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APPLIANCE FOR SEALING THE FEED AND DISCHARGE OPENINGS OF ROTARY CONTAINERS.

APPLICATION FILED FEB. 23, 1916.

1,214,809.

Patented Feb. 6, 1917.

3 SHEETS—SHEET 1.

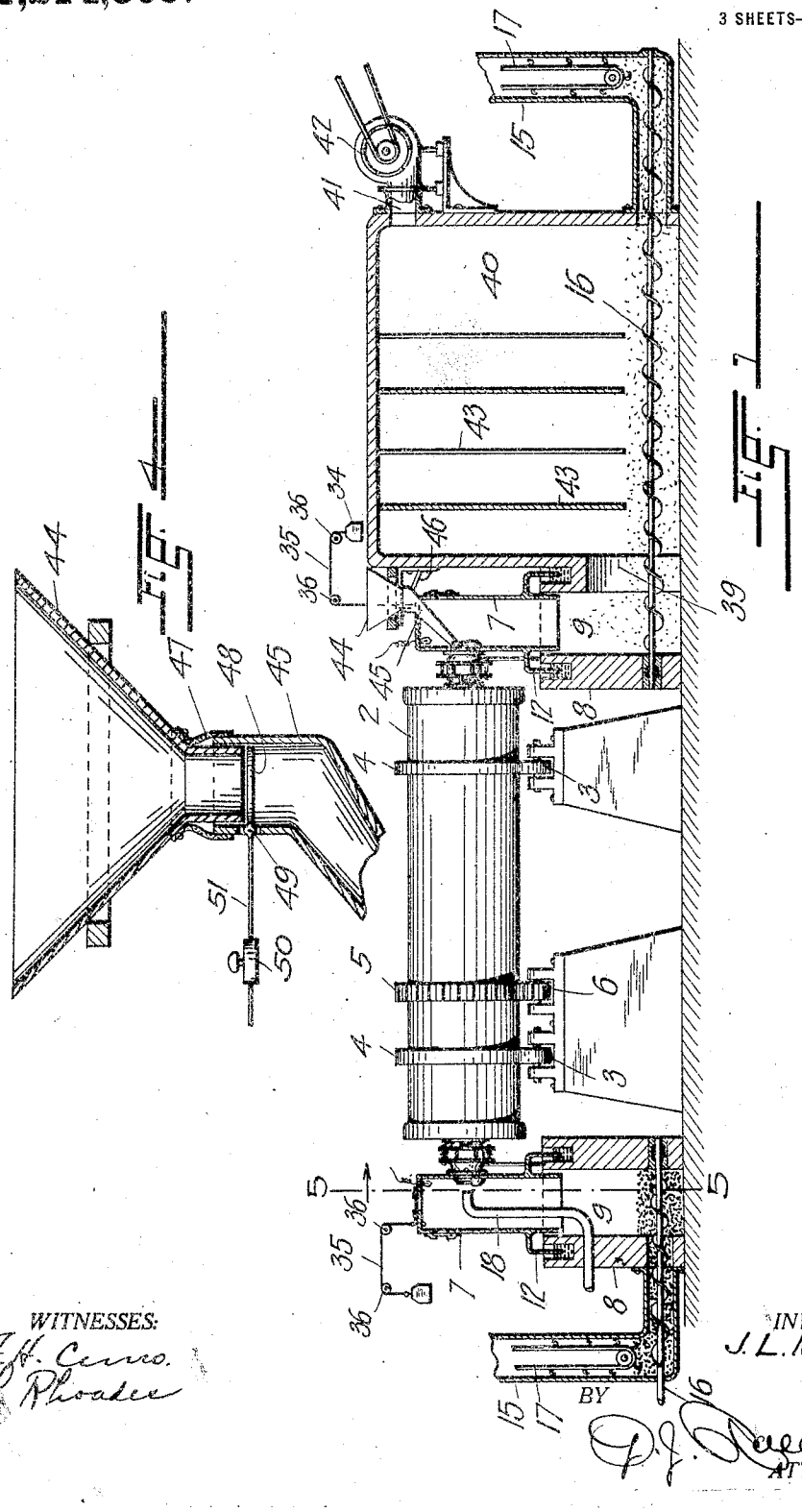


FIG. 4.

