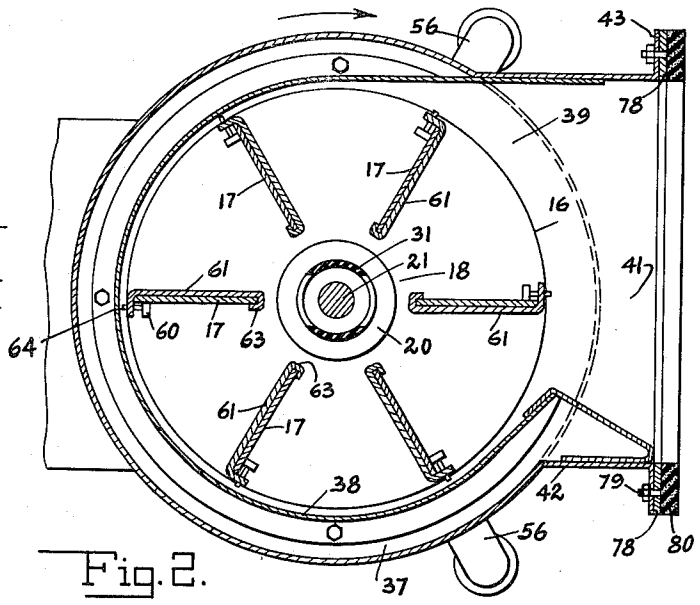


Fig. 2.

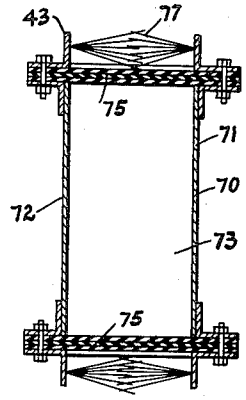


Fig. 5.

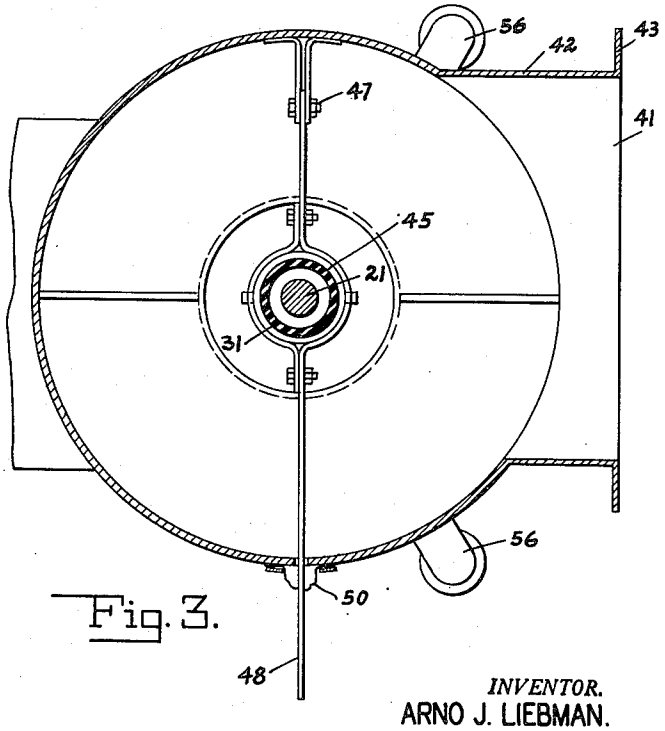


Fig. 3.

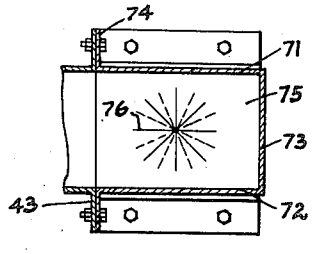


Fig. 6.

