

March 7, 1944.

H. R. ZIMMERMAN

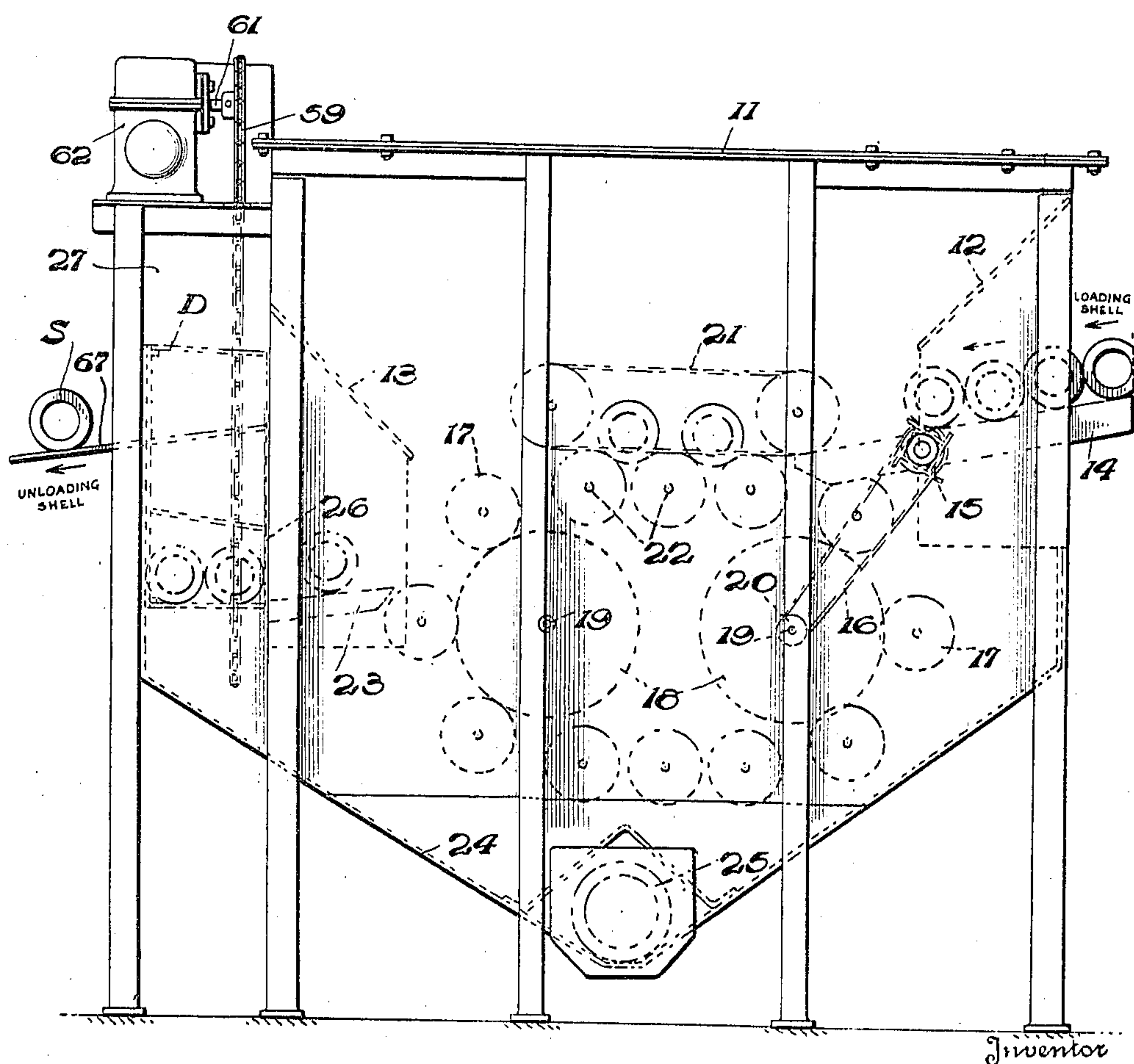
2,343,357

ABRASIVE REMOVING APPARATUS

Filed Dec. 28, 1940

3 Sheets-Sheet 1

Fig. 1.