FIG. 7.

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3 SHEETS—SHEET 2.

FIG. 2

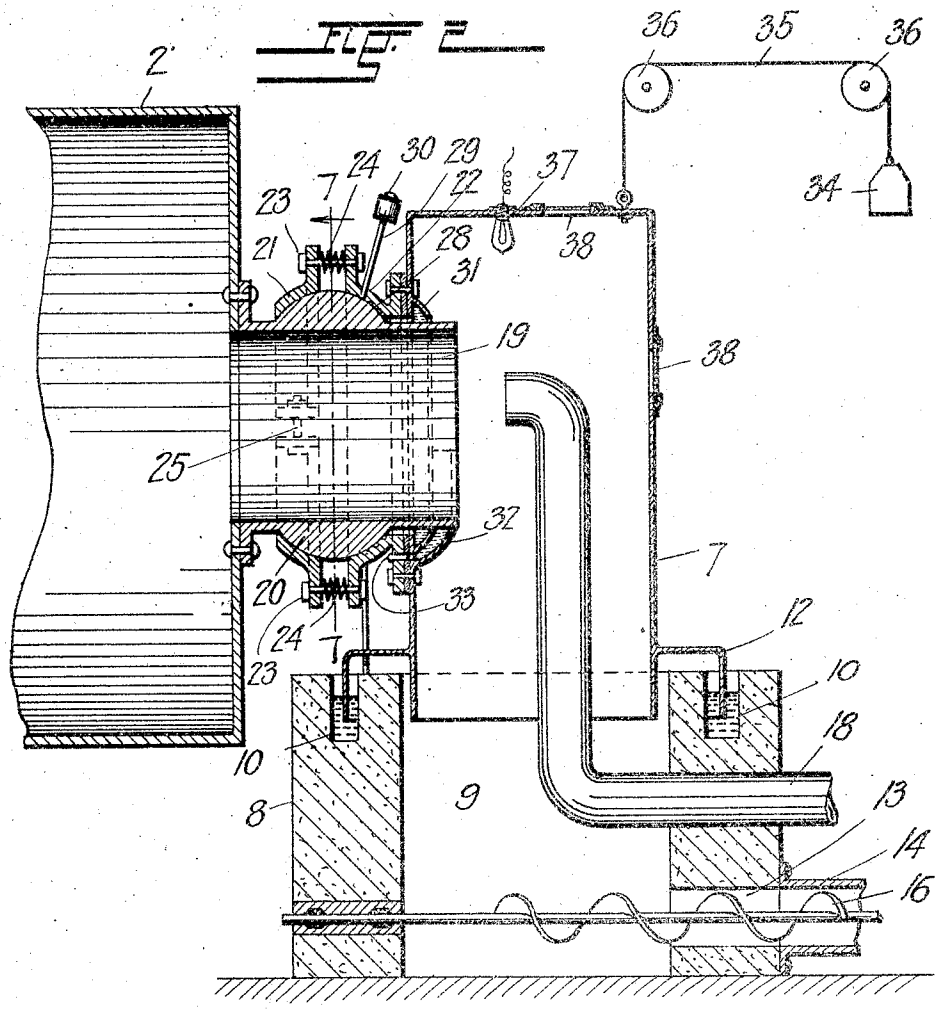
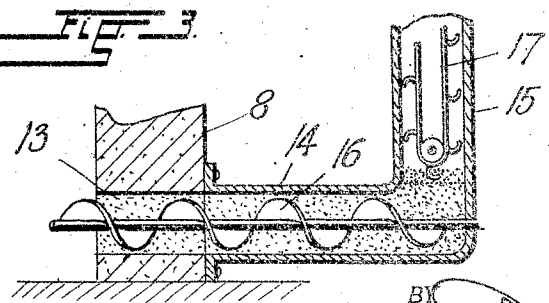


FIG. 3.



