April 16, 1963 W. H. GOODING 3,085,674

UNLOADERS

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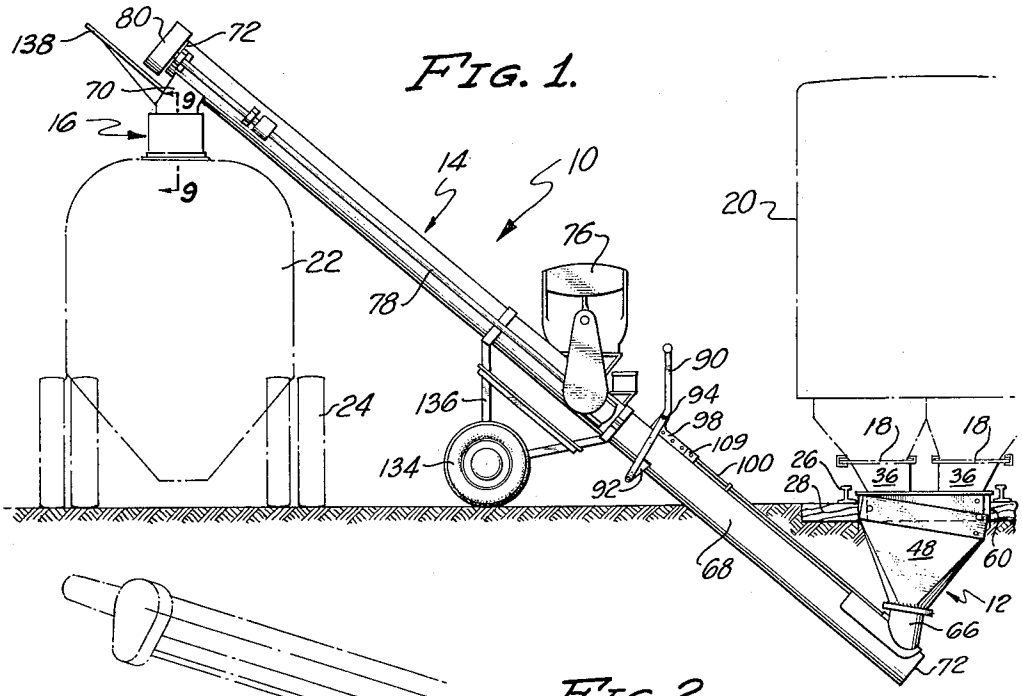


FIG. 1.

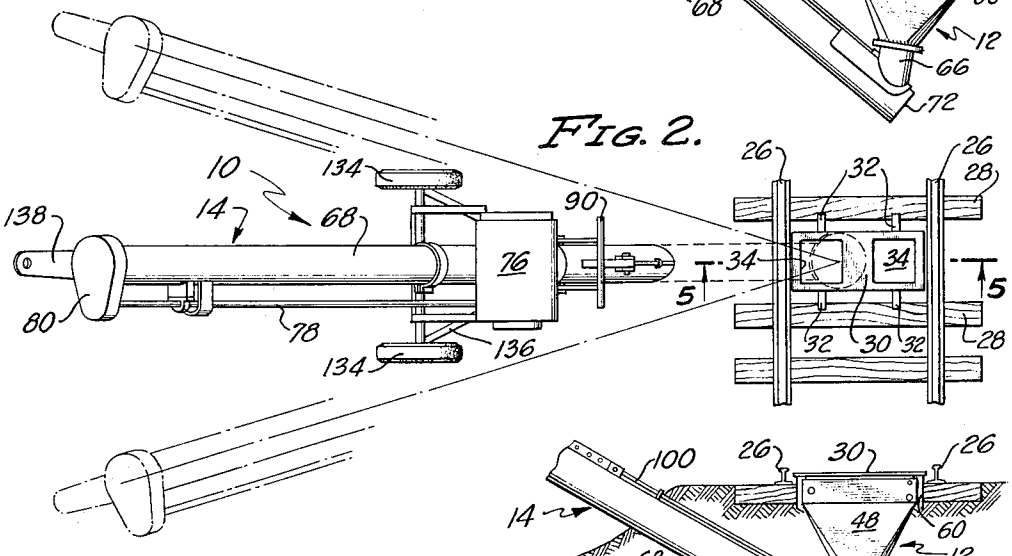


FIG. 2.