Inventor

Harry R. Zimmerman

By Spear, Donaldson & Hall

Attorneys

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H. R. ZIMMERMAN

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Fig. 2

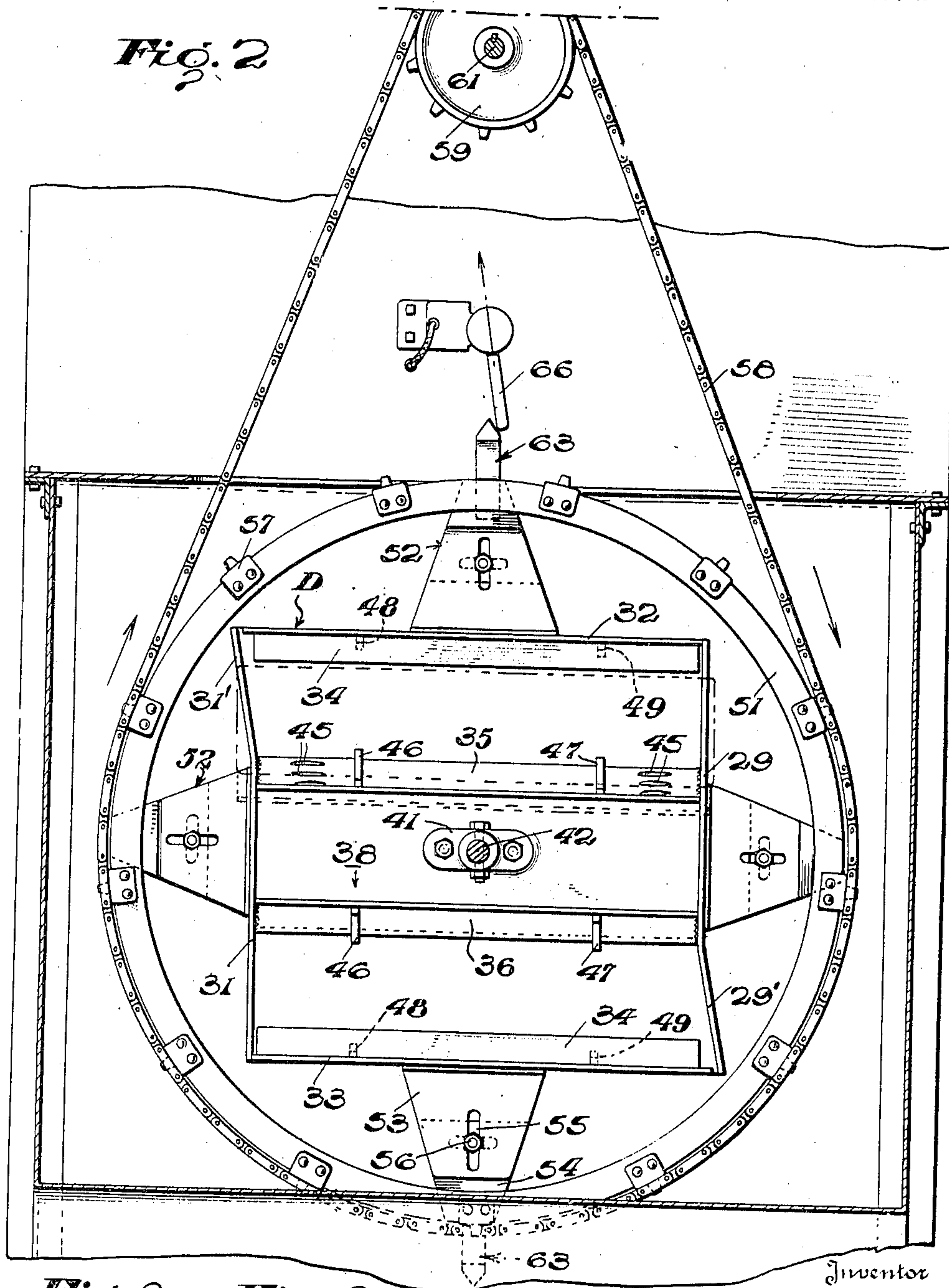
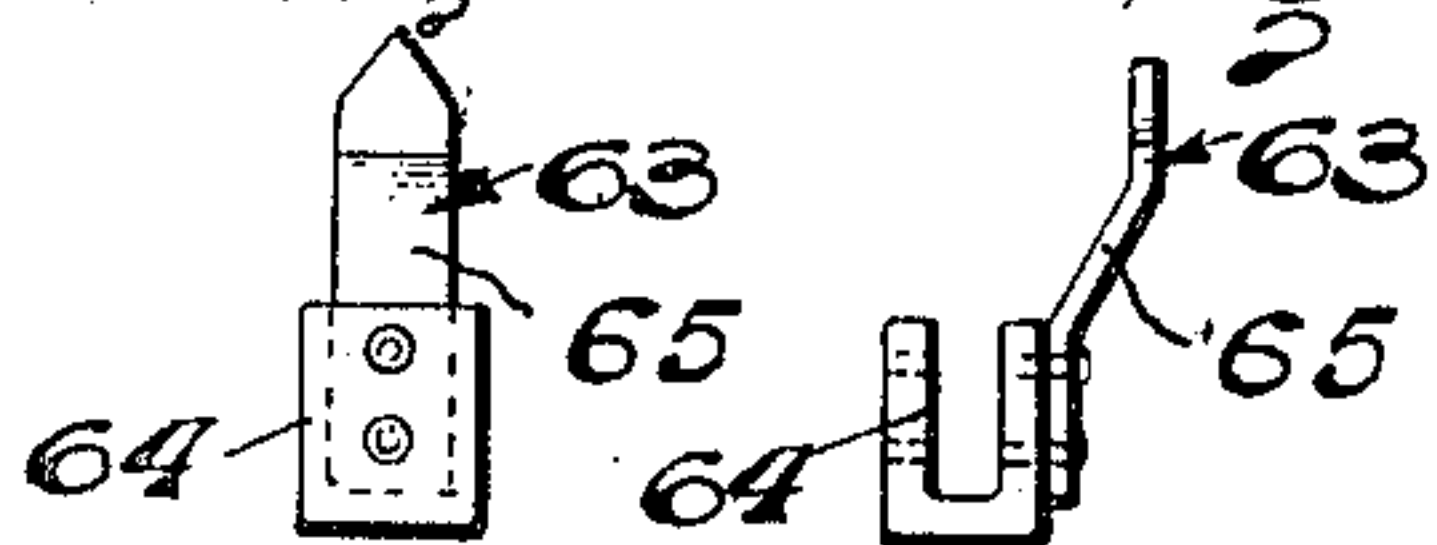


Fig. 8.

Fig. 9.



Harry R. Zimmerman

334 Spear, Donaldson & Hall

Attorneys

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H. R. ZIMMERMAN

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Fig. 3.