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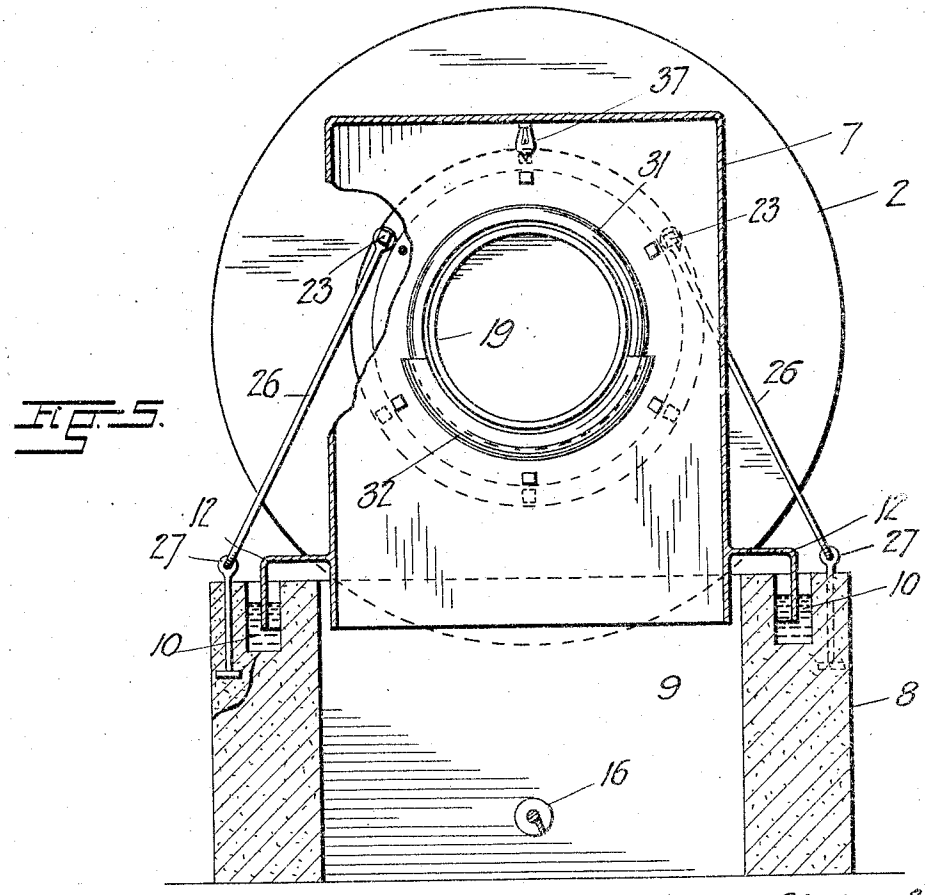


FIG. 5.

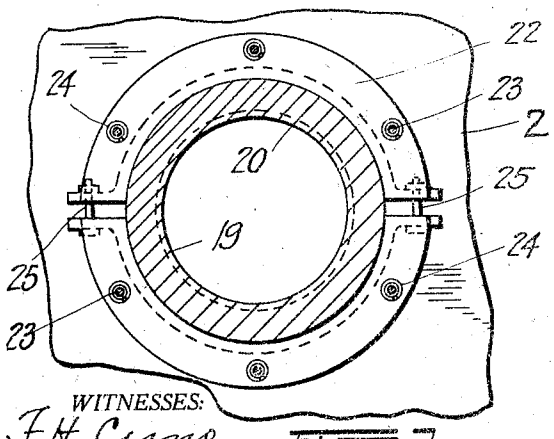


FIG. 7.

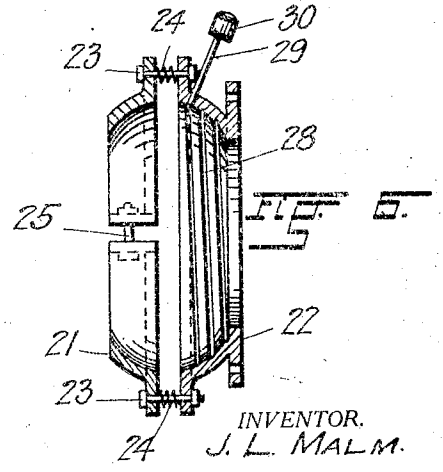


FIG. 6.