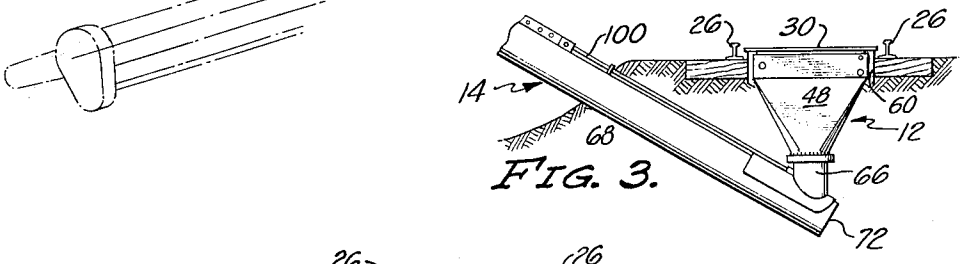


FIG. 3.

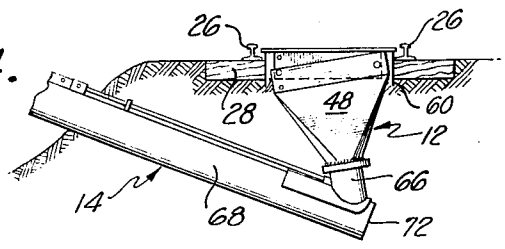


FIG. 4.

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FIG. 5.

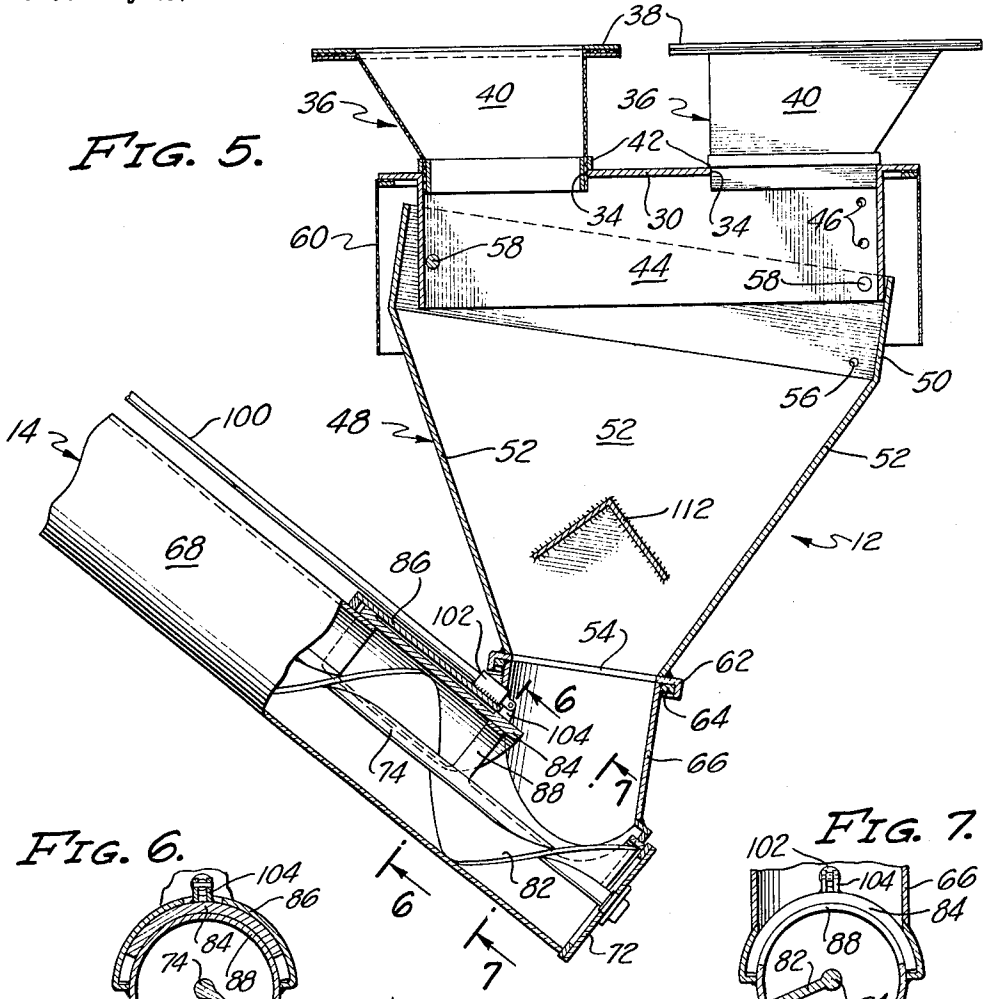


FIG. 6.

FIG. 7.

FIG. 9.