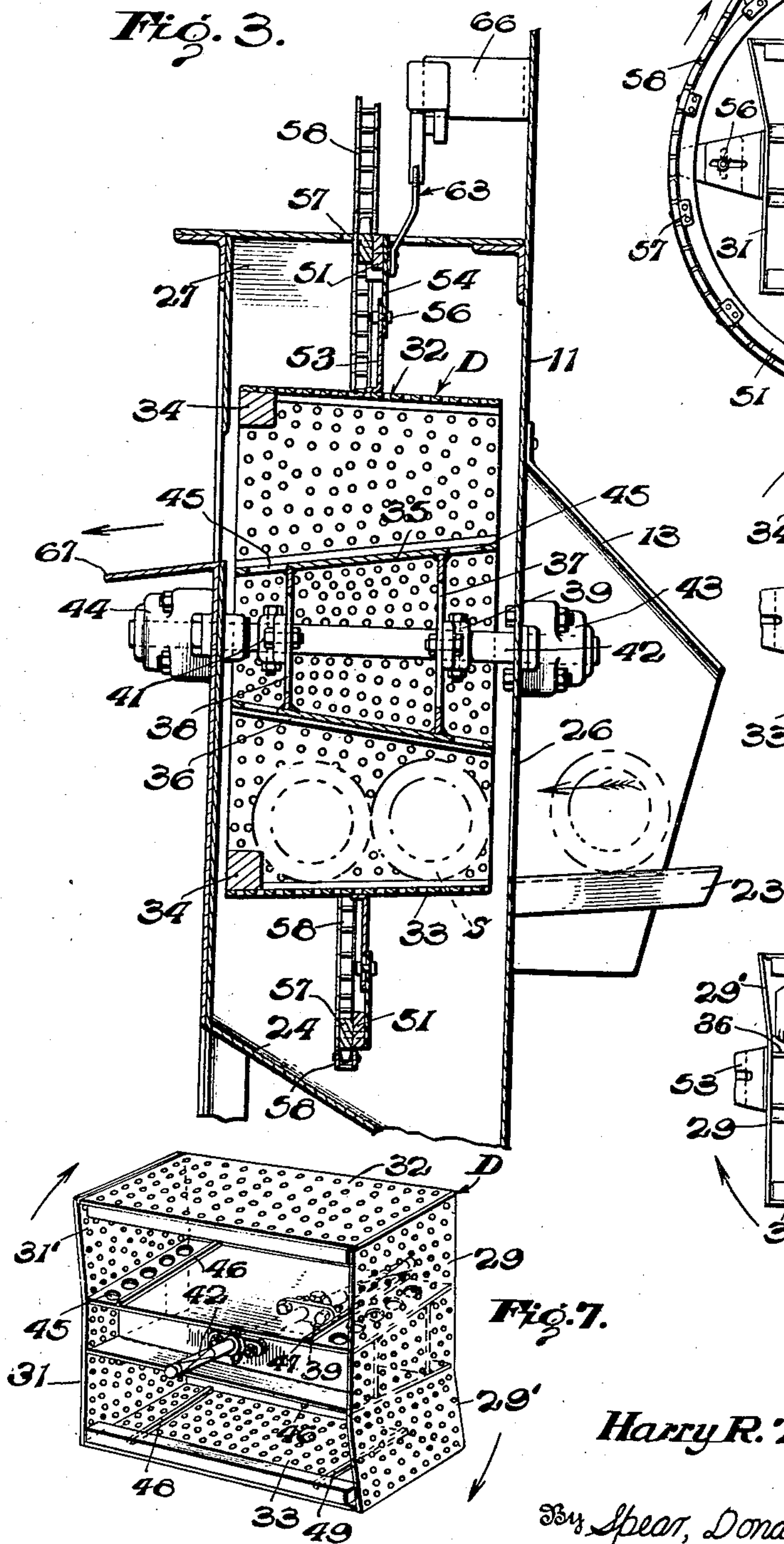


Fig. 4.

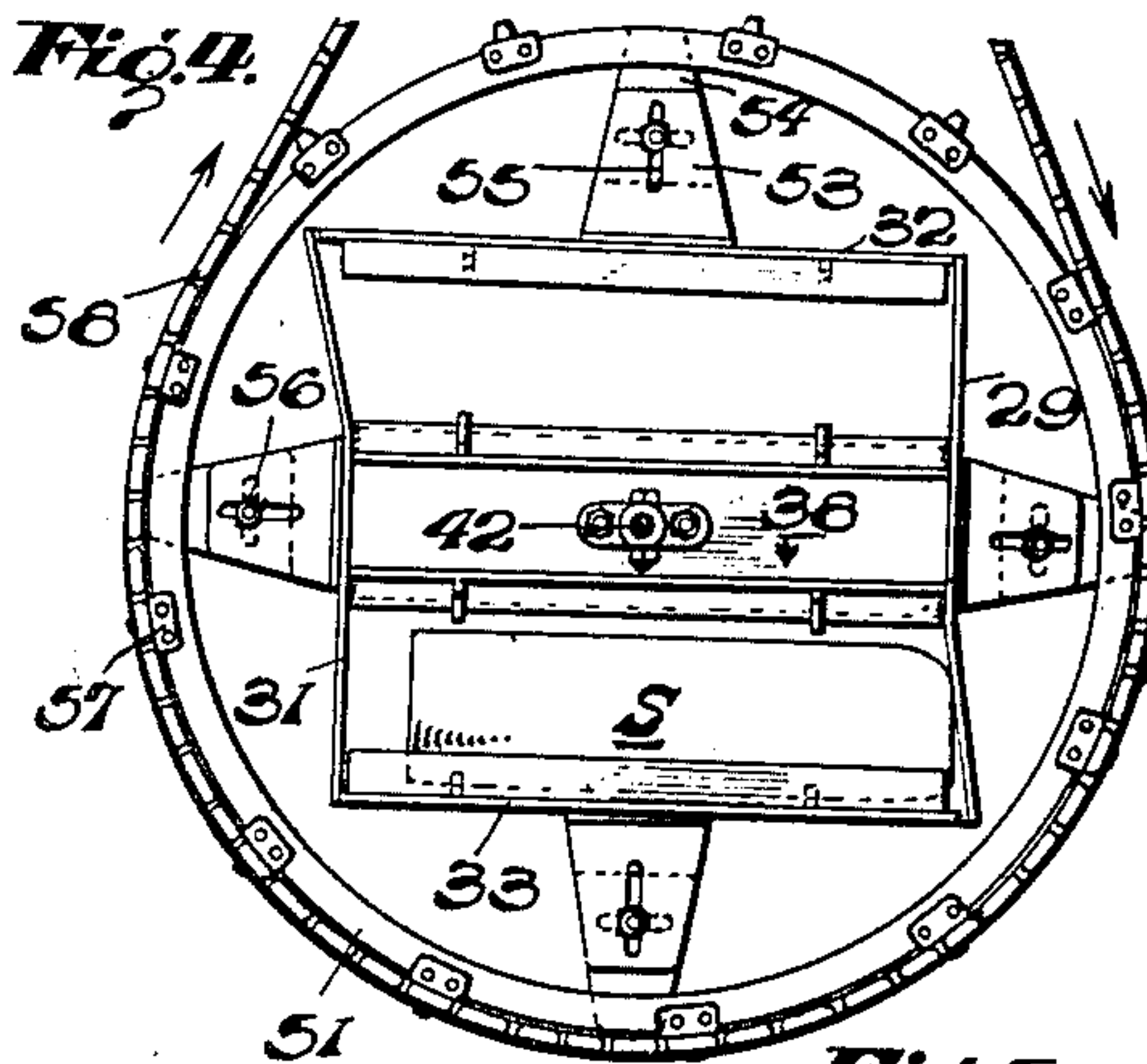


Fig. 5.