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UNITED STATES PATENT OFFICE.

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APPLIANCE FOR SEALING THE FEED AND DISCHARGE OPENINGS OF ROTARY CONTAINERS.

1,214,809. Specification of Letters Patent. **Patented Feb. 6, 1917.**

Appliction filed February 23, 1916. Serial No. 79,965.

To all whom it may concern:

Be it known that I, JOHN L. MALM, a citizen of the United States, residing at Denver, in the county of Denver and State of Colorado, have invented certain new and useful Improvements in Appliances for Sealing the Feed and Discharge Openings of Rotary Containers, of which the following is a specification.

My invention relates to devices for sealing the feed and discharge openings of rotary containers used in the treatment of ores and other materials, against the escape of dust and gases into the atmosphere, and its primary object resides in the provision of a contrivance of simple construction which may be readily applied to a container already in use, without material changes in the construction of the same and which in operation effectively seals the openings of the container against the escape of dust and gases into the atmosphere, without interfering with the rotary motion of the container or the continuous passage of material to and from the same.

My invention is particularly adapted for use in connection with rotary containers employed for the intermixture and reduction of materials in metallurgical and chemical processes, since by the complete elimination of dust and gases from the atmosphere, it protects the operators against the dangers of inhaling injurious matter.

My invention furthermore effects a saving of valuable dust and gases which, especially in the processes of extracting values from metalliferous ores, ordinarily escape into the open when the material under treatment is exposed to the atmosphere.

My invention is also adapted for connection with mills of the type used for grinding animal and vegetable substances to prevent the escape of the fine dust produced by the grinding action.

To the above and other ends which will fully appear in the course of the following description, my invention consists of the features of construction, arrangement of parts and combination of devices shown in the accompanying drawings in the various views of which like parts are similarly designated, and in which,

Figure 1 is a sectional elevation of my invention applied to a rotary cylindrical container, Fig. 2, a vertical axial section of the parts of my invention applied at the discharge end of the apparatus shown in Fig. 1, drawn to an enlarged scale, Fig. 3, a sectional elevation of the screw conveyer partially shown in Fig. 2, and the elevator which coöperates therewith for the removal of solid matter discharged from the container, Fig. 4, an enlarged section of the hopper and chute for supplying material at the feed end of the apparatus shown in Fig. 1, Fig. 5, a transverse section along the line 5—5, Fig. 1, drawn to an enlarged scale, Fig. 6, a sectional detail view of the female member of the universal joint by which the hood included in my invention, is connected with the container, and Fig. 7, a section taken along the line 7—7, Fig. 2.

While, as stated hereinabove, my invention may be used in connection with a rotary container of any apparatus in the operation of which there is a possibility of the escape of volatile and pulverulent substances into the atmosphere, it has in the present instance been shown in operative relation to a rotary cylindrical mill of the type employed in the chemical treatment of metalliferous ores.

Referring more specifically to the drawings, the reference numeral 2 designates the horizontally disposed cylindrical container which as usual is rotatably mounted upon roller-bearings 3 through the intermediary of circumferential tread rings 4, and which by means of coöperative gears 5 and 6 is connected with a conveniently located source of energy for rotation about its longitudinal axis. The cylinder has at its ends central openings for the admission and discharge of the materials used in the practice of the process for which it is employed and it is to these openings that the parts of my invention are applied to prevent the escape of dust and gases into the atmosphere.

My invention comprises essentially, a hood which is connected with the respective opening of the rotary cylinder by a universal joint of the ball-and-socket type, and which is movably suspended above a stationary receptacle with which suitable de-

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vices for the removal of materials discharged from the container, are operatively connected.

The means employed for the removal of solids from the stationary structure, consists of a screw-conveyer operating in a horizontal conduit, and an elevator which removes the material advanced by the conveyer, without depleting the contents of the conduit, which provide a seal to prevent the escape of gases and dust at this point.