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CENTRIFUGAL ABRADING MACHINE

Filed Oct. 11, 1953 3 Sheets-Sheet 3

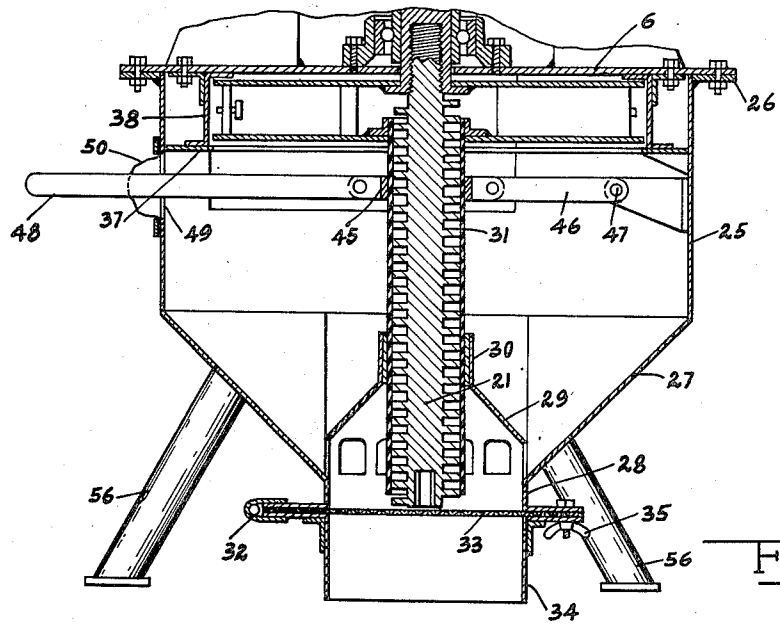


Fig. 7.

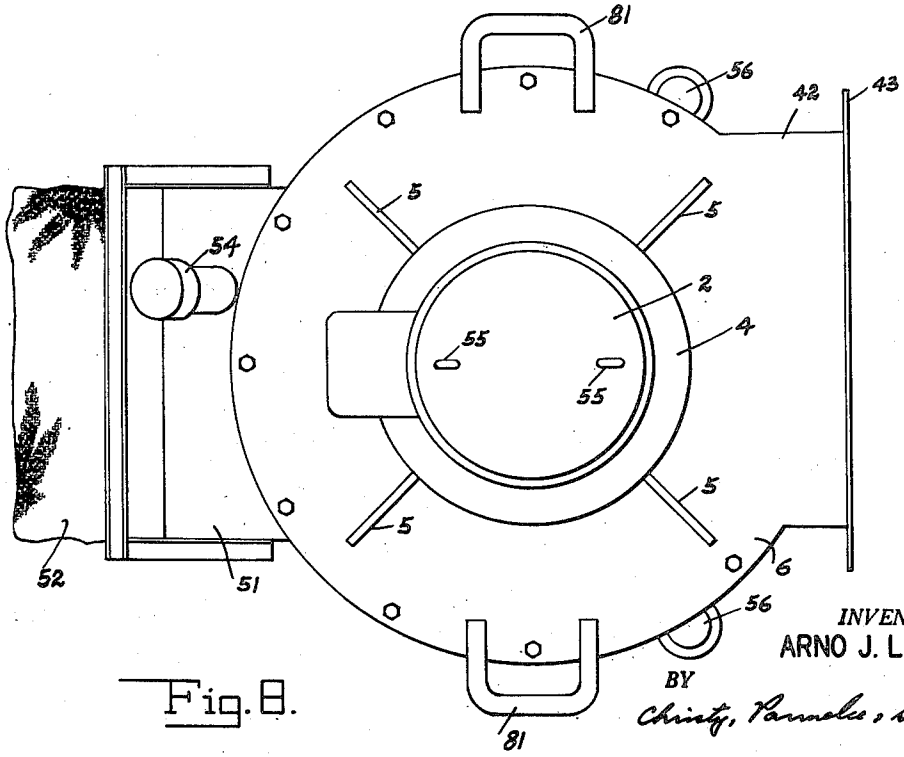


Fig. 8.

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CENTRIFUGAL ABRADING MACHINE

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Application October 11, 1954, Serial No. 461,504

20 Claims. (Cl. 51—9)

This invention is for an abrading machine of the class in which metal pellets or other abrasive particles are impelled by centrifugal force against a surface to be processed, and is especially for a machine of this character which is adapted for use as a portable unit and for use in cleaning or abrading vertical or near vertical surfaces.