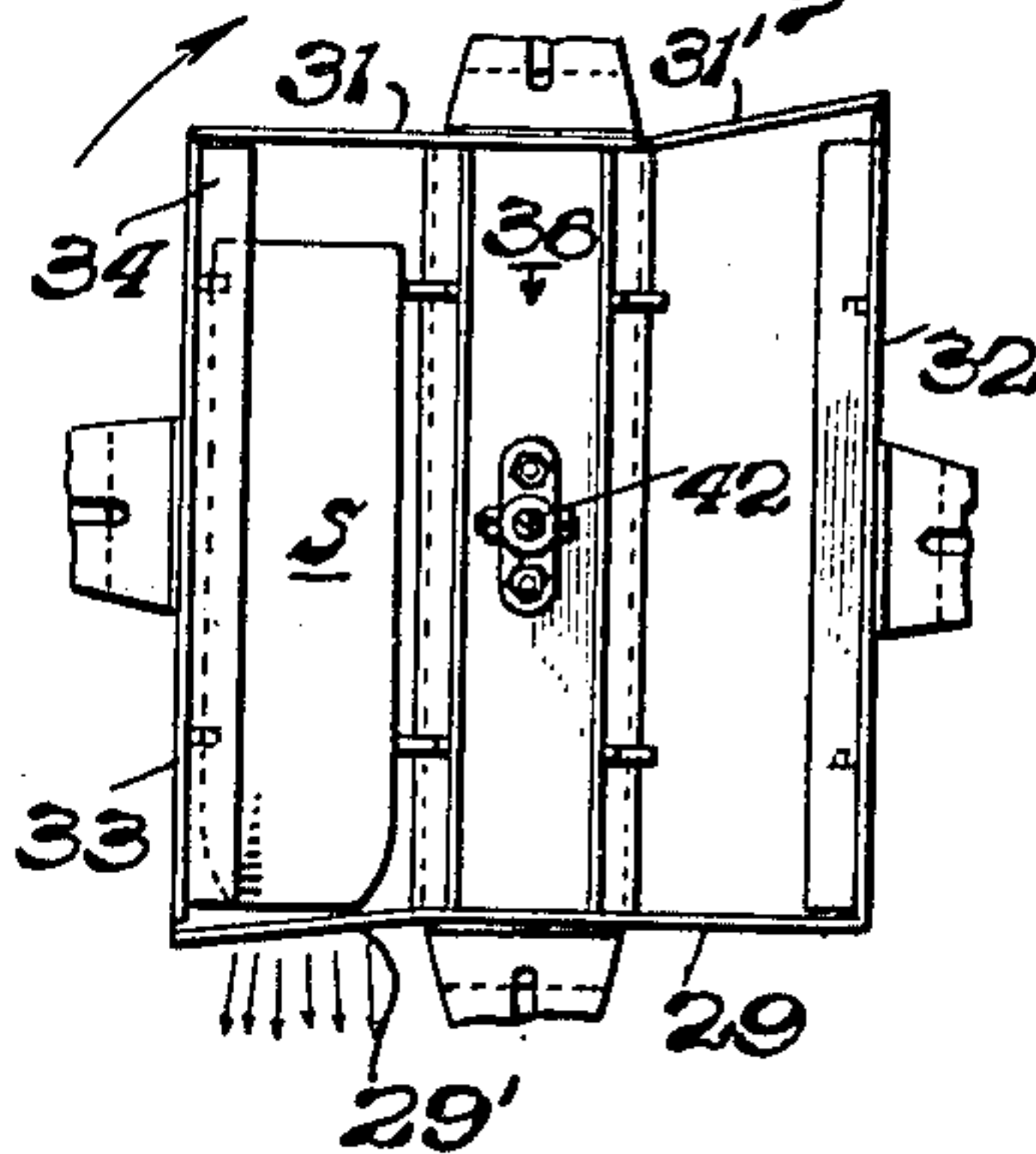


Fig. 6.