The universal joint which connects the hood with the opening of the mill, is sealed by liquid and semi-liquid substances to prevent the passage of gases and dust, and the joint between the hood and the stationary structure of the appliance is produced by a liquid seal which renders it impervious to volatile matter.

The pipe used for the supply of gases to the container is fixed on the stationary structure, and a chute through which the material under treatment is fed into the cylinder, is attached to the suspended hood at the feed end of the mill.

It will be seen that by virtue of the cooperative association of the parts of my invention hereinabove outlined, the mill is free to rotate about its longitudinal axis and to move by lateral deflection and vibration without disturbing the relative positions of the parts which conjointly provide a connection impervious to dust or air and other vapors between the openings at the ends of the cylinder and the devices which in the operation of the mill, supply fresh materials to the rotary cylinder and remove the products discharged from the same.

The hood hereinbefore referred to, consists of a bottomless metal casing 7 which in one of its sides has an opening for its connection with the feed or discharge opening of the rotary container. The stationary structure of the appliance above which the hood is suspended, consists of an inclosing wall 8 made of cement or other suitable material, which is erected upon the foundation of the mill and which provides a receptacle 9 for matter discharged from the rotary cylinder. The wall has in its upper edge, a continuous groove 10 which in practice is filled with oil or other suitable liquid and into which dips a flange 12 formed around the lower edge of the hood.

The wall 8 has adjacent the bottom of the receptacle a laterally extending opening 13 which connects with a horizontal conduit 14 placed exteriorly of the wall in connection with an upright shaft 15. A screw-conveyer 16 which extends partially within the receptacle, is rotatably fitted within the conduit and a bucket chain 17 is mounted in the shaft to provide means for the removal of material advanced by the action of the screw to the outer end of the conduit. A pipe 18 hermetically cemented in a bore of the wall, extends inwardly to a point adjacent the opening of the cylindrical container for the supply of gases used in the process for which the mill is employed.

The universal joint between the hood and the container is composed of a short cylindrical duct 19 attached exteriorly of the container axially in alinement with its axis of rotation and surrounding the opening in its end. The duct has circumferentially an annular, transversely arcuate enlargement 20 which constitutes the male or ball-member of the universal joint by which the suspended hood is connected with the cylinder.

The female or socket member of the joint consists of two annular parts 21 and 22 which are interiorly concaved to fit upon the curved bearing surface of the enlargement at opposite sides of the vertical plane passing through the center of the same. The parts of the socket-member are provided with circumferential flanges and are connected by means of bolts 23 which extend through alined openings in said flanges.

Springs 24 coiled around the bolts between the flanges, permit of a yielding self-adjustment of the annular parts with relation to each other, and the inner one of said parts is composed of two sections connected by bolts 25 to permit of its being placed around the curved bearing surface of the duct.

The female member of the universal joint is anchored against rotation by rods 26 which connect two of the bolts by which the parts of the member are connected, with anchor-bolts 27 fixed in the wall of the receptacle 9. The rods have eyes at their extremities by which they are loosely connected with the respective bolts to permit of the self-adjustment of the female member of the joint at which the hood is rigidly secured. The outer part 22 of the socket-member of the joint has a flange for its rigid connection with the hood 7 around the opening in the side thereof, and it has interiorly a spiral groove 28 which by means of a tube 29 is connected with an oil-cup 30. The duct which projects into the hood through the opening in the side thereof, is surrounded by a flange 31 which curves downwardly from the interior surface of the hood to within a short distance of the exterior surface of the duct. The flange 31 provides a grease-pocket which assists in rendering the joint between the hood and the duct, impervious to dust and gases and it is partially surrounded by a semi-annular gutter 32 which receives the drippings overflowing the edge of the pocket. An opening which is normally closed by a plug 33 is provided for the removal of grease from the gutter, whenever required.

A weight 34 at the end of a rope or chain 35 which runs over sheaves 36 and is at-

tached at the upper end of the hood, serves to counterbalance the hood and thereby yieldingly maintains it in its proper position with relation to the duct of the cylindrical container and the liquid seal in the upper edge of the wall 8.

An incandescent lamp 37 illuminates the hood interiorly and windows 38 placed in its front and top permit of observing the operation of the mill without disturbing the parts which constitute the appliance for sealing its openings against the escape of volatile matter into the atmosphere.