Abrading machines which throw metal shot against an object to be cleaned are now in wide use, but as generally constructed, they are large devices, usually housed in an enclosing room or shell, and the abrasive-throwing wheel revolves about a horizontal axis while objects to be cleaned are moved under its periphery.

An object of the present invention is to provide a centrifugal abrading machine in the form of a complete self-contained unit which may be manipulated and moved about, and which discharges the abrasive particles or pellets horizontally so that it may be used against the sides of ships, buildings, storage tanks and other vertical surfaces, and also inclined surfaces having an inclination as much as 45° from vertical.

A further object of the present invention is to provide an abrading machine of compact construction designed to collect the abrasive pellets after they have been used and recirculate them continuously to the centrifugal wheel.

A further object of the present invention is to provide a unit with means for varying the supply of abrasive to the wheel.

Further objects are to provide a machine of this character designed for the easy repair and replacement of parts, which is constructed to prevent jamming of the abrasive feeding mechanism, and which can be economically constructed.

A further object of my invention is to provide for the use of this machine in the abrading of structural sections, cylinders, pipes, rods and other long sections.

These and other objects and advantages of my invention are obtained as may be more fully understood by reference to the accompanying drawings in which:

Fig. 1 is a vertical section through an abrading machine embodying my invention;

Fig. 2 is a horizontal section through the machine in the plane of line II—II of Fig. 1;

Fig. 3 is a similar section in the plane of line III—III of Fig. 1;

Fig. 4 is a plan view of an attachment for the cleaning of elongated sections;

Fig. 5 is a vertical section through the unit in the plane of line V—V of that figure shown in Fig. 4;

Fig. 6 is a transverse section in the plane of line VI—VI of Fig. 4;

Fig. 7 is a view similar to Fig. 1 of the lower portion only of the machine but in a plane rotated about 30° from Fig. 1, this view also showing a slightly modified arrangement in the bottom of the casing of the machine;

Fig. 8 is a top plan view of the machine;

Fig. 9 is a fragmentary view partly in plan and partly in section of a portion of the centrifugal throwing wheel, one vane and its wear plates being shown in section, the section being in the plane of line IX—IX of Fig. 10;

Fig. 10 is a fragmentary vertical section in the plane of line X—X of Fig. 9 through the portion of the wheel shown in Fig. 9;

Fig. 11 is a transverse vertical section in the plane of line XI—XI of Fig. 9; and

Fig. 12 is a detail fragmentary view of the top of the assembly at the center of the wheel shown in side elevation.

In the drawings, 2 designates a portable power source such as an electric motor or gas engine having a vertical shaft 3, and which is mounted on a plate 4 supported by a plurality of vertical gusset plates or webs 5 above a main horizontal cover plate 6.

The motor shaft 3 has a coupling 7 at its lower end to which is joined a vertical shaft 8, this shaft being mounted adjacent the coupling in a bearing 9 mounted on a plate 10 welded to the webs 5 intermediate the plates 4 and 6. The lower end of the shaft 8 is enlarged to provide an internally threaded socket member 11, and this portion of the shaft 8 is received in a ball bearing 13 mounted in a holder 14 on plate 6. A thrust nut 12 is on the threaded upper end of 11 in a ball bearing 13 mounted in a holder 14 on the plate 6. The lower end of the shaft 8 passes through an opening in the plate 6.

The lower end of shaft 8 also constitutes a hub for the centrifugal throwing wheel which is formed of upper and lower circular plates 15 and 16 respectively, the upper plate being welded to part 11. The two plates are connected by a series of radial vanes 17 extending inwardly from the periphery of the disks and terminating radially outwardly from the center so as to have an open central area 18 (see Fig. 2).

In the bottom plate 16 there is a central opening 19 surrounded by a collar-like raised area 20 on the top face of the plate 16 within the open area 18. There is an abrasive feed screw 21 that passes through the opening 19, this screw terminating below the level of the plate 15, and having a threaded extension 22 that is screwed into the socket 11. The feed screw projects downwardly a substantial distance below the wheel, as shown in Fig. 1.