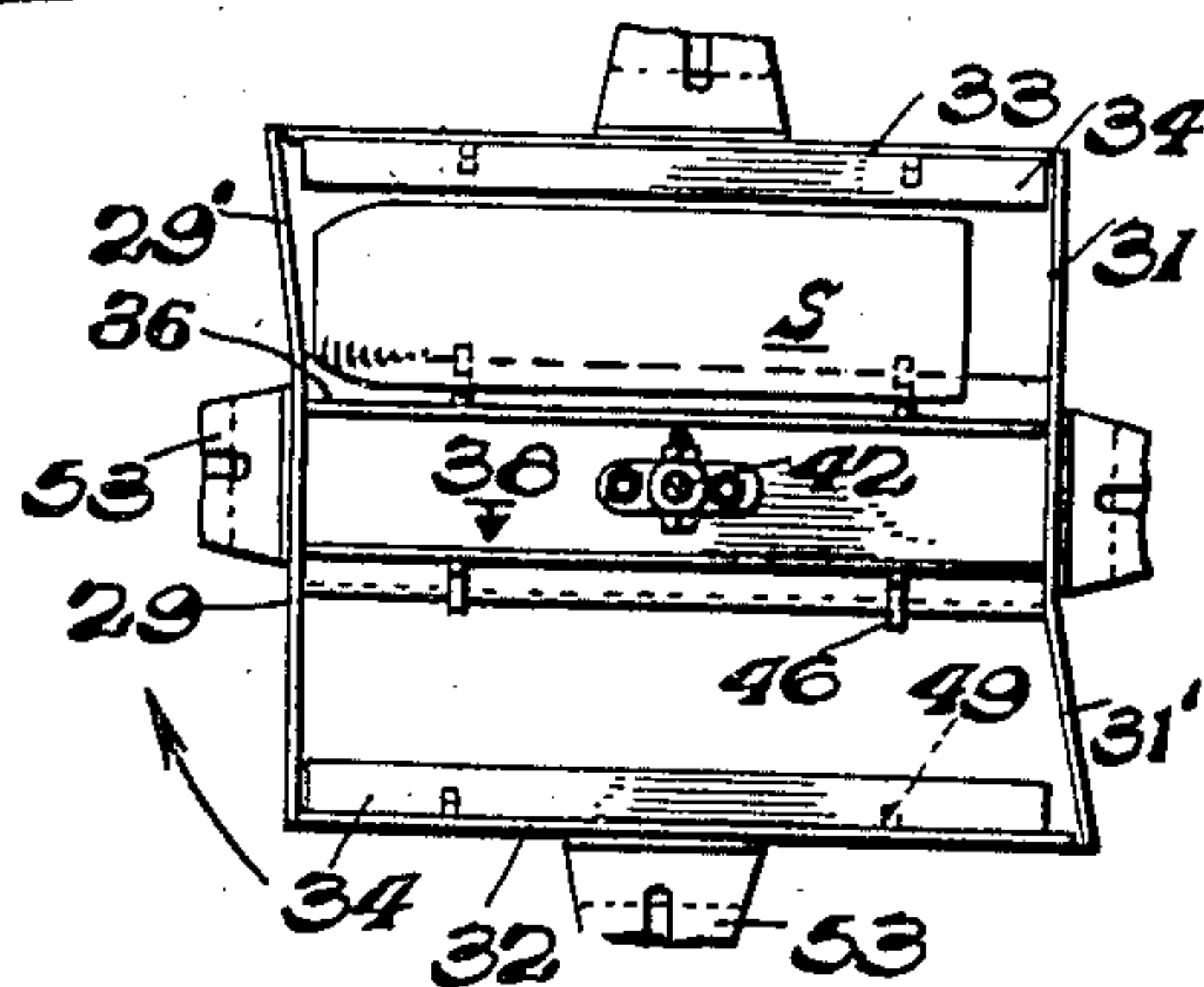
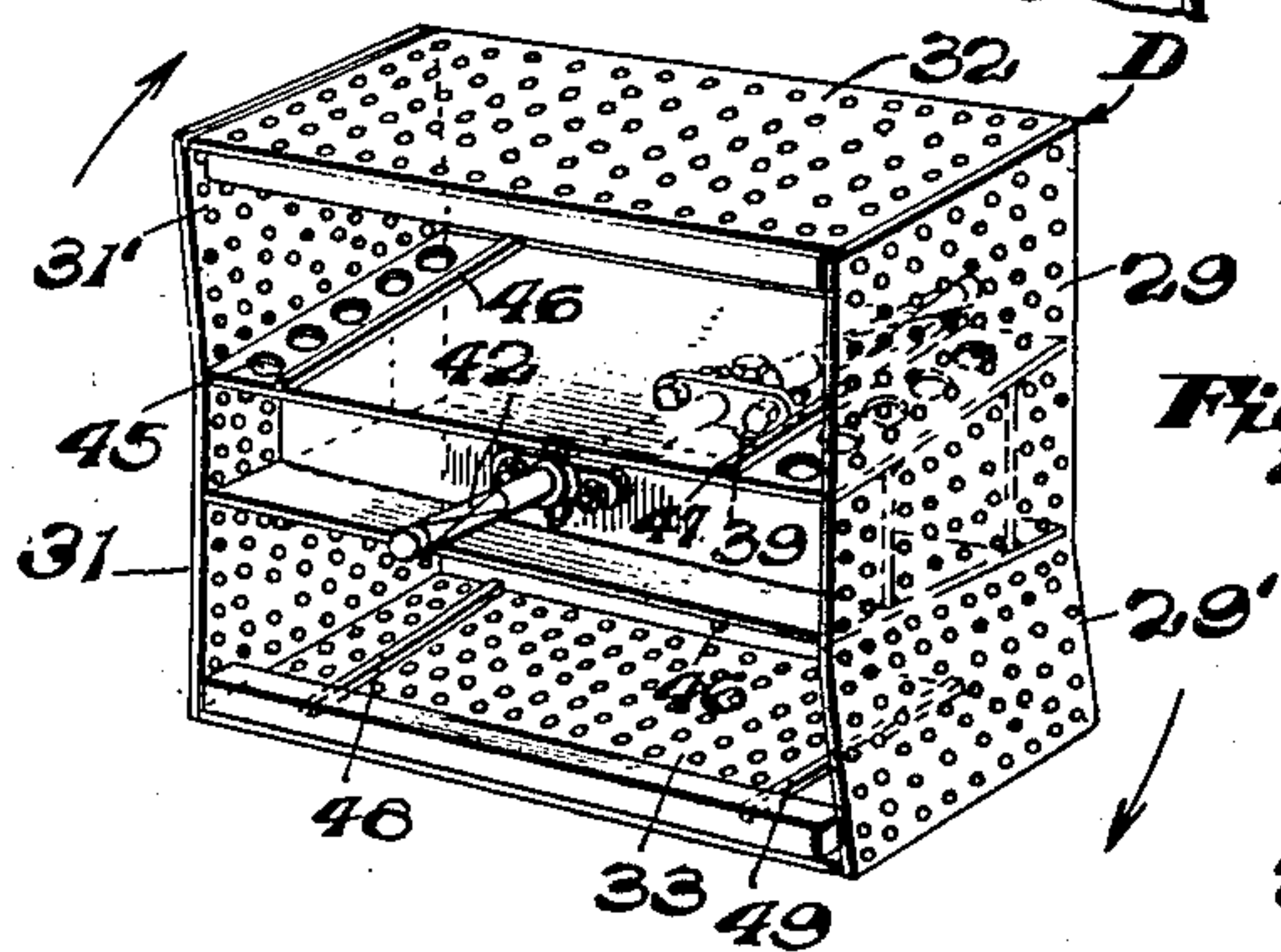


Fig. 7.