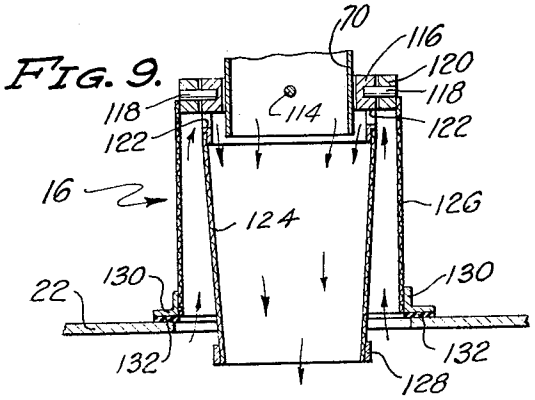
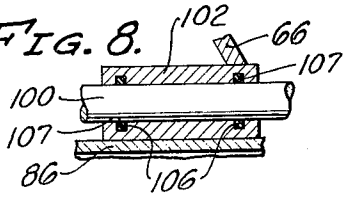


FIG. 8.



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FIG. 10.

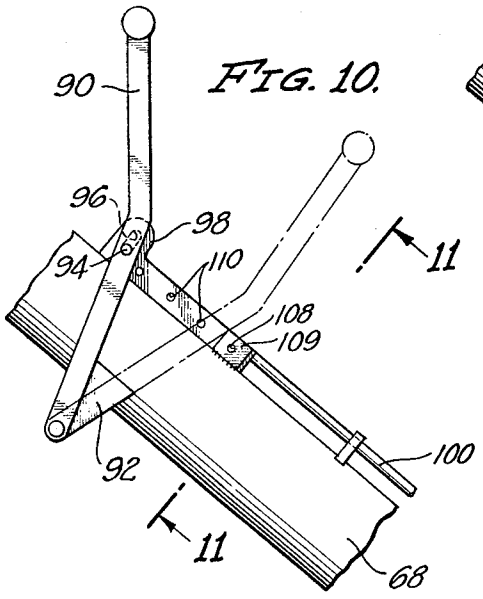
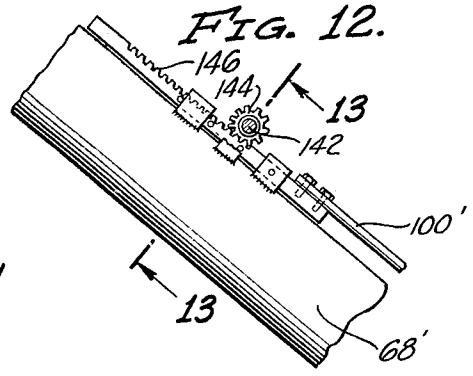


FIG. 12.



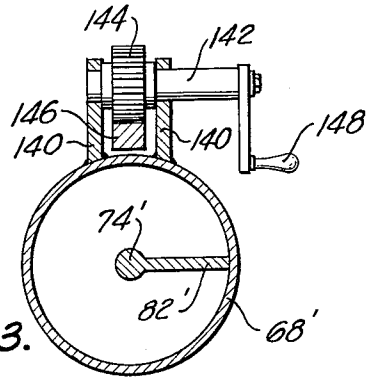
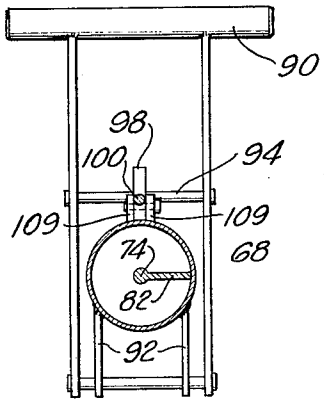


FIG. 13.

FIG. 11.



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3,085,674

UNLOADERS

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Filed May 29, 1959, Ser. No. 816,921
6 Claims. (Cl. 198—64)

This invention pertains to new and improved unloading structures or unloaders which are primarily intended to be used with granular materials such as cement, sand and the like.

The cost of transporting such materials from one location to another is a very important commercial factor at the present time. In general it is preferred to ship materials such as sand, cement and the like from one location to another by railroad because of cost considerations. However, several factors effectively limit the use of railroad transportation in the bulk movement of granular materials.

One of these factors is the availability of railroad tracks leading to desired locations. This factor, while important, is of a secondary nature since there are railroads leading to virtually any area at least within the general vicinity where it is desired to ship such granular materials. A more important factor limiting the use of railroad transportation to ship such materials in the past has been an inability to effectively and inexpensively unload bulk shipments of granular materials from railroad cars without using comparatively expensive, permanent unloading structures. This latter type of problem has been complicated in many areas because of zoning and air pollution requirements.