A generally cylindrical casing or housing 25 has a top flange 26 (see Fig. 7) that is bolted to the main plate 6, and this housing surrounds the wheel and projects downwardly below the wheel, its lower portion being sloped inwardly at 27 to a a restricted outlet 28. In Fig. 7 there is shown a cage-like arrangement 29 over this outlet, with a collar 30 at its upper end. In Fig. 1 no such cage is shown.

There is a heavy soft rubber tube or rigid tube with a rubber-like pliable lining 31 around the feed screw 21 extending from near its lower end up through the opening in the bottom plate 16 of the wheel and terminating above this plate 16 in the open central area of the wheel. In Fig. 7 the lower end of this tube is rotatably received in collar 30.

Hinged to the outlet 28 at the bottom of the housing by a hinge 32 is a perforate closure plate 33 with a depending collar 34. This closure plate is held in the position shown in Fig. 1 by a wing nut and bolt 35, and upon removal of this nut the plate and collar may swing downwardly. The perforate plate or screen 33 has openings that the shot cannot sift through it, but broken pieces of shot, debris and dirt may sift through.

The casing or shell 25 provides a support for a horizontal flange or ledge 37 that is fixed therein, and which extends horizontally under the periphery of the bottom plate of the wheel. This plate serves to support a fixed curved guard or retaining plate 38 (see Fig. 2) that extends around the periphery of the wheel in close relation

thereto. This curved guard entirely surrounds the wheel except for an arc of perhaps 30° to 45° at one point on the periphery of the wheel where it terminates to provide a discharge opening **39** (see Fig. 2). The guard plate sets against the top of the flange **37**, but is secured by brackets **40** to the under side of the plate **6**, so that when the casing is unbolted from the plate **6**, the flange **37** may be moved down relative to the wheel and afford access to the wheel.

The casing or housing **25** is provided with an opening **41** that confronts the opening or break **39** in the guard wall, and around this opening is a laterally-extending projection **42** having an outwardly-turned flange **43** thereon, the flange **43** being in a plane beyond the wall of the casing **5**. This flange may be brought into contact with a vertical wall or other area to be abraded as will be hereinafter more fully described. The bottom **44** of the projection **42** is inclined and terminates inside the casing.

In Fig. 7 and also Fig. 3 a metal collar **45** is vulcanized to the rubber sleeve **31** at a point above the collar **30** and below the plate **37**. This collar **45** is attached to a lever **46** pivotally mounted in the casing at **47**, and the other end of the lever **48** projects through a slot **49** in the casing. This construction holds the rubber tube **31** from rotating with the screw, and at the same time provides a means for adjusting the tube **31** up and down to vary the feeding of the abrasive particles into the center of the wheel. A flexible hood **50** may be attached to the lever **48** to prevent abrasive dust from coming out the slot **49**.

In Fig. 1 the tube is not adjustable vertically and is received and secured to a fixed collar **45'** supported in radial brackets **46'** in the casing.

The casing may also be provided with an outlet flange or extension **51** having a dust collecting bag **52** thereon. There may be a screen **53** across the inner face of this elbow, although it is not required. A filling tube **54** projects at an angle through the top of the extension **51** (see Fig. 1) and it has a removable cap while its inner end is in the casing. By removing the cap, shot may be poured into the machine while it is operating.

Provision is made for suspending the entire unit from a crane or rigging of some kind so that it may be hung against the side of a ship, the exterior or interior of a metal storage tank, or against some other vertical surface to be cleaned. For this purpose I have illustrated the motor **2** as being provided with eyes **55** to which chains or cables can be hooked, but any suitable suspension yoke for the structure may be provided. Additionally the structure may be provided with three or more legs **56** so that it may be set down on the floor or other level surface. It may also be fitted with wheels or roller for movement through and accurate positioning within the interior of large diameter pipes or cylinders.