Inventor

Harry R. Zimmerman

By Spear, Donaldson & Hall

Attorneys

UNITED STATES PATENT OFFICE

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ABRASIVE REMOVING APPARATUS

Harry R. Zimmerman, Hagerstown, Md., assignor
to Pangborn Corporation, Hagerstown, Md., a
corporation of Maryland

Application December 28, 1940, Serial No. 372,129

10 Claims. (Cl. 214—1.1)

This invention relates to abrading apparatus, and more particularly pertains to means for removing or dumping the retained abrasive from hollow articles such as shells, bombs, tubes, pipes, pistons, and the like, after they have been subjected to abrasive blasting.

Prior devices for effecting the removal or dumping of retained abrasive from such articles have involved means to tip an article so that it falls freely face down, and like arrangements. Devices of this type have not been entirely satisfactory in that the article is not under positive control during its fall, there is a possibility of chipping or breaking of the article because of the fall, and the article is constantly losing elevation. Hence, if the article is to be further processed at another station, advantage cannot be taken of the roller type of conveyors, dependent on gravity, which it is desirable to employ because of their economy and simplicity. If such conveyors are to be used, additional apparatus with an additional expenditure of power must be used to elevate the article to the desired point.

Furthermore, the use of devices of this type is confined to articles that will retain their position with an open face downward when they fall upon that face. While this is possible with articles shaped as a dishpan with an exceedingly low center of gravity, it is not possible with articles having a high center of gravity when set upon their open ends, such as shells and bombs which are relatively elongated with small openings in the ends.

In overcoming these and other disadvantages of prior devices, it is a major object of this invention to provide novel means for the removal or dumping of abrasive retained in the interiors of shells, bombs, and like articles after cleaning in a manner whereby the articles are positively controlled at all times during the abrasive removal or dumping operation.

A further object of this invention is the provision of novel means for the removal or dumping of abrasive retained in the interiors of shells, bombs, and like articles of different shapes and different positions of the center of gravity wherein the articles are under positive control at all stages of the operation.

Still a further object of this invention is the provision of novel means for the removal or dumping of abrasive retained in the interiors of articles after blasting wherein the abrasive is simultaneously removed and the article raised to a discharge point of higher elevation than the

receiving point whereby use may be made of gravity conveyors for conveying the articles to other stations for processing.

Further objects and advantages of the invention will appear from the following description, the appended claims, and the accompanying drawings, wherein:

Figure 1 is a diagrammatic view of the preferred embodiment of the invention shown in combination with an apparatus for blast cleaning shells.

Fig. 2 is a front elevation of the abrasive removing means shown at the left of Fig. 1 with a portion of the housing removed.

Fig. 3 is a vertical section taken through the center of Fig. 2.

Figs. 4, 5, and 6 are elevations of the abrasive removing means in its various positions during one cycle of operation.

Fig. 7 is a perspective of the drum or container of Figs. 2 and 3.

Fig. 8 is a front elevation of the latch or stop element arranged to effect halting of the drum or container in the proper position to both receive and discharge articles.

Fig. 9 is a side elevation of the stop element of Fig. 8.

Referring first to Fig. 1 wherein a preferred embodiment of the abrasive dumper of the present invention is shown in combination with a blasting device for shells such as 155 millimeter shells, a housing 11 is provided with an inlet 12 and an outlet 13, the latter also functioning as the receiving or feed station for the dumper, as will presently be described.

The shells to be cleaned are placed upon an inclined runway 14 in the inlet 12, the foremost of the shells being retained against forward movement by a release pinion 15. When the release pinion 15 is rotated in synchronism with the movement of the conveyor mechanism through a chain 16, one shell is permitted to advance down the runway and pass onto an endless conveyor formed of a series of rolls 17 mounted on suitable linkage about drums or pulleys 18 mounted on shafts 19. One of the shafts 19 is provided with a pinion 20 connected to the drive chain 16 whereby the release pinion 15 is operated in synchronism with the movement of the conveyor.

The conveyor formed of the rolls 17 moves in successive steps so that the shells supported thereon between adjacent rolls on the upper run of the conveyor are moved in steps, the shell supporting rolls 17 being continuously rotated by a

drive belt or chain 21 contacting the surfaces of the rolls or pulleys or gears mounted on the roll shafts 22.

While the conveyor is stationary and the rolls 17 are being rotated to rotate the shells, the shells are cleaned by being subjected to abrasive blasts both on the exterior and the interior. The abrasive that is discharged against the exterior of the shells and the abrasive that is expelled from the interior of the shells by reason of the continued discharge of abrasive therein is collected in the bottom of housing 11 in a sloping bottom 24, removed therefrom in conventional manner by a trough and screw conveyor 25, cleaned and returned to the blasting devices for re-use.

After a predetermined blast period, the blasting means is shut off or withdrawn from the shells and the conveyor again moved. As the conveyor formed of the rolls 17 continues its movement, the shells are discharged onto a second inclined runway 23 in the outlet 13. At this stage, the interiors of the shells contain a considerable quantity of abrasive, usually steel grit, that must be removed before the shell can be further processed.

A runway 23 is provided for receiving the blasted shells which extends downwardly to an opening 26 in the housing 11 leading to a chamber 27 in which is mounted an abrasive removal or dumping mechanism, generally indicated at D, and shown in detail in Figs. 2, 3 and 7.

Referring to Figs. 3 and 7, the dumping mechanism comprises a box-like container or drum having side walls 29 and 31 and top and bottom walls 32 and 33, all of said walls preferably being perforated to permit the free escape of abrasive therefrom. One section of each of side walls 29 and 31, as shown at 29' and 31', is angularly disposed with reference to the remaining portion of the side wall. This shaping of the side walls is desired to insure only a point contact with the article being handled thereby permitting the free discharge of abrasive from the open end of the article, and insuring a minimum of frictional resistance to the entry into and discharge of the article from the dumper. Top and bottom walls 32 and 33 are preferably angularly disposed relatively to the drum axis, as shown in Fig. 3, whereby the shells passing therein roll toward the left end of the drum where they are stopped by a stop member 34. This sloping of the wall which is in a lower or loading position insures against the first shell introduced halting at the entrance of the container and preventing the entrance of other shells.