These factors may be explained by referring to the shipment of cement. It is cheaper to ship this material overland in bulk by railroad than to ship it by other methods. However, in the past this mode of shipment has been effectively limited by the need for comparatively costly "bulk plants" for transferring cement from railroad cars to trucks which are used to carry cement to locations where it is used. The cost of these "bulk plants" has resulted in many cement firms owning only a few of these plants. This, in turn, has resulted in comparatively long trucking hauls in transporting cement to where it is used.

Frequently the ultimate cost of such cement to a consumer is indirectly increased because of the fact that such bulk plants have been required to be located in commercially undesirable locations because of zoning requirements. Also the locations of such bulk plants have been limited because of the fact that these structures operate in such a manner that a significant amount of cement is lost from them as dust.

A broad object of this invention is to provide new and improved unloading structures or unloaders. A more specific object of this invention is to provide comparatively inexpensive, reliable, effective unloaders which can be used to transfer bulk shipments of granular materials from railroad cars to trucks. A related object of this invention is to provide unloaders of this type which are much more desirable commercially than prior "bulk plants" and related structures used for the same general purpose as these "bulk plants," because these unloaders are portable, they can be used in virtually any location along a railroad track, and can be installed in any such location with a minimum of difficulty. A further object of this invention is to provide a new process and apparatus for controlling dust during the movement of finely divided material from one location to another.

Because of the nature of this invention it is not considered necessary to set forth specifically further detailed objects and advantages of the invention itself. Such other objects and advantages of this invention will be fully apparent to those skilled in the art to which this invention pertains from a detailed consideration of the remainder of this description, the appended claims and the accompanying drawings, in which:

FIG. 1 is a side elevational view of an unloader of this invention;

FIG. 2 is a top plan view of this unloader;

FIGS. 3 and 4 are partial side elevational views of this unloader showing it in use in several types of locations;

FIG. 5 is a cross-sectional view taken at line **5—5** of FIG. 2;

FIGS. 6 and 7 are partial cross-sectional views taken at lines **6—6** and **7—7** in FIG. 5;

FIG. 8 is a cross-sectional view of a packing gland employed with this unloader;

FIG. 9 is a partial cross-sectional view taken at line **9—9** of FIG. 1;

FIG. 10 is an enlarged side elevational view of part of the unloader shown in FIG. 1;

FIG. 11 is a cross-sectional view taken at line **11—11** in FIG. 10;

FIG. 12 is an enlarged side elevational view similar to FIG. 10 of a modified unloader of this invention; and

FIG. 13 is a cross-sectional view taken at line **13—13** of FIG. 12.

The accompanying drawings are primarily intended so as to clearly illustrate a presently preferred embodiment of this invention. Those skilled in the field to which this invention pertains will realize, however, that a number of differently appearing unloaders using the features of this invention as hereinafter explained may be designed through the use of routine engineering skill.

As an aid to understanding this invention it may be stated in essentially summary form that it concerns unloaders each of which includes what may be termed "hopper means" having a bottom outlet. Such a bottom outlet is connected within an unloader of this invention to the inlet of what may be termed "conveyor means" having a discharge outlet. Preferably the outlet from such a conveyer means is constructed to as to include dust recirculating, discharge means for conveying material from the conveyer means into an appropriate container through an opening in such a container.

The actual nature of this invention is best more fully explained by referring directly to the accompanying drawings in which there is shown a complete unloader **10** of this invention. This unloader includes a hopper structure **12**, a conveyer structure **14** and a discharge structure **16**, all of which structures include various individual parts as hereinafter set forth. These three structures **12**, **14** and **16** are connected together so that they may be used to convey material from discharge openings **18** in the bottom of a conventional railroad car **20** of the type commonly used to convey granular material into an appropriate bin or receptacle **22** on a truck **24** used for conveying granular material from a railroad siding to where this material is used.

Obviously, however, the complete unloader **10** can be employed for other purposes or in conveying materials to various different types of receptacles for such materials. One advantage of the present invention lies in the fact that several of the unloaders **10** may be used adjacent to one another so as to simultaneously convey granular material into several different receptacles on a truck and trailer in order to completely load both of such receptacles simultaneously.

The unloader **10** is formed so that the hopper structure **12** may be located within a space between two con-

ventional railroad rails 26 in the space between two railroad ties 28 normally occupied by another tie (not shown). This hopper structure 12 includes a top plate 30 designed to be held generally within the plane of the top surface of these ties 28 by means of small angle iron brackets 32 engaging the upper surface of the ties 28. If desired, however, the brackets 32 can be omitted.