In operation, steel shot pellets or other abrasive particles are charged into the casing. These can be introduced initially through the filler tube **54**. The machine is brought into position so that the flange **43** is flat against the surface to be cleaned. In cleaning a vertical wall, the machine will usually be suspended from a crane or other rigging so that it can be raised and lowered and moved sidewise while the flange **43** is kept tight against the surface to be cleaned. Adapters for particular contours may be bolted to flange **43**. The motor is then started and abrasive pellets are carried by the screw **21** up through the rubber sleeve **31** and discharged into the center of the centrifugal wheel above the plate **16** and below the plate **15**, the shot being discharged into the open central area of the wheel. Here the shot are engaged by the inner ends of the vanes and thrown outwardly by centrifugal force. They are confined by the guard **38** at every point around the periphery of the wheel, except where the opening **39** and the window **41** are located. The shot pass through this opening at great velocity, strike the surface to be cleaned, and bounce or fall back into the housing **25**. The sloping bottom **27** directs the shot into the bottom of the casing where it is again picked up by the screw and returned to the centrifugal throwing wheel, the part **28** forming a well into which the shot collect. Shot which is badly worn and fragments of shot and particles from the surface being cleaned will sift through the screen **36**, and when needed, new abrasive can be added as the machine is running through tube **54**.

Also when the wheel is operating, it acts as a centrifugal blower, and air is drawn up through the screen, discharged centrifugally by the wheel, and the blast of air generated thereby helps carry the shot against the surface to be cleaned and aids in removing scale and other material loosened by the shot. This creates a pressure in the casing, and the air, laden with dust, escapes through the connection **51** into the dust bag **52** through which the air is filtered into the atmosphere, the dust being trapped in the bag. With the construction shown in Fig. 7, the rate of feeding of the shot can be regulated by moving the rubber sleeve **31** up and down, thereby exposing the lower end of the screw **21** to a greater extent, or enclosing it to a greater extent, as may be required.

In Fig. 1, the upper end of the tube is notched as shown in Fig. 12, the notch **31a** determining the location at which the shot bolts into the wheel. A tube of rubber or similar pliable elastic material is preferred as the enclosure for the screw **21**, since the abrasive material would have a tendency to jam in the conveyor if a non-yielding enclosure were used. Where this occurs with a rubber tube, the rubber will yield without being damaged, and any jamming will relieve itself and the feeding continue without any detrimental effect to the machine, and without "chewing up" the abrasive or the screw or the housing for the screw.

At intervals the nut **35** may be removed, allowing the bottom of the casing to be opened and the accumulation of scale to be cleaned out. After a long period of use, the conveyor screw may require replacement or repair. To facilitate this, the lower end of the screw is provided with a socket **21a** into which a wrench may be placed for unscrewing the upper end **22** of the screw from the socket **11**. The feed screw can thus be removed through the bottom of the casing without disturbing any of the other parts of the machine.

The shot, or pellets, or other abrasive, would abrade the vanes **17** of the centrifugal wheel if these vanes were actually used to engage the abrasive. However, I prefer to use a replaceable wear plate over each of the vanes as shown in Figs. 2, 9, 10 and 11. To this end the back of each vane is provided near its outer end with a lug **60**. The replaceable wear plate **61** has a length coextensive with the length of the vane (see Fig. 2), and at its inner end it is provided with a hook **63** which extends around the inner end of the vane. The outer end of the wear plate is turned backwardly over the outer end of the vane **17**. Set screw **64** passes through this inwardly-turned outer end of the wear plate, and its end is screwed in against the lug **60**. When the screw **64** is turned up tight the hooked inner end of the wear plate will be drawn tightly around the inner end of the vane **17**, and the wear plate cannot fly off due to centrifugal action. As shown in Fig. 10, the wear plate is preferably slightly concave in a transverse direction so that the abrasive tends to ride up on the face of these wear plates and travel out along the center line thereof.

The operator should, from time to time, inspect the wear plates, to determine their condition, and if they are badly abraded the screw **64** can be operated through the window **41**, and the worn plates removed and new plates substituted in their place. It is unnecessary to dismantle the wheel to replace the wear plates on the vanes. If the wear plates should become abraded so that they

cannot withstand centrifugal force, they would be likely to separate near their outer ends where the abrasive action is greater than at the center. The inner portion of the wear plate which is fractured under this condition, would remain hooked to the vane and be prevented from coming off by centrifugal force while the outer end of the wear plate which might thus be broken off, would be thrown through the window with great impact against the surface being processed, and the operator would be warned to shut the machine down, but no damage would be done.