At the feed end of the rotary cylinder, the receptacle above which the hood is suspended has in its side an opening 39 which connects with a chamber 40 in which dust discharged with the vapors through the inlet opening of the cylinder, collects. The collecting chamber has adjacent its top an opening 41 which connects with the ingress of an exhaust fan 42, and it is furthermore provided with a series of baffles 43 which promote the separation of the dust from the gases drawn from the mill by the action of the fan, by compelling them to flow along a circuitous course from the inlet opening to the exhaust opening of the chamber. The dust settling in the bottom of the chamber is removed by the conveyer 16 which in this instance is extended to pass through both the receptacle 9 and the chamber 40 and which exteriorly of the latter, connects with the shaft 15 of the elevator.

The material under treatment is fed into the mill through a hopper 44 discharging into a chute 45 which is secured to the hood and projects into the duct at the feed end of the cylinder. A dust-proof connection between the chute which moves with the hood during vibration or lateral deflection of the cylinder, and the hopper which is fixed upon a suitable support such as a bracket 46 fastened to the wall of the collecting chamber, is established by the use of a sleeve 47 of canvas or other flexible material, which is best shown in Fig. 4 of the drawings.

To prevent the escape of dust and gases into the atmosphere when the hopper and the chute are empty, a damper 48 is fulcrumed as at 49 to normally obstruct the flow of material through the chute. The damper is held in its closing position by gravitation of a weight 50 adjustably supported upon an arm 51 which extends outwardly from the damper, it being understood that the latter is automatically opened by the weight of material falling through the hopper into the mouth of the chute.

In the operation of a mill of the character shown in the drawings, to which my invention is applied, the material under treatment is fed into the hopper and passes through the chute past the damper into the admission opening of the cylinder as hereinbefore described.

The gases used in the treatment of the material enter the mill at the discharge end of the cylinder, through the conduit 18 and are drawn through the cylinder in a current moving oppositely to the direction of the movement of the solid matter, by the action of the fan 42. In this connection it is observed that the discharge opening of the cylinder exceeds in diameter the admission opening of the same to establish a flow-line for the continuous movement of material through the container.

The gases by which the material in the cylinder has been treated, as well as those which are generated in the process, are drawn through the chamber 40 in which the dust held in suspension in the volatile matter, collects, and the product of the process is discharged through the outlet opening of the cylinder into the receptacle at the discharge end of the mill. The solid matter thus discharged at opposite ends of the mill is removed by action of the screw-conveyers and the therewith coöperating bucket elevators whose positions relative to the respective conveyers, assure the continuous presence of quantities of solid material in the conveyer housings to prevent the escape of dust and gases into the surrounding atmosphere.

The universal joint between the hoods and the respective ducts of the cylinder, permit of limited vibratory and deflective movements of the latter without affecting the proper relative positions of the parts of my invention. The liquid and semi-liquid seals between the members of the universal joints, and the liquid seals at the points of connection of the movable hoods with the walls of the respective receptacles, effectively prevent the escape of gases and fine dust into the atmosphere, and the continuously filled housings of the conveyers prevent the gaseous matter from passing outwardly with the solid products while the latter are being removed from the mill.

It will thus be seen that by the use of my invention the escape of gases and dust into the atmosphere is effectively prevented without retarding, interrupting or otherwise hindering the continuous operation of the mill, and I desire it understood that while I have shown my invention in the best form at present known to me, the construction and arrangement of its coöperative parts may be varied in accordance with the character of the mill or the form of container to which it is applied.

What I claim and desire to secure by Letters-Patent is:

1. The combination with a rotary container having an opening for the admission or discharge of material, of a non-rotating,

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air-tight appliance providing a receptacle and a passage connecting said receptacle with said opening, means for removing solid matter from said receptacle, and a flexible gas-tight joint between said container and said appliance.

2. The combination with a rotary container having an opening for the admission or discharge of material, of a non-rotating, air-tight appliance providing a receptacle and a passage connecting said receptacle with said opening, a gas-tight joint between said container and said appliance, and a device for the removal of solid matter from the receptacle, adapted to be sealed against the passage of gases, by the material it removes.