The plate 30 contains two openings 34 which are spaced from one another so as to be approximately aligned with discharge openings 18 on a railroad car 20 when this car is moved into a proper position above the plate 30. These openings 34 are adapted to be attached to the openings 18 by means of connectors 36. Preferably each of the connectors 36 includes a top metal flange 38 (FIG. 5) adapted to be connected by conventional bolts or the like (not shown) to the portion of the railroad car 20 surrounding and defining a discharge opening 18.

In the connectors 36 these flanges 38 are secured to the tops of flexible chutes 40 which may be made out of waterproof canvas or various other similar materials. The bottoms of these chutes 40 within the connectors 36 are smaller than the tops of these chutes; they carry metal rings 42 of substantially the same shape and dimension as the openings 34. These rings 42 are adapted to rest upon the plate 30 surrounding the openings 34 in order to firmly hold the connectors 36 in position with respect to the hopper structure 12 in order to establish essentially a water resistant seal.

An elongated dependent wall or skirt 44 is secured to the undersurface of the plate 30 so as to completely surround the openings 34. This skirt 44 adjacent to its ends is provided with a series of aligned holes 46 which are adapted to be used in supporting a hopper section 48. This hopper section 48 includes a top wall 50 which is attached to tapered walls 52 defining a hopper having a circular bottom outlet 54. The top wall 50 of the hopper section 48 is provided with a series of aligned holes 56 which are spaced so that their locations correspond to the locations of the holes 46.

This construction permits the hopper section 48 to be suspended from the wall 44 in different manners as indicated in FIGS. 1, 5, 3 and 4 of the drawings through the use of pins 58 extending between holes 56 and holes 46 in the top wall 50 and in the skirt 44, respectively. This feature of the invention is important for commercial reasons. It enables the unloader 10 of the present invention to be used where the elevation of the ground adjacent to a railroad track is either the same as, or different from the elevation of the railroad track itself. Thus, the unloaders of the present invention can be used in virtually any location without reference to the grade level of the land. This is important when it is desired to use such unloaders in various locations where prior related devices could not be satisfactorily employed.

In order that the hopper section 48 may be moved to any of the positions indicated in FIGS. 1, 5, 3 or 4 of the drawings it is necessary that the top wall 50 of this section be spaced from the skirt 44. Such spacing would normally permit the entrance of ambient water into the hopper section 48, as, for example, during rainstorms. For this reason it is preferred to locate around the top wall 50 of the hopper section 48 a curtain 60 of flexible, waterproof material which is attached to the plate 30 in a fluid tight manner. In desert regions the curtain can be dispensed with, although even in these locations it is preferably used since it effectively prevents the entrance of other things, such as dust, into the hopper section 48.

An annular flange 62 is located around the bottom outlet 54 in the hopper section 48. This flange abuts against another similar flange 64 or an inlet conduit 66 leading into the conveyer structure 14. These two flanges are preferably secured against one another in a known manner so as to form a water resistant rotary seal enabling the conveyer structure 14 to be moved to various positions with respect to the hopper section 12 as indicated in FIG. 2 of the drawing so that the discharge structure 16 may be aligned with an opening into a bin on a truck or the like as may be required. This adjustable feature increases the utility of the complete unloader 10 to a substantial degree.

The conveyer structure 14 is built about an elongated cylindrical barrel 68 extending at an angle upwardly from the inlet conduit 66 to an outlet conduit 70. The ends 72 of this barrel 68 are closed and serve to carry a rotatable shaft 74 extending the complete length of this barrel 68 itself. This shaft is adapted to be driven using a conventional motor 76 mounted on the barrel 68 intermediate to its ends. The motor 76 is connected to the shaft 74 using a drive shaft 78 and a conventional power transmission unit 80 such as a chain drive located at the ends 72 of the barrel 68 adjacent to the outlet conduit 70.

The shaft 74 carries a conventional screw flight 82 fitting closely within the interior of the barrel 68 itself. This screw flight 82 serves so as to convey material through the conveyer structure 14 out through the outlet conduit 70. In order to regulate the amount of material conveyed in this manner, or the rate at which such material is conveyed, it is preferred to use within the conveyer structure 14 an inlet gate 84 having a curved shape corresponding to the shape of the barrel itself.

This gate 84, when open, is held within a housing 86 of a shape corresponding to the shape of the barrel 68, which housing 86 is secured to the barrel 68 adjacent to the inlet conduit 66. As is best seen in FIG. 5 of the drawings the interior of the housing 86 is open to the interior of the barrel 68 in order to prevent material from "hanging up" within the interior of it so as to interfere with the movement of the gate 84. This gate is normally supported by means of a small strap 88 curved so as to fit around the screw flight 82. As is best seen in FIGS. 5 and 6 of the drawing this strap 88 is located adjacent to one side of the inlet conduit 66.