Where the machine is to be used for the cleaning of objects or elongated sections such as channels, angles, pipes and the like, a box-like casing shown in Figs. 4, 5 and 6 is bolted to the flange **43**. This casing, designated generally as **70**, is formed of heavy sheet metal with a top wall **71**, a bottom wall **72**, an outer wall **73**, and with a flange **74** at its inner face adapted to meet with and be bolted to the flange **43** on the casing. At each end of the box-like casing **70** there are one or more flexible curtains, three preferably being used, which may be formed of rubber or like sheets **75**. These sheets are radially slitted from the center so as to form a number of finger-like flaps as shown in Fig. 6, the slits being designated **76**, and preferably the slits in one sheet are staggered with reference to those of another as indicated by the dotted lines in the figure. With this arrangement, a length of pipe, for example, or other long object, can be thrust through the end curtain at one end of the box **70** while the abrasive is being thrown out by the wheel, and the pipe can be rotated and at the same time pushed on out through the other end curtain, exposing an additional part of the pipe to the abrasive, and the pipe thus progressively moved through the box and rotated so that its whole surface may be cleaned and abraded while the fingers on the end curtains will conform to the shape of the pipe and prevent the shot from bouncing or flying out. The flexible curtains will not only conform to the shape of the pipe, but angle sections or channel sections can be pushed through it in the same way and they serve, of course, to prevent the loss of abrasive. In addition to the rubber curtains, or in lieu thereof, the two ends of the casing may have flexible brushes or bristles, such as **77** (see Fig. 5) mounted there in with the bristles extending across the ends of the casing. These will also permit an elongated object to be pushed through the casing and serve to prevent loss of abrasive.

In some instances, instead of the pipe being pushed through the casing and served, the machine may be moved along the pipe, as for the cleaning of the exterior of pipe lines.

From the foregoing it will be seen that my invention provides a centrifugal abrading machine in the form of a compact unitary structure from which the abrasive is thrown horizontally. Because of the unit construction of the machine it can be transported, suspended against any vertical surface to be cleaned, and be progressed and moved along over that surface, and it provides an economical and rapid way of processing such surfaces, including the sides of ships which now have to be manually scraped, chipped and sanded in preparation for painting. Because of the self-contained nature of the unit, the abrasive is continuously recirculated, and the volume of abrasive material required at any one time is not large, only a few pounds. Very little abrasive will be lost. In some cases it is desirable to use a soft cushion or flange **43** to be yieldably pressed against the work, as where the surface is curved or uneven. To this end I have shown a metal frame **78** having threaded studs **79** to register with holes in the flange **43** (see Fig. 2) that can be held to the flange by nuts, and sponge rubber **80** is vulcanized or otherwise secured to this frame. The machine is also readily adaptable by the use of the casing or box **70** to the cleaning of elongated objects, and in such case the machine may either be suspended, or be set down on its supporting legs **55**. The operator is not required to stand close to the machine, but even if he is, there is little dust because of the provision of the dust collector. The machine may have handles **81** (see Fig. 8) by which it may be conveniently maneuvered.

As previously explained, the wear plates **61** can be replaced through the abrasive discharge window without dismantling the machine, and the feed screw can also be replaced without dismantling the machine, but when it is necessary to dismantle the machine for any purpose, the casing need merely be unbolted from the main plate **6**. It is an easy matter, for example, to remove the main cover plate **6** from the machine and replace the wear plate **38**, or even the ledge **37**, or other internal parts.

While I have illustrated and described a preferred embodiment of my invention, it will be understood that various changes and modifications may be made therein within the scope of the following claims.

I claim:

1. An abrading machine in the form of a self-contained unit comprising a casing with side walls and a bottom having a laterally projecting enclosure at one side thereof providing an enclosed extension terminating in a window for the discharge of abrasive pellets against an object placed in front of the window against the extension, a centrifugal abrasive throwing wheel in the casing rotatable about a vertical axis at the level of the window, a means for driving the wheel, and a conveyor in the casing extending down from the wheel for gathering abrasive pellets which rebound from the object being abraded and collect in the casing and discharging said abrasive pellets into the wheel.