A partition is provided across the central portion of the drum, the partition having a top wall 35 and a bottom wall 36, both partitions being inclined in a direction opposite to the inclination of outer walls 32 and 33, as shown in Fig. 3. The partition walls 35 and 36 extend between side walls 29 and 31, and are connected by vertical ribs 37 and 38 which, in turn, support connections 39 and 41 for a horizontal shaft 42 about which the drum is rotated. Shaft 42 is supported in the chamber or compartment 27 by suitable bearings 43 and 44. A number of openings 45 are provided at the ends of the partition walls 35 and 36 to permit the free discharge of abrasive.

It will be apparent from a consideration of Figs. 2, 3 and 7 and the above description that

two compartments are provided in the dumping mechanism or drum D. One of such compartments is defined by the outer wall 32, a portion of the side wall 29, the partition wall 35 and the wall portion 31'. The other compartment is formed by the outer wall 33, the side wall 31, the partition wall 36 and the wall portion 29'. These compartments may be suitably dimensioned to receive and maintain elongated articles with the major axes of the articles in chord positions within the drum so that these compartments or chambers may be regarded as chordal compartments.

To provide a spaced bearing support for the articles being handled, and to reduce the friction upon feed and discharge to a minimum, the partition walls 35 and 36 are preferably provided with spaced rails 46 and 47, similar rails 48 and 49 being provided on top and bottom walls 32 and 33 for like purpose.

To effect rotation of the dumping mechanism or drum D, a ring 51 (Fig. 2) is secured thereto by gusset plates 52 preferably welded to the outer surface of the walls of the container and to the ring, each gusset plate being preferably formed as two elements 53 and 54, each of the elements being formed with a slot 55 extending at right angles to the slot in the cooperating element, whereby the position of the drum can be adjusted with reference to the ring 51 by adjusting the gusset plate elements with reference to one another and securing them by suitable fastening means through the slots 55, such as bolt 56.

About its periphery, ring 51 is provided with a series of teeth 57, arranged to be engaged by a chain 58, driven from a sprocket 59, mounted on a shaft 61 of a speed reduction mechanism 62, arranged to be suitably driven by an electric motor, not shown.

The ring 51 is also provided with two latch or stop elements 63, as shown in Figs. 2, 8 and 9, each latch being provided with a U-shaped portion 64 to engage the ring 51 and an extending arm 65, the latches being secured to the ring by conventional means, such as bolts and nuts. By reason of the offset of arm 65, the latches clear chain 58 in the rotation of the drum.

The latches 63 are adapted to engage a quick acting limit switch 66 mounted on the housing 11 which stops the driving motor when contacted by a latch 63. Accordingly by properly positioning the latches 63 on the ring 51, the halting of drum D at the proper position for both receiving and discharging the shells can be insured.

In operation, the drum D in the position shown in Figs. 3 and 4 receives blasted shells S containing abrasive from the inclined runway 23. In the embodiment shown, the drum D is of sufficient size to handle two shells in each of the compartments at a time. Obviously the size of the drum can be varied to handle as many shells, or similar articles, as may be practical.

In receiving the shells, the drum D is stationary. Preferably the driving motor therefor is started by the halting of the blast cleaning of the succeeding shells in the housing 11, the drum D at the beginning of its rotation being in the position shown in Fig. 4. In this position, the shells S being treated have their open ends at the right side of the lower compartment of the drum.

Upon continued rotation of the drum D in a clockwise direction, the drum reaches the position shown in Fig. 5, at which point the abrasive is being drained out of the shell through the openings in the wall portion 29' of the drum, the abrasive being collected by a portion of the sloping wall 24 extending across the bottom of the compartment 27.

As the drum D continues its rotation toward the position shown in Fig. 6, the shell S moves from a position where it has been supported by the outer wall 33 of the compartment to a position where it is supported by the inner wall 35 which is inclined in the opposite direction. When the drum reaches the position shown in Fig. 6, the latch 63 contacts the quick acting limit switch 66 to stop the motor, preferably by means of a magnetic brake, which, incidentally, is in engagement when the motor is de-energized, thus halting the drum in a position whereby the other compartment now in the lower position may receive additional shells to be dumped, and the shells in the compartment which is then in an upper or unloading position may roll forward out of the upper compartment onto an inclined runway 67 and proceed therefrom to a gravity conveyor and other processing means.

It will be noted that in the shell's travel from the position shown in Fig. 4 to the position shown in Fig. 6, it has been elevated to a considerable degree, this increase of elevation being of material advantage in installations where gravity conveyors are relied upon to convey the work to other processing stations. Moreover, it will be noted that the shell during the dumping operation is under positive control, and there is no falling or sliding of the shell, as is the case with gravity dumpers. Hence there is no possibility of the shell, or the article, being damaged. The rate of movement of the shell can readily be controlled so that adequate time is allowed for complete draining of the abrasive.

The dumping mechanism herein illustrated is of particular advantage when compared with the prior method of removing abrasive from the interiors of clean shells by compressed air, in that it requires only one percent of the horsepower required by the compressed air blow-out method.

It is to be understood that the dumping mechanism of this invention may be used in combination with blasting machines of other types, the blasting machine shown herein being shown only for the purpose of illustration.

It is to be understood that the invention may be embodied in specific forms other than that illustrated without departing from the principle or essential characteristics thereof. The embodiments shown are therefore to be considered as illustrative and not restrictive, the scope of the invention being defined by the appended claims rather than the foregoing description and drawings. All modifications and changes which come within the meaning and range of equivalency of the claims are therefore intended to be included therein.