When it is desired to close the gate 84 as, for example, when a truck has been loaded, a handle 90 pivotally mounted upon a bracket 92 extending from the barrel 68 may be moved for the position shown in FIGS. 1 and 10 of the drawings toward the hopper structure 12. As this occurs a rod 94 carried by the handle 90 slides within a slot 96 in a plate 98. This plate 98 is attached to a rod 100 so as to cause this rod 100 to slide toward the inlet conduit 96 of the conveyer structure 14 during such movement of the handle 90.

The rod 100 passes through a small packing gland 102 (FIG. 8) secured to the inlet conduit 66; the end of this rod 100 is attached to a small bracket 104 (FIG. 5) extending from the gate 84 on the side thereof remote from the interior of the barrel 68. Preferably O-rings 106 formed out of an elastomeric material are located within grooves 107 in the packing gland 102 so as to engage the rod 100 in order to form a seal therewith at all times.

As the handle 90 is moved in the manner indicated the gate 84 is moved so as to cover the inlet conduit 66 at the location where this conduit leads into the interior of the barrel 68. The handle 90 may be locked into a position with the gate 84 completely or partially closing the conduit 66 by slipping a bolt or the like (not shown) through any of a series of holes 108 in brackets 109 attached to the barrel 68 and through any one of a series of corresponding holes 110 in the plate 98. Partial closing the gate 84 is frequently desired because it results in control of the rate at which material is moved by the unloader 10.

In order to prevent an undue build up of weight of material within the hopper structure 12 bearing against the gate 84 so as to impede its movement it is normally preferred to incorporate within the hopper section 48 a small generally V-shaped, inverted baffle 112. This baffle 112 is located immediately above the outlet 54 so that all of the material within the hopper structure 12

does not all bear directly against this gate 84 when it is extended generally into the inlet conduit 66.

An important feature of this structure of the conveyer structure 14 lies in the fact that when the gate 84 is completely extended so as to close off the inlet conduit 66 the barrel 68 may be substantially emptied of any material within it. Thus, for example, when the complete unloader 10 is used with cement which is capable of caking as when subjected to the moisture within the air substantially all of this material can be removed from the barrel 68 by operating the motor 76 after the gate 84 has been closed. This prevents the accumulation of material within the barrel 68 which might harden and which might impede subsequent turning of the shaft 74 and the screw flight 82.

The outlet conduit 70 from the barrel 68 may be used to directly convey material into any sort of a conveyer bin or the like. However, it is preferred to use on this outlet conduit 70 a discharge structure 16 as is best seen in FIG. 9 of the drawings. This discharge structure 16 is carried upon the outlet conduit 70 by means of an elongated pin 114 which in turn pivotally carries a metal ring 116 fitting closely around the outlet conduit 70. Other pins 118 extend from the ring 116 and pivotally support an outer ring 120 closely spaced adjacent to the ring 116. As is best seen in FIG. 9 the outlet conduit 70 extends through these rings 116 and 120; a series of holes 122 are located in the periphery of the ring 116 so as to connect the space between it and the ring 120.

Within the discharge structure 16 a discharge chute 124 of a flexible material such as water proof canvas is attached to the ring 116 so as to extend therefrom. Another similar, but shorter, chute 126 is attached to the ring 120 so as to be spaced from the chute 124. The chute 124 carries an interior metal ring 128 designed to pull this chute 124 into a substantially vertical position at all times. The chute 126 also carries a similar flanged ring 130 which preferably carries a small elastomeric (rubber) member 132 designed to form at least a partial seal. This discharge structure 16 is designed so that during use the chute 124 extends into a bin such as a bin 22 on the truck 24 while simultaneously the ring 130 rests upon this bin in order to form at least a partial seal therewith at all times.

As the discharge structure 16 is used in conveying material from the outlet conduit 70 this material falls through the chute 124. Normally considerable dust is created as such material is deposited within a bin. With the discharge structure 16 a partial vacuum is created through the movement of this material which tends to cause dust-laden gas to be withdrawn upwardly between the chutes 124 and 126 and thence through the holes 122 in the ring 116. Here the dust within this gas is intermixed with the main stream of material from the conduit and tends to precipitate out with this material as it is being deposited. Because of this action, only an extremely limited quantity of dust escapes from the discharge structure 16 into the ambient air.