2. A self-contained centrifugal abrading machine comprising a casing having a window therein through which abrasive may be discharged against an object held in front of the window and rebound into the casing after striking the object, means forming part of the casing for guiding the pellets after striking an object placed at the window into the bottom of the casing, a centrifugal abrasive throwing wheel mounted on a vertical axis within the casing at the level of the window, means for confining the pattern of discharge of the pellets from the wheel into the window opening a motor for driving the wheel, and a conveyor depending from the wheel and operated by the wheel for elevating abrasive pellets that are collected in the bottom of the casing and delivering them to the center of the wheel.

3. A self-contained abrading wheel as defined in claim 2 in which the casing has an inverted conical bottom so that abrasive pellets which rebound from an object held in front of the window return back into the casing and collect at the bottom of the casing, said conveyor terminating in said conical bottom.

4. A self-contained abrading wheel as defined in claim 2 in which the casing has an inverted conical bottom so that abrasive pellets rebound from an object held in front of the window back into the casing and collect at the bottom of the casing, said conveyor terminating in said conical bottom, the conveyor being a screw rotated by the wheel, and a fixed housing surrounding the screw, the interior of the housing having a yieldable rubber-like interior.

5. A self-contained centrifugal abrasive machine as defined in claim 4 in which the housing for the screw is a heavy rubber-like tube, the bottom of the tube being adjacent the bottom of the screw, and the top of the tube terminating at the center of the wheel.

6. A self-contained centrifugal abrading machine as defined in claim 4 in which the screw conveyor is closed within a tube.

7. A self-contained centrifugal abrading machine comprising a casing having an inverted conical bottom and having a window therein above the bottom against which an object to be abraded may be placed, a centrifugal abrasive throwing wheel in the casing at the level of the window and designed to direct abrasive pellets discharged

therefrom through the window opening means for guiding pellets that strike an object placed at the front of the window into the bottom of the casing, a plate forming the top of the casing, a motor mounted on said plate having a shaft passing through the plate and connected with said wheel for rotating the same, and a screw conveyor at the center of the wheel connected with the motor and extending down into the bottom of the casing, a stationary enclosing tube around the screw conveyor, said tube having its upper end terminating within the hub of the wheel and having its lower end terminating near the bottom of the screw.

8. A self-contained centrifugal abrading machine comprising a casing having an inverted conical bottom and having a window therein above the bottom against which an object to be abraded may be placed, a centrifugal abrasive throwing wheel in the casing at the level of the window and designed to discharge abrasive pellets through the window means for guiding pellets that strike an object placed in front of the window into the bottom of the casing, a plate forming the top of the casing, a motor mounted on said plate having a shaft passing through the plate and connected with said wheel for rotating the same, a screw conveyor at the center of the wheel connected with the motor shaft and wheel and extending down into the bottom of the casing, a stationary enclosing tube around the screw conveyor, said tube having its upper end terminating within the hub of the wheel and having its lower end terminating near the bottom of the screw, and means for raising and lowering the tube.

9. A self-contained centrifugal abrading machine comprising a casing having an inverted conical bottom and having a window therein above the bottom against which an object to be abraded may be placed, a centrifugal abrasive throwing wheel in the casing at the level of the window and designed to discharge abrasive pellets through the window means for guiding pellets that strike an object placed in front of the window into the bottom of the casing, a plate forming the top of the casing, a motor mounted on said plate having a shaft passing through the plate and connected with said wheel for rotating the same, a screw conveyor at the center of the wheel connected with the motor and wheel for rotation therewith and extending down into the bottom of the casing, a stationary enclosing tube around the screw conveyor, said tube having its upper end terminating within the hub of the wheel and having its lower end terminating near the bottom of the screw, and means for raising and lowering the tube, said tube being formed of a yieldable pliable material.

10. A self-contained centrifugal abrading machine comprising a casing having an inverted conical bottom and having a window therein above the bottom against which an object to be abraded may be placed, a centrifugal abrasive throwing wheel in the casing at the level of the window and designed to discharge abrasive pellets through the window means for guiding pellets that strike an object placed in front of the window into the bottom of the casing, a plate forming the top of the casing, a motor mounted on said plate having a shaft passing through the plate and connected with said wheel for rotating the same, a screw conveyor at the center of the wheel connected with the motor and extending down into the bottom of the casing, a stationary enclosing tube around the screw conveyor, said tube having its upper end terminating within the hub of the wheel and having its lower end terminating near the bottom of the screw, means for raising and lowering the tube, said tube being formed of a yieldable rubber-like material, the casing having a screen in the bottom thereof immediately under the end of said conveyor screw through which air may enter the casing and be drawn up into the wheel, and an exhaust outlet connection from the casing above the bottom having a dust filter thereon through which air may escape from the casing and dust carried by the air collected, the rotating parts within the casing constituting a primary means for drawing air through said screen and forcing it through the filter.