3. The combination with a rotary container having an opening for the admission or discharge of material, of a non-rotating, air-tight appliance providing a receptacle and a passage connecting said receptacle with said opening, a gas-tight joint between said container and said appliance, a tubular housing connected with said receptacle in a substantially horizontal position, a screw-conveyer having a rotary movement in said housing to move material from said receptacle to a point exteriorly thereof, and means for the removal of material conveyed through said housing, at a point above the level of the upper portion of its interior.

4. The combination with a rotary container having an opening for the admission or discharge of material, of a non-rotating air-tight appliance providing a receptacle and a passage connecting said receptacle with said opening, a gas-tight joint between said container and said appliance, a tubular housing connected with said receptacle in a substantially horizontal position, a screw-conveyer having a rotary movement in said housing to move material from said receptacle to a point exteriorly thereof, a shaft connected at the outer end of said conveyer, and an elevator in said shaft for the removal of material conveyed through said housing at a point above the level of the upper portion of its interior.

5. The combination with a rotary container having an opening for the admission or discharge of material, of an appliance including a stationary receptacle, a non-rotatable hood providing a passage connecting said opening with said receptacle, means for the removal of solid matter from the receptacle, and joints connecting said hood flexibly with said container and with said receptacle, said joints being sealed against the passage of gases.

6. The combination with a rotary container having an opening for the admission or discharge of material, of an appliance including a stationary receptacle, a non-rotatable hood providing a passage connecting said opening with said receptacle, means for the removal of solid matter from the receptacle, and joints connecting said hood flexibly with said container and with said receptacle, said joints being liquid-sealed against the passage of gases.

7. The combination with a rotary container having an opening for the admission or discharge of material, of an appliance including a stationary receptacle, a nonrotating hood movably suspended from said container and providing a passage connecting said opening with said receptacle, means for the removal of solid matter from the receptacle, and gas-tight joints connecting said hood flexibly with said container and with said receptacle.

8. The combination with a rotary container having an opening for the admission or discharge of material, of an appliance including a stationary receptacle, a non-rotating hood movably suspended from said container and providing a passage connecting said opening with said receptacle, a counterpoise connected with said hood, means for the removal of solid matter from the receptacle, and gas-tight joints connecting said hood flexibly with said container and with said receptacle.

9. The combination with a rotary container having an opening for the admission or discharge of material, of an appliance including a stationary receptacle, a non-rotating hood movably suspended from said container and providing a passage connecting said opening with said receptacle, means for the removal of solid matter from the receptacle, and a joint between said hood and said container, comprising a duct-member connecting with said opening and having a circumferential, transversely curved bearing-surface, and a concaved member movably fitted upon said bearing-surface in rigid connection with the hood.

10. The combination with a rotary container having an opening for the admission or discharge of material, of an appliance including a stationary receptacle, a non-rotating hood movably suspended from said container and providing a passage connecting said opening with said receptacle, means for the removal of solid matter from the receptacle, and a joint between said hood and said container, comprising a duct-member connecting with said opening and having a circumferential, transversely curved bearing-surface, an interiorly grooved, concaved member movably fitted upon said bearing surface in rigid connection with the hood, and means for the supply of liquid to the groove of said concaved member.

11. The combination with a rotary container having an opening for the admission or discharge of material, of an appliance including a stationary receptacle, a non-rotating hood movably suspended from said

container and providing a passage connecting said opening with said receptacle, means for the removal of solid matter from the receptacle, and a joint between said hood and said container, comprising a duct-member connecting with said opening and having a circumferential, transversely curved bearing surface, a concaved member movably fitted upon said bearing-surface in rigid connection with said hood, and an annular grease-pocket covering the joint between said concaved member and the duct.