I claim:

1. Apparatus for removing abrasive from the interiors of open-ended hollow articles after subjection to an abrasive blast stream comprising a receiving station and a discharge station for said articles, a container arranged to revolve about an axis substantially parallel to the general direction of travel of said articles and to register with said receiving station to receive articles therefrom, said container in said receiv-

ing position having a relatively flat bottom wall and an upper wall inclined relative to said bottom wall, said upper wall becoming the bottom wall of said container on translation thereof to said discharge station to effect the removal of said articles from said container by gravity.

2. Apparatus for removing abrasive from the interiors of substantially round open-ended hollow articles, such as shells, after subjection to an abrasive blast stream comprising a container, means for rolling said articles into said container, means to revolve said container about an axis substantially parallel to the direction of travel of said articles, said container having open ends, a relatively flat bottom wall when in article receiving position and a top wall inclined relatively to said bottom wall whereby when said container is inverted to discharge abrasive from the interiors of said articles, said top wall becomes the bottom wall and effects the discharge of articles therefrom.

3. The apparatus claimed in claim 2 wherein a portion of a side wall of said container is positioned in a different plane from that of the remainder of the wall whereby the adjacent end of the article has only a point contact therewith to permit the free discharge of abrasive from the interior of the article and insure a minimum of frictional resistance to the discharge of said article.

4. Apparatus for removing granular material from the interior of hollow elongated articles each having an open end comprising, a drum having open ends, means supporting said articles with the major axes thereof in substantially horizontal positions and with granular material therein and for movement into an open end of said drum, means forming a part of the drum substantially aligned with said first means when the drum is in an article loading position for receiving an article and supporting the same with the major axis thereof in a horizontal position within the drum, apertured means forming a part of said drum adjacent the open end of said article, means for rotating said drum about its axis whereby the article is arranged with the major axis thereof in a vertical position and said apertured means supports the open end of the article so that the granular material may drain therefrom, and means carried by the drum supporting and discharging said article through the other open end of the drum when said article again assumes a position with the major axis thereof in a substantially horizontal position.

5. Apparatus for removing granular material from the interior of hollow elongated articles each having an open end comprising, a drum having open ends, inclined means supporting said articles with the major axes thereof in substantially horizontal positions and with granular material therein for movement into one open end of said drum, means forming a part of the drum substantially aligned with said inclined means when the drum is in an article loading position for receiving and supporting an article with the major axis thereof in a horizontal position within the drum, stop means carried by said drum preventing the escape of said article from the second open end of said drum, means for rotating said drum about its axis whereby the major axis of the article is arranged in a vertical position so that the granular material may drain therefrom, and means supporting said article for movement from the second open end of the drum and in a path clearing said stop means when said

article again assumes a position within the drum with the major axis thereof in a substantially horizontal position.

6. Apparatus for removing granular particles from the interior of hollow elongated articles each having an open end comprising, a drum having open ends, an inclined runway supporting said articles with the major axes thereof in horizontal positions and with granular particles therein for rolling movement into an open end of said drum, means including a wall forming part of the drum substantially aligned with said runway when the drum is in an article loading position for receiving an article from the runway and supporting said article with the major axis thereof in a horizontal position in the drum and conveying the article towards the second open end of the drum, means preventing the escape of said article through the second open end of said drum, an apertured wall forming part of said drum adjacent the open end of said article, means for rotating said drum about its axis whereby the major axis of the article is arranged in a vertical position and the open end of said article is supported on said apertured wall so that the granular particles may escape therefrom, and means sloping in a direction opposite to the inclination of said wall member for rolling said article from the second end of the drum.

7. Apparatus for removing granular particles from the interior of shell casings each having an open end comprising, a drum having open ends, an inclined runway supporting shell casings having granular particles therein for rolling movement into one open end of said drum, a means forming part of the drum substantially aligned with said runway when the drum is in a shell loading position for receiving a shell casing from the runway and supporting said shell casing towards the second open end of the drum, a stop member carried by said wall member adjacent the second end of the drum preventing the escape of said shell casing through the second open end of said drum, an apertured wall forming part of said drum adjacent the open end of the shell casing, means for rotating said drum about an axis substantially parallel to the general direction of said runway whereby the apertured wall supports the open end of said shell casing so that the granular particles may escape therefrom, means within the drum sloping in a direction opposite to the inclination of said first means for supporting and rolling the shell casing from the second end of the drum, and means

aligned with the last mentioned means when the drum is in shell discharging position for conveying said shell casing away from the drum.

8. Apparatus for removing abrasive particles from the interior of hollow elongated articles each having an opening in an end thereof comprising, a rotatable drum for receiving one of said articles with the major axis of the article in a horizontal chord position in the drum, means for rotating the drum to bodily move said articles in a circumferential path and arrange the major axis of the article in a vertical chord position laterally of the axis of the drum whereby the abrasive particles may escape downwardly from the article through said opening, and means maintaining said article with the major axis thereof in a chord position during further rotation of said drum and to convey said articles from the drum.

9. Apparatus for removing abrasive from the interior of hollow articles each having an opening in an end thereof comprising, a drum supported to revolve about its axis, a chordal compartment in said drum at one side of said axis and having an article receiving opening at one end of the drum and discharge opening at an opposite end of said drum, said compartment being formed with a relatively flat wall to receive an article from a position at an end of the drum when the drum is in loading position, and a second wall inclined relative to the first wall to effect discharge of the article from an opposite end of the drum when the drum has rotated about its axis to a position where the article is supported by said second wall.

10. Apparatus for removing abrasive particles from the interior of hollow articles each having an open end comprising, an open-ended drum, a housing encasing said drum, bearings on said housing supporting said drum for rotation within the housing, means on said drum providing chordal compartments within the drum, said housing having an opening therein adjacent a lower portion of the drum and adjacent one open end thereof through which an article having abrasive particles therein may enter one of said chordal compartments, means for rotating the drum to elevate and tilt said article during elevation thereof whereby the abrasive particles may drain therefrom, and a part of the means providing said chordal compartments being operative when the article arrives at an uppermost position in the drum to discharge the article from the other end of the drum.

HARRY R. ZIMMERMAN.