During the use of a discharge structure, such as the discharge structure 16, with a bin such as the bin 22 the receptacle will gradually become filled with material. Hence, there is a tendency for the air pressure within such a container to gradually build up. If a container such as a bin 22 was completely sealed, and if the discharge structure used with the container was also of a similar character this build up of air pressure would tend to impede or detrimentally affect the operation of the complete discharge structure 16 after it had been used for a prolonged period. Such effects are avoided with the present invention because of the structure employed.

During the use of the discharge structure 16 some minor amount of gas will tend to gradually seep out of the discharge structure around the interiors of the rings 116 and 120. Since this gas is rising vertically heavier particles of dust carried in it will tend to be separated adjacent to these rings 116 and 120 and will be drawn back into the chute 124. Also, usually some gas will escape from a bin such as the bin 22 through various openings in it which openings, in and of themselves, frequently exercise a filtering effect so as to tend to hold unwanted dust within the interior of the bin.

This result of preventing loss of dust is exceedingly important in many highly urban areas. Because of the substantially dust-free operation of a complete unloader of this invention, such as the unloader 10, these unloaders may be used where because of prior zoning regulations bulk loading plants for the handling of cement and similar granular materials could not be used. This results in an important economic advantage.

The unloader 10 preferably includes wheels 134 attached to the barrel 68 by means of an appropriate frame 136. Also a bracket 138 adapted to be connected to a truck or the like in a known manner is preferably attached to the outlet 70. This structure is designed so that the complete unloader 10 may be readily transported from one location to another as may be desired for commercial reasons. The transportability of the unloaders of this invention is very advantageous commercially. Because of this transportability unloaders as herein described may be moved from one job to another as may be required. Further, they eliminate the necessity of maintaining large facilities such as, for example, a bulk loading plant in various locations where these unloaders may be used.

Those skilled in the art to which this invention pertains will realize that a number of modifications and changes of essentially an engineering nature may be made in unloaders as herein described without departing from the essential or basic features of the present invention. As an example of this it is possible with the present invention to replace the handle 90 used with this invention with a structure as is indicated in FIGS. 12 and 13 of the drawings. For convenience of designation those parts of this structure which are identical or substantially identical to the parts of the complete unloader 10 are designated by the primes of the numerals previously used.

In the structure shown in FIGS. 12 and 13 of the drawings brackets 140 attached to the barrel 68' serve to rotatably support a shaft 142 carrying a small gear 144. This gear 144 co-acts with a rack 146 attached to the end of the rod 100' so that as a handle 148 attached to the shaft 142 is turned the rod 100' is moved so as to cause movement of a gate attached to it.

Those skilled in the art to which this invention pertains will realize that unloaders such as the unloader 10 are extremely advantageous for the purposes intended. If desired, a plurality of these unloaders may be used simultaneously in loading a corresponding number of containers upon one or more trucks and can be operated together. They will further realize that unloaders, such as the unloader 10, can be used with an extremely wide variety of different materials. It will also be realized that such unloaders are portable in that they may be easily moved from one location to another through the use of the wheels 134 and that they may be installed in any new location by the simple expedient of digging an appropriate opening or pit underneath a railroad track and removing a single tie from beneath such a track.

Because of the fact that the positions of conveyors in the unloaders of this invention may be adjusted in either a horizontal plane through the use of a swivel joint, or may be adjusted in a vertical plane through the proper positioning of the pins 58, they may be used in various locations where the ground elevations are of virtually any shape. Further, unloaders such as the unloader 10, when constructed as described are essentially of a waterproof character and, hence, may be used with materials which would be damaged by rain or the like.

Because of the nature of this invention it is to be con-

sidered as being limited only by the appended claims forming a part of this disclosure.

I claim:

1. An unloader which includes: hopper means, said hopper means being adapted to be located beneath a railroad car carrying granular material, said hopper means including a top opening formed therein, said hopper means having a bottom outlet opening; conveyer means, said conveyer means including an inlet conduit attached to said outlet opening of said hopper means, and a discharge outlet located remote from said hopper means, said conveyer means extending away from said hopper means; and discharge means attached to said discharge outlet of said conveyer means, said discharge means including a discharge conduit formed out of flexible material attached to said discharge outlet so as to extend therefrom and a dust conduit formed out of a flexible material located around said discharge conduit, said discharge means also including openings leading from the end of said dust conduit adjacent to said discharge outlet to the end of said discharge conduit adjacent to said discharge outlet.

2. An unloader as defined in claim 1 including gate valve means located on said conveyer means, said gate valve means being capable of being actuated so as to cover the opening from said inlet conduit into said conveyer means, said gate valve means including a gate slidably mounted on said conveyer means.