12. The combination with a rotary container having an opening for the admission or discharge of material, of an appliance including a stationary receptacle, a non-rotating hood movably suspended from said container and providing a passage connecting said opening with said receptacle, means for the removal of solid matter from the receptacle, and a joint between said hood and said container, comprising a duct-member connecting with said opening and having a circumferential, transversely curved bearing-surface, a concaved member movably fitted upon said bearing-surface in rigid connection with said hood, an annular grease-pocket covering the joint between said concaved member and the duct, and a gutter disposed to receive the overflow of said pocket.

13. The combination with a rotary container having an opening for the admission or discharge of material, of an appliance including a stationary receptacle, a non-rotating hood movably suspended from said container and providing a passage connecting said opening with said receptacle, means for the removal of solid matter from the receptacle, and a joint between said hood and said container, comprising a duct-member connecting with said opening and having a circumferential, transversely curved bearing surface, and a concaved member movably fitted upon said bearing-surface in rigid connection with the hood and composed of two resiliently connected sections.

14. The combination with a rotary container having an opening for the admission or discharge of material, of an appliance including a stationary receptacle, a non-rotating hood movably suspended from said container and providing a passage connecting said opening with said receptacle, means for the removal of solid matter from the receptacle, and a joint between said hood and said container, comprising a duct-member connecting with said opening and having a circumferential, transversely curved bearing-surface, and a concaved member movably fitted upon said bearing surface in rigid connection with the hood, and anchored against rotation.

15. The combination with a rotary container having an opening for the admission or discharge of material, of an appliance including a stationary receptacle having a groove in the upper edge of its wall, a non-rotating hood providing a passage connecting said opening with said receptacle and having a flange extending loosely into said groove, means for removing solid matter from the receptacle, a liquid in said groove and a flexible joint between the hood and the container.

16. The combination with a rotary container having an opening for the admission or discharge of material, of an appliance including a stationary receptacle, a non-rotating hood providing a passage which connects the opening with said receptacle, a flexible joint between the container and the hood, means for the removal of matter from the receptacle, and a liquid seal providing a joint between the receptacle and the hood.

17. The combination with a rotary container having an opening for the admission or discharge of material, of an appliance including a stationary receptacle, a non-rotating hood providing a passage which connects the opening with said receptacle, gas-tight joints flexibly connecting the hood with the container and the receptacle, a feed chute connected with said hood for the supply of material to said opening, and means for the supply of material to said chute, exteriorly of the hood.

18. The combination with a rotary container having an opening for the admission or discharge of material, of an appliance including a stationary receptacle, a non-rotating hood providing a passage which connects the opening with said receptacle, gas-tight joints flexibly connecting the hood with the container and the receptacle, a feed chute connected with said hood for the supply of material to said opening, means for the supply of material to said chute, exteriorly of the hood, and a damper normally closing the chute and adapted to be opened by material passing through the chute.

19. The combination with a rotary container having openings at opposite ends for the admission and discharge of material, of air-tight appliances providing receptacles and passages which connect said receptacles respectively with said openings, means for the removal of solid matter from said receptacles, and gas-tight joints flexibly connecting said container with said appliances.

20. The combination with a rotary container having openings at opposite ends for the admission and discharge of material, of air-tight appliances providing receptacles and passages which connect said receptacles respectively with said openings, means for the removal of solid matter from said receptacles, a chute connected with one of said appliances for the supply of material to the

respective opening, and gas-tight joints flexibly connecting said container with said appliances.

21. The combination with a rotary container having openings at opposite ends for the admission and discharge of material, of air-tight appliances providing receptacles and passages which connect said receptacles respectively with said openings, means for the removal of solid matter from said receptacles, means for the admission of gases to one of said appliances, means for the exhaust of gases from the other appliance, and gas-tight joints flexibly connecting said container with said appliances.

22. The combination with a rotary container having openings at opposite ends for the admission and discharge of material, of air-tight appliances providing receptacles and passages which connect said receptacles respectively with said openings, a dust-collecting chamber connected with one of said appliances, means for the admission of gases to the other appliance, means for the exhaust of gases from said chamber, devices for the removal of solid matter from said appliances and said chamber, and gas-tight joints flexibly connecting said container with said appliances.

In testimony whereof I have affixed my signature in presence of two witnesses.

JOHN L. MALM.

Witnesses:
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S. A. IONIDES.