11. A self-contained centrifugal abrading unit as defined in claim 10 wherein the screen at the bottom is hinged for removing the contents of the casing.

12. A self-contained centrifugal abrading machine as defined in claim 1 in which the casing is provided with means by which it may be suspended and is also provided with legs on which it may stand in an upright position.

13. A self-contained centrifugal abrading machine as defined in claim 2 having a box-like structure detachably secured over the outer face of said window, said box-like structure having end closure means through which an elongated object may be moved and in which said object can be rotated, but which confine the abrasive pellets from escape so that they are returned to the bottom of the casing.

14. A self-contained centrifugal abrading machine as defined in claim 2 having a box-like structure detachably secured over the outer face of said window, said box-like structure having deformable end walls through which an elongated object may be moved and in which said object can be rotated, but which confine the abrasive pellets from escape so that they are returned to the bottom of the casing, said deformable end walls being formed of radially slitted rubber sheets.

15. A self-contained centrifugal abrading machine as defined in claim 2 having a box-like structure detachably secured over the outer face of said window, said box-like structure having deformable end walls through which an elongated object may be moved and in which said object can be rotated, but which confine the abrasive pellets from escape so that they are returned to the bottom of the casing, said deformable end walls being provided by bristles projecting across the ends of the casing.

16. A centrifugal abrading machine as defined in claim 2 in which there is a lateral flange around the window which can be pressed against the surface of an object to be abraded so as to confine the abrasive pellets and cause them to rebound into the casing.

17. A centrifugal abrading machine as defined in claim 2 in which there is a lateral flange around the window which can be pressed against the surface of an object to be abraded so as to confine the abrasive pellets and cause them to rebound into the casing, said flange having a compressible cushion on its face surrounding the opening for sealing the unit tightly against the surface being abraded.

18. A centrifugal abrasive machine comprising a casing having bottom walls which converge downwardly to a central area, said casing having an abrasive discharge window in the side wall thereof above the bottom, a centrifugal abrasive throwing wheel in the casing at the level of the window, a detachable guard surrounding the wheel for directing the abrasive pellets from the wheel through the window, a supporting plate at the top of the casing above the wheel and to which the casing is removably secured, a driving means mounted on the top of said plate having a vertical shaft depending therefrom, a conveyor screw removably connected into the said shaft and extending down to the level of the bottom of the casing, the screw passing through the center of said wheel, said wheel also being connected with said motor shaft to rotate therewith and with the screw, a yieldable tube surrounding the screw and held against rotation with respect thereto, the top of said tube terminating at the center of said wheel and the bottom of said wheel terminating near the bottom of the screw, the bottom of the casing comprising a screen, said screw being removable from the wheel and the motor upon removal of said screen.

19. In a centrifugal abrading machine of the class described, an abrasive throwing wheel comprising a disk

having radial vanes thereon, the vanes extending from the periphery of the disk toward but not to the center, a wear plate on one surface of each vane, said wear plate having an inner end which is hooked around the inner end of the vane to which it is secured, a set screw at the outer end of said wear plate, and an abutment on the vane against which the set screw bears for holding the wear plate tightly in position on the vane and restraining it against radial and tangential movement.

20. In a centrifugal abrading machine of the class described, an abrasive throwing wheel comprising a disk having radial vanes thereon, the vanes extending from the periphery of the disk toward but not to the center, a wear plate on one surface of each vane, said wear plate having an inner end which is hooked around the inner end of the vane to which it is secured, a set screw at the outer end of said wear plate, and an abutment on the vane against which the set screw bears for holding the wear plate tightly in position on the vane and restraining it against radial movement, the surface of said wear plate which is out of contact with the vane being transversely concaved.

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