3. An unloading structure which includes: a plate containing openings which are spaced so as to correspond to the spacing of discharge openings on a railroad car, said plate being adapted to be located between railroad rails in the area normally occupied by a railroad tie; means for locating said plate between railroad rails in the area normally occupied by a railroad tie; a dependent wall attached to said plate so as to extend downwardly therefrom around said openings; a waterproof curtain attached to said plate so as to extend downwardly therefrom, said curtain being spaced from said wall and extending completely around said wall; a hopper having an open top and a bottom opening, said top of said hopper fitting within the space between said curtain and said wall so that the angle beneath said hopper and said plate is capable of being varied; and means for suspending said hopper from said wall so that the angle of said hopper with respect to said wall may be changed; a screw conveyer including an elongated cylindrical barrel, an opening leading into an end of said barrel, an inlet conduit leading into said opening, said inlet conduit being attached to said barrel so as to extend therefrom, and a screw flight fitting closely within the interior of said barrel, said screw flight extending past said opening; and water resistant swivel joint means connecting said bottom opening of said hopper with said inlet conduit whereby said barrel may be rotated with respect to said hopper about the axis of said inlet conduit.

4. An unloading structure which includes: a plate containing openings which are spaced so as to correspond to the spacing of discharge openings on a railroad car, said plate being adapted to be located between railroad rails in the area normally occupied by a railroad tie; means for locating said plate between railroad rails in the area normally occupied by a railroad tie; a dependent wall attached to said plate so as to extend downwardly therefrom around said openings; a waterproof curtain attached to said plate so as to extend downwardly therefrom, said curtain being spaced from said wall and extending completely around said wall; a hopper having an open top and a bottom opening, said top of said hopper fitting within the space between said curtain and said wall so that the angle beneath said hopper and said plate is capable of being varied; and means for suspending said hopper from said wall so that the angle of said hopper with respect to said wall may be changed; a screw conveyer including an elongated cylindrical barrel, an opening leading into an end of said barrel, an inlet conduit leading into said opening, said inlet conduit being attached to said barrel so as to extend therefrom, and a screw flight fitting closely within the interior of said barrel, said screw flight extending past said opening; and water resistant swivel joint means connecting said bottom opening of said hopper with said inlet conduit whereby said barrel may be rotated with respect to said hopper about the axis of said inlet conduit; a housing secured to the exterior of said barrel adjacent to said opening and said inlet conduit, said housing having a shape corresponding to the shape of said barrel and being open to the interior of said barrel; an inlet gate having a curved shape corresponding to the shape of said barrel located adjacent to said screw flight in said housing, said gate being capable of being moved so as to extend from said housing so as to close off said opening; and means for moving said inlet gate from an open position within said housing to a closed position in which said opening is closed off.

5. An unloading structure which includes: plate means adapted to be located between railroad rails in the area normally occupied by a railroad tie; means for locating said plate means between railroad rails in the area normally occupied by a railroad tie; hopper means having an open top and a bottom opening for receiving material from a railroad car operatively secured to said plate means so as to be suspended therefrom; a screw conveyer including an elongated cylindrical barrel an opening leading into an end of said barrel, an inlet conduit leading into said opening, said inlet conduit being attached to said barrel so as to extend therefrom, and a screw flight fitting closely within the interior of said barrel, said screw flight extending past said opening; and water resistant swivel joint means connecting said bottom opening of said hopper with said inlet conduit and securing said hopper with respect to said inlet conduit whereby said barrel may be rotated with respect to said hopper about the axis of said inlet conduit; and adjustable gate means positioned between the interior of said barrel and said inlet conduit.

6. An unloading structure which includes: plate means containing openings which are spaced so as to correspond to the spacing of discharge openings on a railroad car, said plate means being adapted to be located between railroad rails in the area normally occupied by a railroad tie; means for locating said plate means between railroad rails in the area normally occupied by a railroad tie; a hopper having an open top and a bottom opening, said top of said hopper being located beneath said openings and said plate means; means operatively connecting said hopper and said plate means so that the angle of said hopper with respect to said plate means may be changed; a screw conveyer including an elongated cylindrical barrel, an opening leading into an end of said barrel, an inlet conduit leading into said opening, said inlet conduit being attached to said barrel so as to extend therefrom, and a screw flight fitting closely within the interior of said barrel, said screw flight extending past said opening; and water resistant swivel joint means connecting said bottom opening of said hopper with said inlet conduit whereby said barrel may be rotated with respect to said hopper about the axis of said inlet conduit.

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